Three Essays on the Well-Being of Vulnerable Populations

Introduction

Many programs and policies, whether or not they are directly intended to, have an impact on the well-being of individuals that are at high risk of being poor (vulnerable populations). Most welfare programs are directly intended to improve the economic standing of resource constrained individuals, thus their impact on the wellbeing of target populations is the natural measure of program success. For example the impact on the food insecurity of eligible USDA Food Stamp Program (FSP) participants is a natural measure of the performance of the FSP. The role that the FSP plays in reducing overall exposure to expenditure poverty would also provide an indication of program success. Policies not intended to directly impact vulnerable populations may also have a crucial impact on their economic prospects. For instance, legislation aiming to improve desegregation of public education affects public support for Historically Black Colleges and Universities (HBCUs). HBCUs, however, host a highly disproportionate share of historically disadvantaged Black college attendees, particularly in the rural South, and have been shown to provide unique human capital and economic wellbeing contributions to rural counties with high concentrations of Blacks (Mykerezi and Mills, 2005). Decisions regarding the fate of HBCUs may thus have significant implications for economic wellbeing in historically disadvantaged areas in the south.

Perhaps the most important component of any analysis of policy impact on vulnerable populations is establishing appropriate measures of wellbeing. In a complex socio-economic environment, programs and policies are likely to have lingering, and perhaps time varying impacts. Thus, more often than not, dynamic measures of individual and family wellbeing are

required to appropriately evaluate policy impacts. Many analyses continue, however, to rely on static measures of economic well-being.

This dissertation is composed of three papers that use innovative and dynamic measures of economic wellbeing to evaluate the impact of programs and policies on vulnerable populations. In all three cases panel datasets are used to operationalize measures of wellbeing. Programs and policies explored are support of HBCUs to increase post-secondary education of African Americans in historically disadvantaged areas, and food assistance programs aiming alleviation of food insecurity and poverty.

The first paper entitled "The Wage Impact of Historically Black College and University Attendance" examines the impact of attending a Historically Black College or University on the wages of Blacks attending HBCUs versus other four year colleges or universities. Historically Black Colleges were originally founded in the 1890s to provide "separate but equal" educational opportunities to Blacks in the South. Since Brown v. the Board of Education (1954), however the maintenance of institutions of higher education with a mission to educate Blacks has been the object of debate. Perhaps the most controversial court ruling affecting the fate of public HBCUs was in the case of United States V. Fordice (1992). The Fordice ruling stated that implementation of race neutral policies alone is insufficient to eradicate segregation in the higher education system. Instead state policies rooted in the previous system, and that may perpetuate segregation need to be eliminated. This ruling has been interpreted to imply that HBCUs, especially ones that are located nearby mixed public institutions with similar programs, need to be merged with mixed universities or closed all together. The interpretation of the verdict provided by the U.S. Department of Education in 1994 however, requires that states do not impose unnecessary burdens on Black students in an effort to further integrate their higher

education system (Moore, 2000). Whether the merging or closing down of HBCUs poses a burden on Black students is therefore a crucial empirical question. An examination of the impact of attending an HBCU versus a mixed four year college on the earnings of Blacks is an important aspect of assessing the effect of closing HBCUs on Blacks that currently attend HBCUs or are likely to attend them in the future.

Previous studies that have examined the impact of HBCUs on post-college earnings of African Americans find mixed results. Two studies (Constantine, 1995; Constantine, 1998) indicate a positive impact of HBCU attendance on wages, and one (Ehremberg and Rothstain, 1994) indicates a negative impact. One important limitation of these studies however is that they examine the impact of wages at a particular point in time, namely at an average age of 32 for the first two studies and 25 for the third. The first paper in my dissertation takes a dynamic approach, examining the impact of HBCU attendance soon after individuals leave college and also late in their careers.

The second paper in the dissertation entitled "Chronic and Transient Poverty in the United States: The impact of The Food Stamp Program", examines the impact of intensity of use of benefits provided by the UDSA Food Stamp Program (FSP) on household exposure to temporary and long term poverty. The FSP is a cornerstone of the US social safety net, with on average 26 million monthly participants in 2005 and a total program cost of $31 billion (USDA, 2006). Many dimensions of FSP impacts on recipient family well-being have been examined, including impacts on self-reported measures of food insecurity (Gundersen and Oliveira, 2001; Kabbani and Kmeid, 2005), impacts on the income-based official poverty measure for the general population (Bishop, Formby, and Zeager, 1996; Hoynes, Page, and Stevens, 2006), and impacts on specific target groups like children (Jolliffe, Gundersen, Tiehen, and Winicki, 2005).

An important, and often overlooked, impact of the FSP however, is the reduction in food consumption variability associated with participation. For instance, Gundersen and Ziliak (2003) estimate that FSP participation reduces food-expenditure volatility by 14 percent. However, the expenditure smoothing benefits of the program are also found to have declined in the early 1990s relative to the 1980s.

The second paper in my dissertation documents several other important potential impacts of the FSP. Perhaps most importantly, despite evidence that FSP participation has a significant impact on the variability of family food consumption, the impacts of FSP participation on family poverty dynamics have not been quantitatively explored. Family economic well-being and economic deprivation, as measured by poverty status, fluctuate over time. A single survey provides only a snap-shot of a family's exposure to economic deprivation. Dynamic analyses of poverty provide a much broader picture of household exposure to economic deprivation and the ameliorative role of social protection programs. Such dynamic poverty measures have been employed to examine the frequency of spells of poverty in a fixed time frame (e.g. Coe and Duncan, 1978) and the durations of spells of poverty over multiple years (e.g. Bane and Ellwood, 1986) using panel datasets. Panel data on spells of poverty can also be used to classify families as transiently and chronically poor (Rogers and Rogers, 1993); with the transient poor defined as families that have average resources over time above the poverty line, but who are poor in one or more survey rounds and chronically poor families defined as having average incomes below the poverty line across the period of analysis. The study uses this same definition to classify US households as transient and chronic poor.

Multivariate analysis is then conducted with a severity of poverty measure that has the following desirable properties: 1-The measure incorporates information on the degree of

deprivation by considering the distance of family resources from the poverty line. 2-The measure increases exponentially with distance of resources from the poverty line, penalizing inequality among the poor. In other words, a transfer from a poor household close to the poverty line to a poor household further from the poverty line decreases the overall severity of poverty. 3-Overall severity of poverty can be decomposed into the component that is due to average resources being less than the poverty line over a time period (chronic poverty), and that due to variability of resources within the same time period (transient poverty). 4-Measures are expenditure based, to account for consumption smoothing.

The use of the FSP as a smoothing mechanism to reduce expenditure variability may have an important impact on transient poverty. This impact would not be captured in traditional static poverty measures or income-based dynamic poverty measures. Similarly, the intensity of use of the FSP over time is likely to support base well being levels and reduce chronic poverty. But this impact is, to date, undocumented.

The results are expected to shed light on common and unique determinants of chronic and transient poverty in the US as well as the differential impact of FSP use in combating each type of hardship. The information can be used by policy makers to improve the role that the Food Stamp Program plays in ameliorating chronic and transient hardship.

Perhaps the most direct measure of the success of the FSP in safeguarding the wellbeing of the poor is its impact on food insecurity and hunger. The third paper in my dissertation entitled "Food Insecurity and the Food Stamp Program" examines the impact of FSP use on self-reported food insecurity and hunger. While food assistance is expected to reduce food insecurity most studies on food insecurity in the U.S. find no significant impact, and in some cases, a paradoxical positive effect of FSP use on household food insecurity. This impact of FSP use on

household food insecurity has been difficult to document due to two empirical problems, simultaneity of FSP use and food insecurity (Gundersen and Oliveira, 2001; Kabbani and Yazbeck, 2004; Huffman and Jensen, 2006), and the potential existence of omitted confounders that distort the observed empirical relationship between FSP use and food insecurity (Ribar and Hamrick, 2003; Wilde and Nord, 2005).

Most of the recent literature only accounts for the impact of physical assets, human capital, family demographics, and employment circumstances on food insecurity. Food insecurity is however self reported and household perceptions and choices may influence food insecurity. For instance, higher household risk tolerance may be correlated with behaviors that cause food insecurity. In addition to a measure of risk tolerance, other measures of household preferences in the study include use of addictive substances such as tobacco. A historic measure of income volatility is also included and is generally not accounted for in most previous studies.

My third paper examines the structural relationship between FSP use and food insecurity accounting for simultaneity. The results are expected to document the FSP's ability to alleviate household concerns about a steady and sufficient food supply. Results also inform researchers and policy makers on the impact of subjective attitudes towards risk and other household choices on self reported food insecurity.

All three papers in this dissertation use innovative dynamic measures of well being and state-of-the-art quantitative methods to examine the impacts that policies and programs would have on vulnerable populations. Results are expected to provide policy makers with a basis for more informed decision making in the areas of education and public assistance.

References

Bishop, John A. John P. Formby, Lester A. Zeager, 1996 "The Impact of Food Stamps on US Poverty in the 1980s: A Marginal Dominance Analysis" *Economica*, New Series, Vol. 63, No. 250.

Constantine, J. M., 1995. "The Effect of Attending Historically Black Colleges and Universities on Future Wages of Black Students." *Industrial and Labor Relations Review* 48:531-46.

Constantine, J. M., 1998. "The Effect of Historically Black Colleges on Wages of Black Students: An Analysis by Gender" *The Williams Project on the Economics of Higher Education working paper.*

Ehrenberg, Ronald, G., and Donna S. Rothstein. 1994 "Do Historically Black Institutions of Higher Education Confer Unique Advantages on Black Students: An Initial Analysis," *Choices and Consequences: Contemporary Policy Issues in Education.* Ronald G. Ehrenberg, ed. ILR Press: Ithaca, NY.

Gundersen, C. and V. Oliviera, 2001 "The Food Stamp Program and Food Insufficiency" *American" Journal of Agricultural Economics* 83

Hoynes, H. W., M. E. Page, and A. H. Stevens., 2006. "Poverty in America: Trends and Explanations" *Journal of Economic Perspectives*, 20:1.

Jensen, H Helen., 2002 "Food Insecurity and the Food Stamp Program" *American Journal of Agricultural Economics* 84:5

Kabbani, N. S., and M. Y. Kmeid., 2005 "The Role of Food Assistance in Helping Food Insecure Households Escape Hunger" *Review of Agricultural Economics* 27:3

More John A. (2000). Are State-Supported Historically Black colleges and Universities Justifiable After Fordice?—A Higher Education Dilemma. *Florida State University Law Review*, Tallahassee FL.

Mykerezi, E., and Bradford. F. Mills, 2005. "Economic Growth in Racially Diverse Rural Counties: The Contribution of Historically Black Colleges and Universities" *The Review of Regional Studies* 34: 303-319.

Nord, M., and C. Philip Brent. Food Insecurity in Higher Income Households, 2002 Electronic Publications from the Food Assistance & Nutrition Research Program, E-FAN-02-016 Economic Research Service, US Department of Agriculture.

Wilde Parke, and Mark Nord (2005) "The Effect of Food Stamps on Food Security: A Panel Data Approach" *Review of Agricultural Economics*—Volume 27, Number 3 Pages 425–432

Ribar, D. and K. Hamrick. *Dynamics of Poverty and Food Sufficiency*. Washington DC: U.S. Department of Agriculture, ERS FANRR 36, September 2003.

Rodgers, Joan R., and Rodgers, John L., ‘‘Chronic Poverty in the United States.’’ *Journal of Human Resources.* 28, 1:25–54, Winter 1993.

Essay 1

The Wage Earnings Impact of Historically Black Colleges and Universities

Introduction

Historically Black Colleges and Universities (HBCUs) were originally founded to provide postsecondary educational opportunities to Blacks. Since the end of *de jure* segregation in public education under the Supreme Court *Brown V. The Board of Education of Topeka (1954)* ruling, the HBCU mandate has become the object of considerable debate. The Supreme Court ruling in *United States V. Fordice (1992)* may be interpreted to suggest that continued state and federal support of HBCUs as racially distinct institutions must be justified by educational benefits beyond just providing a low-cost educational alternative (Moore 2000). Differential post-college labor market success is an important indicator of the value of unique HBCU benefits and, thus, of considerable interest for postsecondary education policy.

Previous studies by Ehrenberg and Rothstein (1994), Constantine (1995), and Constantine (1998) use data from the National Longitudinal Study of the High School Class of 1972 to examine the impact of HBCU attendance, relative to attendance of other colleges, on the wages of Blacks. However the findings of these studies are somewhat conflicting. Ehrenberg and Rothstein (1994) find a 0 to 12 percent wage loss for HBCU attendees, relative to their counterparts who attended other four-year colleges or universities. Constantine (1995), on the other hand, finds that HBCU attendees realize 38 percent higher wages than Black college attendees at other four-year institutions. Constantine (1998) finds that Black males who attend HBCUs realize 7 percent higher wages than Black attendees at other four-year colleges and universities and that wages would be 25 percent higher for the general college attendee population of Black males with HBCU attendance. Black females who attend an HBCU show 15

percent higher wages relative to Black females who attended other four-year colleges, but there are no significant wage gains from HBCU attendance for the general population of Black females. The conflicting findings in these studies potentially arise from changes in the differential return on HBCU education with post-college experience in the labor market, as the median age in the Ehrenberg and Rothstein (1994) sample is 25 years, compared to 32 years of age in the Constantine (1995) and Constantine (1998) sample.

This paper augments the existing literature on the wage-earnings impact of Blacks' HBCU attendance in two important ways. First, the age-earnings profiles of HBCU attendees and other college-educated Blacks are examined using data from a more recent cohort of Blacks in the 1979 National Longitudinal Survey of Youth. Specifically, the current study examines the impact of HBCU attendance on the initial post-college wage, on the most recent survey wage observation, and on the average annual growth rate in wages. Measuring labor market success by the age-earnings profiles of individuals over time provides more complete information about patterns of labor market success than a wage observation at a single point in time. Second, the study explicitly accounts for the impact of location of HBCUs. Of particular note, the distance of one's residence at age 14 to the nearest HBCU and to other colleges and universities is controlled for in the college selection decision, as are the local economic conditions for the individual's place of residence at age 14.

Estimates of the differential return to HBCU attendance are developed in the rest of the paper as follows. Section two presents background information on the role and geographic distribution of HBCUs. Section three outlines the estimation strategy and empirical specification. Section four describes the data and variables used in the analysis. Section five presents the empirical results, while section six concludes and distills policy implications.

The Role and Location of HBCUs

HBCUs were established to provide equal educational opportunities for Black students denied admission to their States' original 1862 land-grant university system.[1] Currently, 105 HBCUs are nationally or regionally accredited; of these, 89 are four-year colleges-of which 18 were established as 1890 Land Grants, and 51 are publicly funded.

HBCUs continue to play a very important role in the education of Black Americans by reducing the costs of obtaining a college education and increasing academic success. In 2001, HBCUs matriculated 21.3 percent of all African-American students enrolled in four-year colleges, awarded 21.5 percent of all baccalaureate degrees earned by African-Americans nationwide, and awarded masters degrees and first-professional degrees to about 12 percent of African-Americans who earned graduate degrees (Provasnik and Shafer 2004). In addition, Braziel (1983) finds that a disproportionate share of Black Ph.D. holders attended an HBCU as undergraduates. Blacks at HBCUs are also more likely to persist towards a degree and report a more rewarding overall college experience relative to their counterparts at mixed institutions (Deskins 1991; Hoffman, Snyder, and Sonnenberg 1992).

A highly disproportionate share of HBCUs, including the 18 Land Grants, are located in the South, and many are in or near areas with high concentrations of persistently poor Black families (Mykerezi, Mills, and Gomes 2003). HBCUs also appear to have important spillovers onto the economic well-being of their local communities, as decreased physical distance of a

[1] The Higher Education Act of 1965, as amended, defines an HBCU as: "any Historically Black College or University that was established prior to 1964, whose principal mission was, and is, the education of Black Americans, and that is accredited by a nationally recognized accrediting agency or association determined by the Secretary [of Education] to be a reliable authority as to the quality of training offered or is, according to such an agency or association, making reasonable progress toward accreditation."

community from the nearest HCBU increases the share of adult Blacks with college degrees and, thereby, community-level per-capita incomes (Mykerezi and Mills 2005).

Empirical Strategy

The determinants of Black male and female earnings have been shown to differ and, in the current application, the effects of HBCU attendance are estimated separately by gender. As noted, the earnings impacts of HBCU attendance are also estimated at the time of the first post-college job, at the most recent wage observation, and as the average annual growth in wages between the first and most recent wage observation.

The effect of attending an HBCU is analyzed as a counterfactual comparison. Following Imbens' (2004) terminology, let W be an indicator of college selection with $W=1$ denoting attendance of an HBCU and $W=0$ denoting attendance of any other four-year college. $Y_i(1)$ and $Y_i(0)$ denote the logarithm of wage (or wage-growth) for individual i with and without HBCU attendance, respectively. We are interested in two effects. The average treatment effect (ATE) for all four-year college attendees is defined as

(1) $\tau = E[Y(1) - Y(0)]$

The average treatment effect on the treated (ATT), in this case those attending an HBCU, is defined as

(2) $\tau_t = E[Y(1) - Y(0) \mid W = 1]$

For each individual, however, only one of these wages is observable. Unobserved and observed heterogeneity in HBCU choice will potentially bias inferences on wage impacts drawn from the comparison of the two groups. Therefore, estimators that account for unobserved and observed heterogeneity in HBCU choice are employed.

With observational data there is a concern that institution selection may, in part, depend on unobserved characteristics of individuals that are also correlated with post-college wages. This endogeneity concern is addressed by estimating a standard two-step Heckman (1979) model that takes advantage of the availability of appropriate instruments and assumes joint normality of the error terms. First, a probit model is estimated as follows:

(3) $P(W = 1 \mid \mathrm{Z}) = \Phi(Z\alpha) + \varepsilon_1$

where Z is a vector of covariates assumed to be correlated with college choice, α is a vector of parameters, ε_1 is a normally distributed random error, and $\Phi(\bullet)$ represents the normal cumulative density function. For samples of HBCU attendees and other four year college attendees second-stage equations are then estimated as

(4) $Y = XB + \rho\hat{\lambda} + \varepsilon_2$

where X is a vector of observed covariates, ρ is a parameter. Further, $\hat{\lambda}$ is the estimated inverse Mills ratio, defined as

(5) $\hat{\lambda} = \hat{\phi}(Z\alpha)/1 - \hat{\Phi}(Z\alpha)$

where $\phi(\bullet)$ is the normal probability density function. The significance of the parameter associated with the inverse Mills ratio (λ) provides a test for endogeneity of selection of education institution. Failure to reject the null hypothesis that ρ is statistically zero at a conventional level of significance provides evidence that the institution choice is exogenous after controlling for observed covariates. The choice to attend an HBCU then satisfies the conditional exogeneity assumption.[2]

(6) $[Y(1), Y(0)] \perp \mathrm{W} \mid \mathrm{X}$

[2] This condition has also been referred to as selection on observables (Imbens 2004).

As a result, the treatment effect could be estimated by OLS as

(7) $Y = \tau W + X\beta + \varepsilon_3$

where Y and W are previously defined, X is the vector of observed covariates, β is a vector of parameters, and ε_3 is a vector of IID regression errors.[3] τ is an unbiased estimate of the ATE, which is equal to the ATT under the assumption of a constant proportional treatment with selection strictly on observables.

Under the conditional exogeneity assumption separate ATE and ATT can be estimated without the assumption of joint normality on the error terms of (3) and (4), by utilizing a propensity score. Specifically, first the propensity score is estimated using the probit specification in (3). Then second stage wage regressions are estimated by weighted least squares (Price 2005).[4]

In this case, τ is an unbiased estimate of the ATE if the weights used are given by:

(8) $$\omega = \frac{W}{\hat{e}(Z)} + \frac{1-W}{1-\hat{e}(Z)}$$

and it is an unbiased estimate of the ATT if the weights used are given by:

(9) $$\omega_t = W + (1-W)\frac{\hat{e}(Z)}{1-\hat{e}(Z)}$$

with $e(Z) = P(W = 1 \mid Z)$

Data and Variable Description

The main data source is the 1979 Geo-coded National Longitudinal Survey of Youth (NLSY 79). The initial 1979 sample contains 3,078 Blacks between the ages of 14 and 22. Individuals are resurveyed annually until 1996, and then biannually until 2002. Our analysis

[3] Note that this specification assumes all covariates are linearly related to the logarithm of wages and that the effect of HBCU attendance is a constant multiplicative shift in wages. Further, given the constant treatment assumption, conditional exogeneity is equivalent to assuming W and ε_3 are independent in the linear regression model.

[4] Alternatively, second stage non parametric estimators could be employed, but they are biased in small samples.

focuses on the 596 Black respondents (265 males and 331 females) who report attending a four-year postsecondary institution before the age of 25 and have wage observations at some point between 1998 and 2002. Of these four-year college attendees, 100 males and 109 females reported attending an HBCU at some point in time and 165 males and 222 females attended other colleges only. In addition to information on education, the dataset contains information on county of residence in each survey period and individual and family characteristics prior to attending college.

Means and standard errors of the model variables are reported separately for males and females in table 1. The mean initial hourly wages of HBCU attendees are 8 percent lower for males and 6 percent lower for females, compared to Black males and females, respectively, who attended other four-year colleges. The mean hourly wage of HBCU males is, however, 6 percent higher for the most recent wage observation, an average of 16 years after college. Females' most recent wages are 7 percent lower for HBCU attendees compared to non-HBCU attendees. So a simple comparison of means suggests that the impact of HBCU attendance on the wages of males may initially be negative, but is not constant over one's career. By contrast, the wage difference for females is relatively unchanged over time.

Variables reflecting individual, family, and school attributes prior to college attendance are assumed to affect wages as well as the college attendance decision. Early upbringing plays a crucial role in lifetime economic success (Restuccia and Urrutia 2004). Thus factors within the family and at school are controlled for in both college-selection equations and parametric wage equations. These include a dummy variable indicating residence in the same household with both parents at 14, a socio-economic prestige index (SEI) of the father's occupation,[5] parent's

[5] The SEI is derived using census-designated SIC codes as a way to compare the social and economic prestige of professions based on average earnings and educational requirements (Duncan 1961).

education, an indicator of whether an adult in the household held a library card when the respondent was 14 years of age, and an indicator of whether the most influential person in the respondent's life would agree with a decision not to attend college. School characteristics include an indicator of public school attendance, as well as an indicator of whether the respondent's high school had a college preparatory track to proxy for exposure to information regarding colleges and universities. Individual characteristics include the Armed Forces Qualifying Test (AFQT) score as a measure of base productive skills. These skills may reflect inherent intelligence, as well as family and early schooling characteristics that may be difficult to observe directly (Maxwell 1994). An indicator of whether the respondents believed they had faced discrimination in the labor market in 1979 is included, as individuals expecting to face race discrimination may respond by altering both their college choices and their labor market behavior. The SEI index of the respondent's aspired profession before college is also included to control for professional ambition.

Pre-college attributes suggest that HBCU attendees generally have less advantageous backgrounds compared to other college attendees. The most notable difference is that both male and female HBCU attendees have significantly lower AFQT scores than those of respective non-HBCU four-year college attendees. Further, a smaller share of HBCU attendees attended private high schools or high schools offering a college preparatory track. Turning to place-based attributes, county per-capita income of Blacks at age 14, the share of adult Blacks with college in the county of residence at age 14, as well as indicators of residence in the South and the rural South at age 14, are included in both the college selection equation and the parametric wage and wage-growth equations. In terms of geographic location, as expected, HBCU attendees reside disproportionately in relatively economically disadvantaged areas before attending college. Also,

the shares of HBCU attendees who reside in the South, as well as the rural South, at age 14 are significantly higher than the corresponding shares for Blacks attending non-HBCUs.

Straight-line distance measures from the center of the county of residence at age 14 to the nearest HBCU, the nearest public non-HBCU, and the nearest four-year non-HBCU are used to identify the wage and wage-growth equations in the Heckman specification, and are thus included in the college choice equations but excluded from the parametric wage and wage-growth equations.[6] The data suggest that physical distance to HBCUs may play an important role in the college selection decision of young Blacks. The average distance from the counties of residence of male HBCU attendees to the nearest HBCU is 54.3 miles, compared to 173.95 miles for male non-HBCU attendees. The same pattern is visible for females. The average distance of the pre-college location of female HBCU attendees to the nearest HBCU is 80.8 miles, compared to 181.53 miles for females who did not attend an HBCU.

These identifying variables are assumed to be correlated with college choice, but not the actual or counterfactual wages. It is possible to test if the identifying variables are significant in the college selection model, and if they can be excluded from the wage equations. However, the assumption on non-correlation with counterfactual wages is not testable because counterfactual wages are unobserved. This assumption would fail if the identifying variables were correlated with unobserved factors that have an impact on wages. For example, if the concentration of HBCUs were higher in areas with relative prosperity that was not controlled for, the assumption would likely fail. This is not the case in the current analysis, which controls for the county-level

[6] Distances from county-centers at age 14 to the nearest college or university, nearest public college or university, and nearest accredited HBCU are generated by Arc GIS software, using US Census Tiger database county location information and college zip codes.

per-capita income of Blacks, as well as county-level rates of college graduation among adult Blacks.

In terms of post-college controls in the wage equations, consistent with previous studies, college persistence is slightly higher for HBCU males (Ehrenberg and Rothstein 1994; Constantine 1995). Part of the HBCU impact captured in models that control only for pre-college attributes may be due to this enhanced persistence. Similarly, the data indicate that HBCU attendees reside in counties with lower Black per-capita incomes after college. Again, HBCU attendance may, in part, determine this pattern of post-college residence. Controls for total years of education, per-capita income among Blacks in the current county of residence, and experience are initially excluded from the wage equations as they can be broadly considered as HBCU impacts. They are, however, included in alternative model specifications to assess their roles in determining the magnitude of total HBCU impacts on wages.

One concern regarding the data is that some individuals present in the initial 1979 sample do not report wages between 1998 and 2002 and are excluded from the analysis. If HBCU attendees present in the initial sample have a systematically different tendency to report post-college wages than do Black students who attended other four-year institutions, then the above empirical models may produce biased estimates of the HBCU wage impacts due to sample selection bias. However, tests indicate that the probability of remaining in the wage-earning sample is not systematically related to HBCU attendance in either gender group.

Results

The College Choice Model

Results for the male and female college choice probits are presented in table 2. The only individual characteristic that influences the choice of an HBCU for both genders is the AFQT

score, with higher scores decreasing the likelihood of attending an HBCU. However, father's SEI and attending a high school with a college preparatory track do show a weak positive association ($p=0.01$ level) for females.

Spatial proximity and attributes of pre-college residence appear to be the primary determinants of the decision to attend an HBCU for both males and females. The parameter estimate for distance from the county of residence at age 14 to the nearest HBCU is negative and significant in both probits. The marginal effects associated with the parameter estimates suggest that a 10-mile reduction in distance to the nearest HBCU prior to attending college increases the probability of enrolling in an HBCU by about 7 percentage points for males and 1 percentage point for females. The parameter estimate for the distance to the nearest public non-HBCU is significant and positive for both gender groups, so proximity to non-HBCU public colleges appears to compete with proximity to HBCUs and reduces the probability of HBCU attendance. The parameter estimates for being located in a Southern state at age 14 are also positive and significant in both probits, with the probability that Southern residents attend an HBCU being 20 and 24 percentage points higher for males and females, respectively, compared to their counterparts in other regions of the United States. These results are not surprising, as there is a public HBCU in each Southern state where residents are eligible for in-state tuition. Females also appear to be more likely to attend an HBCU if they come from a county with a higher share of Blacks in the population.

Selection Bias

Before turning to the estimation results of the HBCU impact, we focus on the results of the college choice endogeneity tests. Coefficients and standard errors associated with the predicted inverse Mills ratios in the selectivity-corrected wage-earnings models for HBCU

attendees are presented in table 3. None of the coefficients are significant at the *p=0.10* level. Thus these tests find no evidence of significant bias due to selection on unobservables.

Estimates of HBCU Impact

Given the lack of evidence of selection on unobservables, the presentation focuses on the results from the OLS wage equations and the propensity score weighted equations.[7] For males, OLS parameter estimates indicate that HBCU attendance has no impact on the wages earned at the first post-college job (table 4). However, HBCU attendance has a positive impact on the most recent wage observation, as well as on the growth of wages over time. Specifically, the annual growth of wages is 1.4 percent higher for the average Black male with HBCU attendance relative to attendance of other colleges. The faster rate of wage-growth for Black males following college leads to estimated 17.6 percent higher most-recent wages with HBCU attendance.

Other characteristics also influence wages. AFQT scores have a significant positive impact on both wages and wage-growth. Living in a family that would agree with a decision by the respondent not to attend college has a positive significant impact on the most recent wage, while feeling discriminated against in the labor market has a negative impact on the wage-growth and the most recent wage. Attendance of a public rather than a private high school also has a negative impact on the most recent wage of males, while a higher share of Blacks with college in the county of residence at age 14 has a positive impact on initial wage at the *p=0.10* level.
OLS estimation results for females are presented in table 5. The estimates indicate that HBCU attendance has no impact on initial post-college wages, and no impact on wage-growth or final wages. Other characteristics do, however, influence wages. As for males, AFQT scores are positively correlated with both initial and final wages and with wage-growth. Living in a family

[7] Selectivity-corrected parameter estimates of the HBCU impact are similar in sign and magnitude to the OLS estimates and estimation results are available from the authors upon request.

who would agree with a decision not to attend college by the respondent has a negative effect on initial wages (*p=0.10*), but a positive effect on wage-growth (*p=0.10*). Also, a higher share of college-educated Blacks in the county of residence at age 14 has a significant positive impact on the first wage of females, but then a negative impact on their wage-growth.

Propensity Score-Weighted Estimates

Propensity score-adjusted estimates of the impact of HBCU attendance on male and female wage profiles are presented in Table 6. Parameter estimates associated with other observed covariates are not shown but are similar in sign and magnitude to OLS parameter estimates.[8] The estimate of the ATE of HBCU attendance on the initial wage of males remains statistically insignificant. The estimated impacts of HBCU attendance on wage growth and the most recent wage are, however, statistically significant for men. Wage growth is 1.5 percentage points higher annually with HBCU attendance and most recent wages are 20 percent higher. Both of these estimates are not statistically different from the OLS estimates of male ATEs. The ATTs for male HBCU attendance are also of similar magnitude and not statistically different from the ATE estimates. Turning to the propensity score-adjusted estimates for women, consistent with OLS estimates, the ATEs and ATTs of HBCU attendance for the initial wage, wage growth, and most recent wage are not significantly different from zero.

Propensity score weighted estimates of ATEs and ATTs were also estimated using a truncated control group of other four year college attendees with propensity scores greater or equal to the lowest propensity score among HBCU attendees. For both males and females the ATEs and ATTs estimated are not statistically different from the original estimates.

Alternative Specifications

[8] These parameter estimates are available upon request from the authors.

Alternative OLS and propensity score-adjusted model spesifications are estimated for the most recent wage that include post-college attributes. Age and age squared at the time of the most recent observation, county per-capita incomes of Blacks in the post-college county of residence, and years of schooling, are included in order to isolate the extent to which the HBCU impacts on the most recent wage potentially operate through increased college persistence and migration to more affluent Black communities. ATE and the additional covariate parameter estimates are presented for males but not females in table 7, as HBCU impact on wages of females is not statistically different from zero.[9] Adding age and per-capita income leaves the HBCU parameter estimate virtually unchanged in both, the OLS and propensity score-adjusted specifications. Controlling for total years of education reduces the OLS estimate of the impact of HBCU attendance on the last wage from 17.6 percent to 16.2 percent and reduces the propensity score adjusted estimate from 20.0 to 17.8 percent. However, neither estimate is statistically different from the ATE estimate in the initial specification. These results suggest that the estimated impact of HBCU attendance on the most recent wage for males does not appear to arise through enhanced college persistence or through variations in experience or post-college residence.

Discussion and Conclusions

The net present value of the wage difference with and without HBCU attendance is calculated for Black males using the estimated propensity score-adjusted ATE estimates to measure the overall impact of HBCU attendance. The average present value of the HBCU wage differential, discounted at a 5 percent rate over 16 years following college, is 8.9 percent of total discounted earnings for Black males. Similarly, the average net present value of HBCU wage

[9] The HBCU impact remains insignificant for females even after adding these post-college attributes.

gains for HBCU attendees is imputed from the ATT estimates at 9.6 percent of total discounted earnings, over a 16-year wage profile with a 5 percent discount rate.

It is important to note that even though we find a large positive HBCU impact on the most recent wages of Black males after controlling for pre-college attributes, the average HBCU attendee actually has most recent wages that are only 6 percent higher than the average non-HBCU male attendee, due to differences in characteristics. Figure 1 plots the actual wages of HBCU attendees and of non-HBCU attendees to illustrate this point. As noted, the initial wages for Black male HBCU attendees are 8 percent lower than the wages of Black male non-HBCU attendees, but the wages of HBCU attendees grow faster through year 16 of the wage profile. Therefore, the HBCU impact appears to a large extent to be attributable to the fact that HBCUs enroll disadvantaged males, in terms of pre-college attributes, who initially earn less than non-HBCU males, but eventually catch up. In other words, HBCUs are particularly effective in matriculating Black males from relatively poor areas with disadvantaged backgrounds and providing them with the tools to overcome their initial disadvantage in the skilled labor market. This gateway allows them to eventually earn wages that are statistically no different from those of Black males with more advantaged characteristics who attended other four-year institutions.

Female HBCU attendees, on the other hand, realize earnings that are no lower than those of Black females attending other four-year colleges throughout their careers once pre college attributes are controlled for, however often at much lower costs of attending college. A major question generated by the results is why HBCUs have a positive impact on the wages of males over time, but not on the wages of females. Evidence suggests that Black males face greater wage disparities in labor markets relative to whites than do Black females (Darity and Mason 1998). One potential explanation for the differential impact of HBCUs by gender is that the

strong social networks developed in HBCUs are particularly effective over time in ameliorating racial wage disparities and, thus, have a greater impact on the wages of Black males. Further research is, however, needed to understand the specific pathways and mechanisms through which wage gains from HBCU attendance accrue over time.

Overall, the results present consistent evidence of significant long-term economic benefits from HBCU attendance for Black males. Thus, policies that alter the HBCU environment such as merging HBCUs with nearby predominantly white institutions, or even placing restrictions on the missions, types of programs administered, and admission policies of HBCUs are likely to impose a long-term burden on young Black males who choose to attend four-year colleges. Continued public support to HBCUs, on the other hand, is likely to have a long-term positive impact on the economic success of young Blacks from disadvantaged backgrounds.

References

Brazziel, William F. 1983. Baccalaureate college of origin of black doctorate recipients. *The Journal of Negro Education* 52:102-9.

Constantine, Jill M. 1995. The effect of attending historically black colleges and universities on future wages of black students. *Industrial and Labor Relations Review* 48:531-46.

Constantine, Jill M. 1998. *The effect of historically black colleges on wages of black students: An analysis by gender.* Ithaca, NY: The Williams Project on the Economics of Higher Education.

Darity, William A., Jr., and Patrick L. Mason. 1998. Evidence of Discrimination in Employment: Codes of color, codes of gender. *The Journal of Economic Perspectives* 12:63-90.

Deskins, Donald R., Jr. 1991. Winners and losers: A regional assessment of minority enrollment and earned degrees in U.S. colleges and universities, 1974-1984. In *College in black and white: African American students in predominantly white and in historically black public universities*, edited by Walter F. Allen, Edgar G. Epps and Nesha Z. Haniff. Albany, NY: State University of New York Press, pp. 17-39.

Duncan, Otis D. 1961. A socio-economic index for all occupations. In *Occupations and social status*, edited by Albert J. Reiss, Otis D. Duncan, Paul K. Hatt and Cecil C. North. Glencoe, IL: Free Press, pp. 109-338.

Ehrenberg, Ronald G., and Donna S. Rothstein. 1994. Do historically black institutions of higher education confer unique advantages on black students: An initial analysis. In *Choices and consequences: Contemporary policy issues in education,* edited by Ronald G. Ehrenberg. Ithaca, NY: ILR Press, pp. 89-132.

Heckman, James J. 1979. Sample selection bias as a specification error. *Econometrica* 47:153-62.

Hoffman, Charlene M., Thomas Snyder, and Bill Sonnenberg. 1992. *Historically black colleges and universities, 1976-1990.* Washington, DC: National Center for Education Statistics.

Imbens, Guido W. 2004. Non parametric estimation of treatment effects under exogeneity: A review. *The Review of Economics and Statistics* 86:4-29.

Maxwell, Nan L. 1994. The effect on black-white wage differences of differences in the quantity and quality of education. *Industrial and Labor Relations Review* 47:249-64.

Moore, John A. 2000. Are state-supported historically black colleges and universities justifiable after Fordice? A higher education dilemma. *Florida State University Law Review* 27:547-564.

Mykerezi, Elton, and Bradford F. Mills. 2005. Economic growth in racially diverse rural counties: The contribution of historically black colleges and universities. *The Review of Regional Studies* 34:303-19.

Mykerezi, Elton, Bradford F. Mills, and Sonya Gomes. 2003. Education and socioeconomic well-being in racially diverse rural counties. *Journal of Agricultural and Applied Economics* 35:251-62.

National Longitudinal Survey (1979) U.S. Department of Labor, Bureau of Economic Analysis. Retrieved on March 5, 2002 from the World Wide Web: http://www.bls.gov/nls/nlsy79.htm

Price, Gregory. 2005. The Causal Effects of Participating in the American Economic Association Summer Minority Program *Southern Economic Journal*, 72:1

Provasnik, Stephen, and Linda L. Shafer. 2004. *Historically Black Colleges and Universities, 1976 to 2001*. Washington, DC: U.S. Department of Education, National Center for Education Statistics. Government Printing Office.

Restuccia, Diego, and Carlos Urrutia. 2004. Intergenerational persistence of earnings: The role of early and college education. *American Economic Review* 94:1354-78.

Table 1. Summary Statistics

	HBCU Males		Non HBCU Males		HBCU Females		Non HBCU Females	
Wage	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Wage First	10.92	1.48	11.82	1.68	9.34	1.21	9.89	0.95
Wage Last	22.86	6.31	21.57	5.78	16.65	5.28	17.82	2.54
Family								
Both Parents Present in Household (age 14)	0.65	0.15	0.56	0.14	0.55	0.15	0.56	0.13
Father's Profession (SEI)	29.82	6.51	29.11	5.04	31.67	6.34	32.76	5.86
Parent's Education	11.98	0.98	11.65	0.84	11.71	1.00	11.70	0.82
Household Held Library Card (age 14)	0.71	0.14	0.70	0.13	0.73	0.14	0.79	0.11
Family Agrees with Decision not to Attend College	0.07	0.08	0.08	0.08	0.06	0.08	0.06	0.06
Schooling								
Education Last	15.70	0.56	15.62	0.49	15.75	0.50	15.81	0.49
Education First	15.10	0.46	14.79	0.40	14.92	0.39	14.93	0.39
Public High School	0.95	0.07	0.93	0.07	0.94	0.07	0.90	0.10
College Preparatory Track	0.50	0.16	0.51	0.14	0.49	0.16	0.52	0.13
Individual								
AFQT Score	35.65	6.60	44.30	6.86	30.80	5.60	42.85	5.92
Felt Discriminated Against	0.20	0.13	0.16	0.10	0.14	0.11	0.18	0.10
Professional Aspirations (SEI)	62.32	7.25	60.78	6.29	62.32	7.24	59.00	6.03
Location								
Per-Capita Income for Blacks (county last)	16,041	1,380	16,211	1,062	15,540	1,304	15,946	1,680
Per-Capita Income for Blacks (county first)	8,716	525	9,443	574	9,029	646	9,100	491
Per-Capita Income for Blacks (county 14)	8,439	585	9,029	529	8,337	597	8,976	508
Percent Black population (county 14)	0.34	0.06	0.24	0.04	0.33	0.06	0.23	0.04
Percent Black Population with College (county 14)	0.18	0.02	0.20	0.02	0.19	0.03	0.21	0.02
Resided in South (county 14)	0.72	0.14	0.44	0.14	0.80	0.12	0.48	0.13
Residence Rural (county 14)	0.14	0.16	0.10	0.09	0.18	0.12	0.09	0.11
Residence Rural South (county 14)	0.11	0.15	0.08	0.08	0.17	0.12	0.05	0.10
Distance to Nearest HBCU	54.30	20.89	173.95	73.09	80.80	102.56	181.53	82.52
Distance to Nearest College	17.92	6.01	25.29	8.97	39.68	69.83	21.59	6.03
Distance to Nearest Public College	8.46	2.53	8.87	3.76	8.49	2.18	7.46	2.04
	N=100		N=165		N=109		N=222	

Source: National Longitudinal Survey of Youth (1979)

Table 2. College Choice

	Males		Females	
Family	ME	SE	ME	SE
Both Parents Present in Household	0.009	0.073	-0.038	0.062
Father's Profession (SEI) (x10)	0.010	0.020	0.030*	0.020
Parent's Education	0.015	0.012	0.001	0.009
Household Held Library Card at Age 14	0.098	0.071	0.006	0.069
Family Agrees with Decision not to Attend College	-0.010	0.128	-0.063	0.106
School				
Public High School	0.126	0.116	0.110	0.109
College Preparatory Track	0.029	0.059	0.100*	0.052
Individual				
AFQT Score (X10)	-0.037**	0.016	-0.067**	0.014
Felt Discriminated Against	0.058	0.090	-0.088	0.066
Professional Aspirations (SEI) (X10)	0.009	0.015	0.022	0.012
Location				
Per-Capita Income for Blacks (county 14) ($1000s)	-0.022	0.030	0.006	0.020
Percent Black population (county 14)	0.294	0.230	0.665**	0.181
Percent Black Population with College (county 14)	0.004	0.007	0.011**	0.004
Resided in South (county 14)	0.203**	0.098	0.236**	0.075
Residence Rural (county 14)	0.224	0.229	0.061	0.177
Residence Rural South (county 14)	-0.288	0.244	0.082	0.193
Distance to Nearest HBCU (X10)	-0.067**	0.005	-0.010**	0.002
Distance to Nearest College (X10)	-0.010	0.021	0.005	0.004
Distance to Nearest Public College (X10)	0.145**	0.050	0.065*	0.039
Chi2	75.140		93.870	
L	-138.060		-162.814	
R2	0.214		0.224	
N	265		331	

Notes: ME denotes probit marginal effects and SE denotes standard errors and ** and * denote statistical significance at the *P=0.05* and *P=0.10* levels, respectively.

Table 3. College Choice Endogeneity Tests

	Males		Females	
	Coefficient	SE	Coefficient	SE
Most Recent Wage	-0.236	0.303	0.130	0.288
Wage Growth	-0.008	0.020	-0.024	0.020
Initial Wage	-0.105	0.197	0.335	0.224

Notes: Heteroskedasticity robust standard errors reported and ** and * denote statistical significance at the *P=0.05* and *P=0.10* levels, respectively.

Table 4. Male's Wage Regressions OLS

	First Wage		Last Wage		Change in Wage	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
HBCU	-0.046	0.06	0.176**	0.088	0.014**	0.006
Family						
Both Parents Present in Household (age 14)	0.020	0.058	0.047	0.100	0.002	0.007
Father's Profession (SEI) (x10)	0.016	0.018	0.042	0.029	0.002	0.002
Parent's Education	0.006	0.008	0.006	0.013	0.001	0.001
Household Held Library Card at Age 14	0.071	0.064	0.065	0.090	0.001	0.006
Family Agrees with Decision not to Attend College	0.092	0.103	0.381**	0.151	0.018	0.012
School						
Public High School	-0.126	0.117	-0.373**	0.172	-0.015	0.012
College Preparatory Track	-0.057	0.05	-0.028	0.060	0.002	0.004
Individual						
AFQT Score (X10)	0.042**	0.013	0.081**	0.018	0.002*	0.001
Felt Discriminated Against	-0.050	0.067	-0.277**	0.128	-0.014*	0.009
Professional Aspirations (SEI) (X10)	0.002	0.011	0.017	0.018	0.001	0.001
Location						
Per Capita Income for Blacks (county 14) ($1000s)	-0.013	0.02	-0.039	0.033	-0.002	0.002
Percent Black population (county 14)	-0.007	0.167	0.001	0.328	0.001	0.023
Percent Black Population with College (county 14)	0.867*	0.439	0.866	0.665	0.001	0.047
Resided in South (county 14)	0.105	0.070	-0.053	0.111	-0.010	0.008
Residence Rural (county 14)	0.293	0.218	0.208	0.384	-0.005	0.033
Residence Rural South (county 14)	-0.283	0.225	-0.135	0.396	0.009	0.033
Intercept	6.667**	0.235	7.274**	0.424	0.038	0.028
F	1.97		3.72		1.34	
R^2	0.13		0.21		0.09	
N	265		265		265	

Notes: Heteroskedasticity robust standard errors reported and ** and * denote statistical significance at the *P=0.05* and *P=0.10* levels, respectively.

Table 5. Female's Wage Regressions OLS

	First Wage		Last Wage		Change in Wage	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
HBCU	-0.017	0.046	-0.014	0.069	0.001	0.005
Family						
Both Parents Present in Household (age 14)	0.049	0.044	-0.032	0.072	-0.005	0.005
Father's Profession (SEI) (x10)	0.000	0.001	-0.001	0.002	0.001	0.000
Parent's Education	-0.008	0.008	-0.001	0.011	0.001	0.001
Household Held Library Card at Age 14	0.062	0.050	0.113	0.095	0.003	0.006
Family Agrees with Decision not to Attend College	-0.181*	0.100	0.056	0.126	0.015*	0.009
School						
Public High School	0.012	0.058	-0.144	0.106	-0.010	0.006
College Preparatory Track	-0.005	0.036	0.058	0.082	0.004	0.006
Individual						
AFQT Score (X10)	0.002**	0.001	0.007**	0.002	0.002**	0.001
Felt Discriminated Against	0.071	0.053	-0.051	0.083	-0.008	0.006
Professional Aspirations (SEI) (X10)	0.000	0.001	0.001	0.001	0.001	0.000
Location						
Per Capita Income for Blacks (county 14) ($1000s)	0.001	0.001	0.001	0.001	0.001	0.001
Percent Black population (county 14)	-0.073	0.121	-0.003	0.223	0.004	0.015
Percent Black Population with College (county 14)	0.659**	0.312	-0.393	0.477	-0.066**	0.030
Resided in South (county 14)	-0.028	0.049	-0.090	0.085	-0.004	0.006
Residence Rural (county 14)	0.087	0.138	0.081	0.113	0.000	0.008
Residence Rural South (county 14)	-0.065	0.146	-0.031	0.142	0.002	0.010
Intercept	6.753**	0.192	7.240**	0.332	0.030	0.022
F	1.86		3.24		1.75	
R^2	0.10		0.13		0.08	
N	331.00		331.00		331.00	

Notes: Heteroskedasticity robust standard errors reported and ** and * denote statistical significance at the *P=0.05* and *P=0.10* levels, respectively.

Table 6. Propensity Score Adjusted Wage Regressions

	First Wage		Last Wage		Change in Wage	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Males						
ATE	-0.044	0.052	0.200 **	0.074	0.015 **	0.005
ATT	-0.072	0.053	0.195 **	0.075	0.016 **	0.005
Females						
ATE	0.010	0.037	0.043	0.059	0.002	0.004
ATT	-0.014	0.037	-0.001	0.003	-0.050	0.055

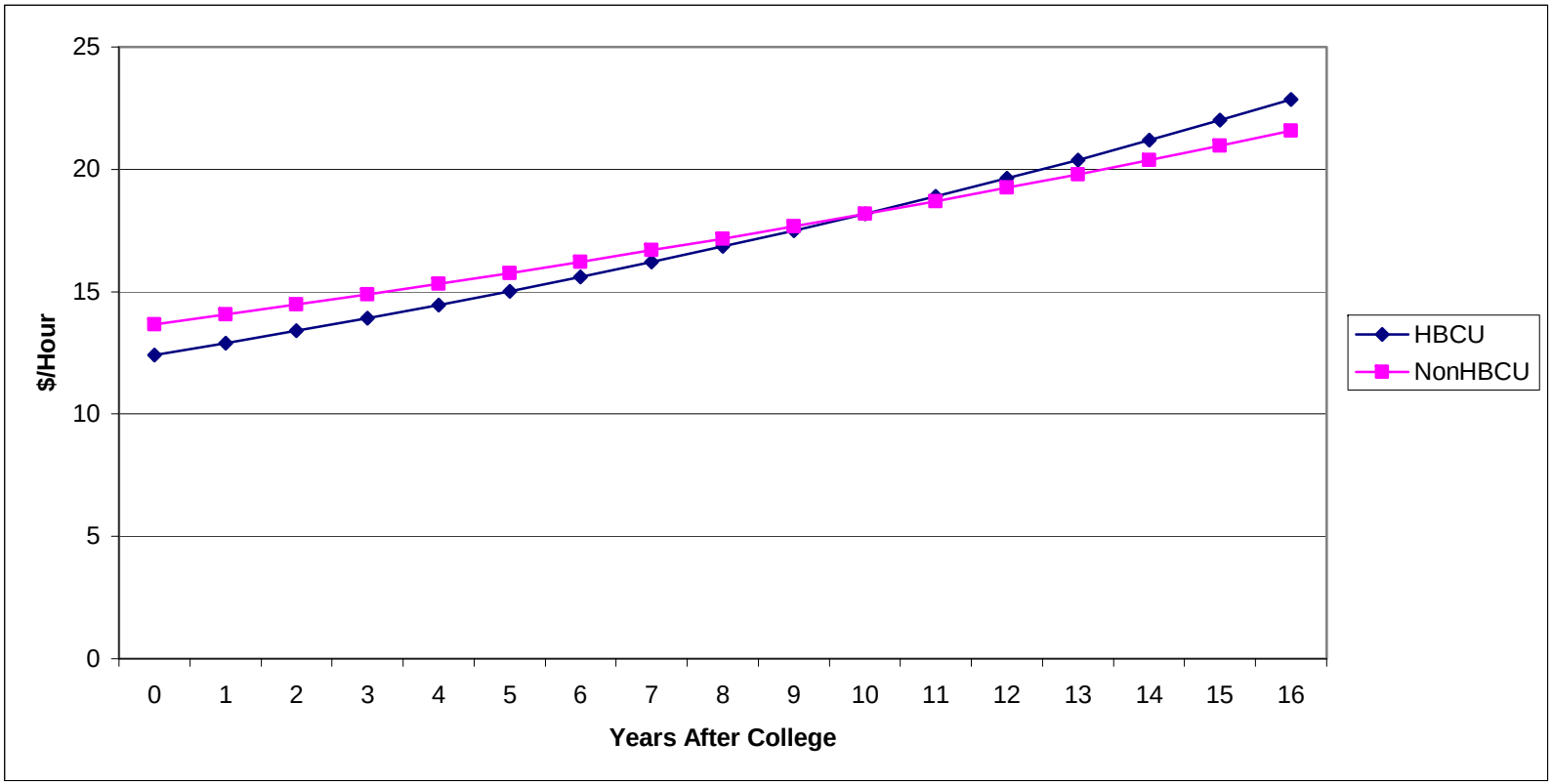
Notes: Heteroskedasticity robust standard errors reported and ** and * denote statistical significance at the *P=0.05* and *P=0.10* levels, respectively.

Table 7. Post College Controls for Male's Most Recent Wage

	Age		County Income		Education	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
OLS						
HBCU	0.175*	0.089	0.175**	0.088	0.162*	0.085
Age	-0.263	0.585				
Age Squared	0.003	0.007				
Per-Capita Income for Blacks (county current) ($1000s)			0.025**	0.010		
Education					0.102**	0.025
Propensity Score Adjusted						
HBCU	0.190*	0.076	0.205**	0.073	0.178**	0.071
Age	-0.014	0.680				
Age Squared	0.001	0.002				
Per-Capita Income for Blacks (county current) ($1000s)			0.023**	0.011		
Education					0.116**	0.024

Notes: Heteroskedasticity robust standard errors reported and ** and * denote statistical significance at the *P=0.05* and *P=0.10* levels, respectively. Parameter estimates of other controls have been suppressed.

Figure 1. Actual Wages of HBCU and Other Four Year College Attendees



Essay 2

Transient and Chronic Poverty in the US: The Role of the Food Stamp Program

Introduction

The United States has two relatively distinct types of poor; those consistently below the poverty line (chronically poor) and those temporarily exposed to poverty due to negative short-run economic shocks (transient poor). The food assistance needs of transiently and chronically poor families are likely to differ. Yet little is known about the unique and common determinants of transient and chronic poverty or the responses to both states of poverty to food assistance.

The Food Stamp Program (FSP) is the most significant food assistance program, with annual spending of over $30 billion (USDA, 2007). Many dimensions of FSP impacts on family well-being have been examined, including impacts on food insecurity (Gundersen and Oliviera, 2001; Kabbani and Kmeid, 2005), impacts on the official poverty measure for the general population (Bishop, Formby, and Zeager, 1996; Hoynes, Page, and Stevens, 2006), and impacts on specific target groups like children (Jolliffe et al. 2005). Studies have also documented the impacts of the FSP on family expenditures, food consumption and diet quality (Breunig et al. 2001; Wilde, McNamara, and Ranney 1999). An important, and often overlooked, impact of the FSP is the reduction in food consumption variability associated with program participation. For instance, Gundersen and Ziliak (2003) estimate that FSP participation reduces food-expenditure volatility by 14 percent.

Despite evidence that FSP participation has a significant impact on the variability of family food consumption; the impacts of FSP participation on family poverty dynamics have not been quantitatively explored. Family economic deprivation, as measured by poverty status,

fluctuates over time. Panel data can be used to capture these fluctuations in family wellbeing and to classify families as transiently and chronically poor (Rogers and Rogers, 1993).

This paper uses Consumer Expenditure Survey (CEX) data from 2001 to 2004 to generate transient and chronic expenditure-based poverty measures from a short-term panel of quarterly family expenditures. In the application, transient poverty measures the component of poverty that stems from intra-annual (quarterly) variability in family expenditures over one year, while chronic poverty refers to the component of poverty associated with average expenditures below the poverty line over the same year.

The FSP will have different impacts on transient and chronic poverty, depending on the role the program plays in maintaining family economic well-being. If the FSP is primarily used as an expenditure smoothing mechanism, it will reduce transient poverty. If, on the other hand, the FSP is mainly used to support long-term expenditure levels, it will reduce chronic poverty. These potentially distinct FSP contributions to transient and chronic poverty alleviation, along with the unique impacts of family assets and other covariates are, to date, undocumented.

The rest of the paper is organized as follows. Section 2 details the data and the measures of the incidence and severity of transient and chronic poverty used in the study. Section 3 presents the statistical model employed in the analysis. Section 4 presents descriptive statistics for poverty measures and covariates. Section 5 presents model estimation results while section 6 distills policy implications and concludes.

Data and Measures

The primary source of data for the analysis is the Bureau of Labor Statistics CEX; a nationally representative rotating panel of about 5,000 families (consumption units) per quarter. Families are in the panel for five consecutive quarters, but consumption expenditure information is only available for the second through fifth quarters. Income sources in the previous 12 months

are recorded in the second and fifth quarters of participation in the survey, along with information on family demographics, education and other characteristics of the family head, workforce participation and FSP participation.

This study uses data on the 19,950 families that were interviewed between 2001 and 2004, and that have complete expenditure information for their last four quarters in the panel. Data on state-level FSP participation rates are obtained from U.S Census Bureau's Small Area Income and Poverty Estimates and are attached to the family-level CEX data based on the state and year of the second quarterly interview. For a small share of observations (14 percent), data on state of residence is suppressed. In this case, the observation uses more aggregate FSP participation rates for the region of residence.

This application generates expenditure-based dynamic poverty measures. The use of expenditure as opposed to income data as a measure of well-being offers two advantages when analyzing short-term exposure to poverty. First, family incomes vary more in response to shocks to economic circumstances than do family expenditures, as families use accumulated assets and credit markets to smooth consumption in the face of transitory income changes (Jorgenson, 1998). Thus, income-based measures may over-estimate variations in family economic well-being and the magnitude of transient poverty. Second, expenditures appear to be less susceptible to systematic under-reporting than income, particularly among low-income families (Meyer and Sullivan, 2003).

Transient and Chronic Poverty Measures

Quarterly family expenditures are divided by one-quarter of the family-type-specific official annual U.S. poverty line in the particular survey year in order to normalize expenditures for family size. Thus, a family expenditure measure below one indicates that the family's

expenditures fall below the official poverty line for the relevant quarter. Household expenditures are adjusted for several other factors. Only few CEX households purchase durables in any given quarter but these expenditures are consumed over longer time periods, often years. Thus, durable expenditures lead to an over estimation of wellbeing in the quarter of a purchase and underestimation in other quarters. A procedure similar to the one used by the BLS in computing aggregate durable expenditure data for the CEX is used to adjust for the lumpy nature of consumer durables. The sample was grouped by family size, marital status, race, income bracket, and year of interview, then for each household the average group expenditure on durables was used to measure household durable consumption instead of the actual household expenditure. Expenditures on home ownership are often a mixture between investment and consumption. Therefore, all expenditures associated with home ownership including mortgage interest, property taxes and maintenance/repair are subtracted from total expenditures and are replaced with a self reported rent-equivalent. By the same rationale, expenditures toward retirement and pension funds were excluded as they are investments. Finally, health expenditures are excluded as they do not contribute to current consumption. Meyer and Sullivan (2001) perform similar adjustments of raw expenditure data to approximate current consumption.

For the incidence measures, a family is identified as chronically poor if normalized expenditures averaged across the four survey quarters are below one. A family is defined as transiently poor if, on the other hand, normalized expenditures in at least one quarter are below one, but the family is not chronically poor.

The severity of poverty measure is defined as:

$$P(y_{it}) = (1 - y_{it})^2 \quad if \quad y_{it} < 1$$

$$= 0 \text{ otherwise}$$

where y_{it} represents normalized expenditures of household *i* in quarter *t*. The severity measure has the advantageous property of penalizing inequality among the poor (Sen, 1976). For empirical work the severity measure also has the advantageous properties of being convex and approaching zero at the poverty line smoothly from below.

The severity of poverty measure is also additively decomposable into transient and chronic components. Let $P(y_{i1}, y_{i2}, ..., y_{i4})$, be a measure of the average annual severity of poverty for the *i*th household over the four survey quarters. Following Jalan and Ravallion (2000) the transient component of poverty is defined as the portion of the severity of poverty measure attributable to variability in expenditures:

$$T_i = \sum_{t=1}^{4} [P(y_{it}) - P(\overline{y}_i)]/4$$

where $\overline{y}_i$ is the inter-temporal mean of the normalized expenditure indicator. Severity of poverty at mean normalized expenditures $P(\overline{y}_i)$ is the measure of chronic poverty, C_i. Total annual severity of poverty is then exactly equal to the sum of the transient, T_i, and the chronic, C_i, components.

Empirical Model

The multivariate modeling effort focuses on identifying the determinants of the transient and chronic components of the severity of poverty. Most families have transient and chronic severity of poverty measures of zero. Therefore, the transient severity of poverty model is best expressed as:

$$T_i = T_i^* \quad if \quad T_i^* > 0 \quad where \quad T_i^* = \gamma_1^T F_i + x_i' \beta_1^T + \varepsilon_i^T$$
$$= 0 \quad otherwise$$

where T_i^* is a latent continuous variable, T_i is the observed measure of transient poverty, F_i is the measure of food stamp benefits, x_i is a vector of covariates of expenditure-poverty, γ_i^T and β_i^T are vectors of transient poverty parameters, and ε_i^T is the vector of the transient poverty equation errors. The chronic severity of poverty model can be similarly expressed as:

$$C_i = C_i^* \quad if \quad C_i^* > 0 \quad where \quad C_i^* = \gamma_1^C F_i + x_i^{'}\beta_1^C + \varepsilon_{1i}^C$$
$$= 0 \quad otherwise$$

A major empirical challenge is to disentangle the relationships between the transient and chronic components of poverty and the intensity of FSP participation.[10] FSP benefits and the severity of poverty components are likely to be jointly determined, as family well-being is a primary determinant of program eligibility and influences the participation decision for the eligible households. In addition, most households do not participate in the FSP and report receiving no program benefits. To account for potential simultaneity and the censored nature of both the severity of poverty components and FSP benefits received, the transient poverty equation is estimated jointly with the FSP use equation as follows in a Tobit system framework:

$$T_i = T_i^* \quad if \quad T_i^* > 0 \quad where \quad T_i^* = \gamma_1^T F_i + x_{1i}^{'}\beta_1^T + \nu_{1i}^T$$
$$= 0 \quad otherwise$$
$$F_i = F_i^* \quad if \quad F_i^* > 0 \quad where \quad F_i^* = \gamma_2^T T + x_{2i}^{'}\beta_2^T + \nu_{2i}^T$$
$$= 0 \quad otherwise$$

where F_i^* is a latent variable representing FSP benefits, $x_{2i}^{'}$ is a vector of covariates of FSP benefits, γ_2^T and β_2^T are vectors of parameters, while ν_{1i}^T and ν_{2i}^T are the system errors that are assumed to be joint normally distributed.

[10] For example Gundersen and Oliviera (2001) find that FSP participants have higher rates of food security than non-participants. However, this relationship is reversed when the FSP participation decision is jointly modeled in a simultaneous system of equations.

Similarly the chronic poverty system is estimated as

$$C_i = C_i^* \quad if \quad C_i^* > 0 \quad where \quad C_i^* = \gamma_1^C F_i + x_{1i}^{'}\beta_1^C + \nu_{1i}^C$$
$$= 0 \quad otherwise$$
$$F_i = F_i^* \quad if \quad F_i^* > 0 \quad where \quad F_i^* = +\gamma_2^C C_i + x_{2i}^{'}\beta_3^C + \nu_{2i}^C$$
$$= 0 \quad otherwise$$

The reduced forms for these systems of censored equations are estimated as bivariate Tobits. Structural parameters of interest are then recovered. As standard errors of structural parameters are difficult to derive analytically, confidence intervals for the structural parameters are bootstrapped (Cameron and Trivedi, 2005). The significance of the system error covariance parameter provides a direct test of simultaneity of the severity of poverty measures and FSP benefits.

Six common groups of covariates are included in the specifications of the determinants of transient and chronic poverty and the specification of the determinants of the intensity of FSP use. 1) Family demographic and structure characteristics include age and age-squared of the head of the family, number of children and number of children-squared below the age of 18, marital status of family-head, race and ethnicity of family-head and an indicator for single parent families.[11] 2) Family educational assets are measured by discrete indicators of education level of the family-head (no high-school degree, high-school degree, some post-secondary education but no college degree, and a college degree). 3) Family workforce characteristics include indicators of self-reported involuntary unemployment for the family head and the spouse during both the survey year and the year prior to the survey. Involuntary unemployment is defined as having spent a positive number of weeks unemployed and reporting that 'they couldn't find a

[11] Family head is designated as the most educated of either the self-reported head or their spouse.

job' as the reason for not working.[12] 4) Changes in family circumstances during the survey year include divorce, addition of family members, and reduction of family members. 5) Location attributes and time trends are measured by indicators of residence in the South, in a rural county, and in the rural South to capture unique circumstances associated with living in these regions. State fixed effects are also included to control for time invariant state-specific unobservables that impact economic well-being and FSP use. Indicators of year of interview are included to capture aggregate time-varying unobserved heterogeneity. 6) Controls for measurement error are specified though dummy variables (never, almost never, occasionally, mostly, almost always and always), that indicate how often the respondent consulted financial records (such as bills, receipts, checkbooks etc.) when they answered expenditure related questions. Households that maintain and consult financial records likely make fewer mistakes in reporting expenditures and, thus, measurement error in expenditure data may be inversely correlated with frequency of consulting records. Measurement error in expenditure data overstates both the chronic and the transient severity of poverty, thus households with poor record keeping practices are likely to show higher observed severity of poverty, ceteris paribus[13].

State-level per-capita rates of participation in the FSP in the year that the household was interviewed are included in the FSP intensity of use equation and are used to identify the transient and chronic poverty equations. Transaction costs, including stigma, are likely to play an important role in the FSP use decision (Moffit, 1983). These transaction costs are hypothesized to decline with higher state rates of FSP participation. As a proper identifying restriction, state FSP participation rates need to be uncorrelated with the transient and chronic poverty measures

[12] While the actual number of hours worked by the head of the household and the spouse during the survey year and the year prior to the survey year are available, they are arguably endogenous variables.

[13] For example, if the observed expenditure y_{it} can be expressed as the sum of error free expenditures e_{it} and zero mean measurement error λ_{it}: $y_{it}=e_{it} + \lambda_{it,}$ with Var $(e_{it})= \delta_{e,}$ Var $(\lambda_{it})=\delta_{\lambda,}$ Cov $(e, \lambda)=0$, $E(\lambda)=0$,
then $E[C_i(y)-C_i(e)]= ¼\ \delta_\lambda$ and $E[T_i(y)-T_i(e)]= ¾\ \delta_\lambda$

except through their impact on household FSP participation. This assumption would fail if state FSP participation rates, in addition to being correlated with program accessibility, were also influenced by other factors that are correlated with family well-being, such as state-level poverty rates. However, the inclusion of state fixed effects explicitly accounts for any time-invariant component of such correlation.

The FSP intensity of use equation is identified by the inclusion of lump-sum non-income receipts in the transient and chronic poverty equations, but exclusion of such receipts from the intensity of FSP use equation. Such receipts include one time payments from court case settlements, insurance settlements, etc. Non-income receipts are likely to directly impact expenditures. However, as these receipts are one time events and often unpredictable by the household, we argue they are unlikely to influence the intensity of FSP use except through the indirect impact on expenditures. This identifier is debatable. Therefore, the models are also estimated using only the state rates of FSP participation to identify FSP use impacts on transient and chronic poverty. Under these alternative specifications only the parameter estimates for the intensity of FSP use on transient and chronic poverty are structurally identified.

Descriptive Statistics

Incidence and Severity of Poverty

Incidence and severity measures for chronic and transient poverty are presented in table 1. Overall, the national rate of chronic poverty is 8.3 percent and the rate of transient poverty is significantly lower at 6.5 percent. The annual severity of chronic poverty is 0.0044 while the severity of transient poverty is less then half of the severity of chronic poverty at 0.0018. Thus, transient poverty accounts for 44 percent of the total incidence of poverty and 29 percent of the

total severity of poverty. Focusing on annual poverty measures alone may overlook a significant component of family economic distress.

Food Stamp Program Participation and Benefits

Descriptive statistics for the other endogenous variable in the model, the intensity of FSP use, are provided in table 2. Nationally, the rate of FSP participation in the CEX sample is low, with 5 percent of individuals living in families that received Food Stamps. Conditional upon participation in the FSP, the average amount received during the survey year was $1,937 (in real 2004 dollars).

FSP participation rates are, as expected, much higher among chronically poor families, with 28.3 percent of individuals in chronically poor families receiving on average $2,242 in program assistance. FSP participation rates are also higher in transiently poor families than in the sample as a whole, with 19.2 percent of individuals in transiently poor families participating in the program and receiving on average $2156.

Descriptive statistics for other model covariates are presented in table 3.

Results

Reduced form and structural parameter estimates for the transient poverty system of equations are presented in table 4. The discussion focuses on the structural parameter estimates. As noted, statistical significance for these structural estimates is based on bootstrapped five and ten percent two-tailed confidence intervals. Turning to the main structural parameter of interest, the impact of the intensity of FSP use on transient poverty is negative and statistically significant at the *P=0.05* level. Many of the structural estimates for other covariates are also significant. Non income receipts, male-headed and married family heads, and higher levels of education reduce the transient component of the severity of poverty. Transient poverty also falls with

larger family size, after controlling for the significantly positive effects of number of children and number of elderly household members on transient poverty. Changes in family size over the survey year are also associated with increases in transient poverty, with additions in family size significant at the *p=0.05* level and reductions in family size significant at the *p=0.10* level. Race and ethnicity also influence the severity of transient poverty. Families headed by African Americans and other non-White racial groups show higher levels of transient poverty than families headed by Whites, and Hispanic-headed families show higher levels than non-Hispanics, even after controlling for other family characteristics and assets. Involuntary unemployment of the family head during the survey year and in the prior year also significantly increases transient poverty.

The parameter estimates for the jointly estimated determinants of the intensity of FSP use are also presented in table 4. The structural parameter estimate for the impact of transient poverty on the intensity of FSP use is positive, but not significantly different from zero. The rate of state FSP caseloads per-capita is, however, positive and significant. Parameter estimate for number of children is not significant but the significantly positive parameter estimate on the number of children squared suggests that the impact of additional children on the intensity of FSP use increases at an increasing rate. Additions to the family over the survey year also increase the intensity of FSP use. Single mothers show a much higher intensity of FSP use, ceteris paribus, and the intensity of program use declines with the age of the family-head. Interestingly, involuntary unemployment of the head or spouse in the previous year increases the intensity of FSP use. But only involuntary unemployment of the head in the current year influences positively the intensity of FSP use.

It is also worth noting that the error covariance parameter estimate is significant, suggesting simultaneity in the transient poverty and intensity of FSP use equations.

Parameter estimates for the chronic poverty system are presented in table 5. The parameter estimate for the impact of the intensity of FSP use on chronic poverty is negative but not significant. While non-income receipts are estimated to have a significant (*P=0.10*) negative impact on chronic poverty. The chronic component of the severity of poverty also decreases with family size and when the family-head is male, but increases with the number of children squared (*p=0.10*). Education, race and ethnicity, and involuntary unemployment of the family head show similar associations with chronic poverty and transient poverty in terms of sign and significance. Additions or reductions to the family during the year, and number of persons in the family over 64 years of age, however, do not significantly influence the severity of chronic poverty.

As expected, reduced form parameter estimates for the intensity of FSP use equation in the chronic poverty system are virtually identical to reduced form estimates for the FSP equation in the transient poverty system. Structural parameter estimates for the intensity of FSP use equation do, however, vary slightly from those in the transient poverty system because the structural estimates depend, in part, on the jointly estimated severity of poverty equation reduced-form parameter estimates. The parameter estimate for the impact of chronic poverty on the intensity of FSP use is large and positive, but not statistically significant. Other parameter estimates have the same sign and significance as in the transient poverty system, with one exception. Age of the household head while negative, it is not statistically significant in the chronic poverty system. The error covariance term is, again, significant.

Measurement error controls through dummy variables for never consulting records while reporting expenditures and not providing an answer to the record consulting question are

significant and positive in both the transient and the chronic systems. As expected, the computed severity of transient and chronic poverty is higher for households with poor record consulting practices relative to households that always consult records, ceteris paribus. The finding likely reflects the impact of higher measurement error in expenditure reporting. Using these parameter estimates the study adjusts the descriptive statistics on severity of poverty to the levels that would be expected of households with excellent record consulting. The adjusted average transient severity of poverty is 20.3 percent lower, while the average severity of chronic poverty is 8.7 percent lower (table 1). Measurement error may thus be an important source of upward bias in non-linear dynamic poverty measures, with transient poverty measures being, as expected, most biased.

Alternative specifications

There is a concern that non income money received may, arguably, not be a good variable to identify the intensity of FSP use equations in the transient and chronic poverty systems of equations. Therefore, the transient and chronic poverty systems are also estimated without the inclusion of non income receipts in their respective transient and chronic poverty equations. As noted, under these specifications the impacts of the intensity of FSP use on transient and chronic poverty are the only identified structural parameter estimates in their respective systems. The results are virtually identical to the initial estimates. Specifically, the impact of the intensity of FSP use is only significant for the transient poverty.

Discussion and Conclusions

Intra-annual transient poverty appears to account for a large share of the economic hardship that US families face. In fact, the incidence of exposure to a spell of transient poverty within a year is only slightly smaller then the incidence of chronic poverty over the whole year. Further, the

transient component accounts for approximately one-third of the total severity of poverty. Simple annual income-based poverty measures do not capture this important indicator of within-year economic hardship.

Results from the estimation of transient and chronic poverty systems of equations indicate that the FSP primarily impacts transient poverty. Thus, poor and near-poor families appear to use the FSP as a short-term expenditure stabilization tool rather than for long-term expenditure support. The parameter estimates from the transient poverty system imply that a one percent increase in FSP benefits for the average family of FSP participants reduces the transient component of the severity of poverty by 3.5 percent. The same increase in the FSP benefits reduces transient poverty by 0.43 percent for the average family with a positive severity measure[14].

The common determinants of transient and chronic poverty are low human capital, minority status, and involuntary unemployment of the household head. Changes in family composition on the other hand are only associated with increased transient poverty, implying that such changes provide negative shocks to family wellbeing, but the shocks only have temporary effects.

The fact that the FSP's main impact is on transient poverty is somewhat problematic for the documentation of program impacts. As noted, intra-annual transient poverty is rarely measured and, thus, the primary impact of FSP benefits on family economic well-being is not readily apparent. The results also suggest that a two-track FSP may be warranted. Fast-track

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[14] The average percent effect on FSP participants is computed as $\frac{\partial E(T_i|x)}{\partial F} \times \frac{\bar{F}}{E(T_i|x)}$ evaluated at the sample mean of FSP participants, while the impact for poor families is computed as $\frac{\partial E(T_i|x,\, T>0)}{\partial F} \times \frac{\bar{F}}{E(T_i|x,\, T>0)}$ evaluated at the sample mean of all households with T>0.

eligibility and certification guidelines could enhance short-term program use and improve the programs effectiveness as an expenditure smoothing mechanism for transiently poor families. Alternative guidelines and certification procedures to enhance the ability of the FSP to meet the needs of chronically poor families also need to be explored. Cash public assistance has increasingly moved towards providing short-term assistance for families in transition from welfare to work. Yet the FSP, as the other major assistance component of the social safety net, does not appear to provide significant long-term expenditure support for poor families. This implies that there is a gap in public assistance support for chronically poor families that struggle to successfully transit from welfare to work.

References

Attanasio, O., and G. Weber. 1995. "Is Consumption Growth Consistent with Intertemporal Optimization? Evidence for the Consumer Expenditure Survey." *Journal of Political Economy*, 103: 1121-1157.

Bane, M.J., and D.T. Ellwood. 1986. "Slipping Into and Out of Poverty: The Dynamics of Spells." *Journal of Human Resources*, 21(1): 1-23.

Bishop, J., J. Formby, and L. Zeager. 1996. "The Impact of Food Stamps on U.S. Poverty in the 1980s: A Marginal Dominance Analysis." *Economica*, 63(Supplement): 141-162.

Breunig, R., I. Dasgupta, C. Gundersen, and P. Pattanaik. 2001. "Explaining the Food Stamp Cash-Out Puzzle." Food Assistance and Nutrition Research Report (FANRR) 12. Washington, DC: USDA, Economic Research Service.

Cameron, C.A. and P.K. Trivedi. 2005. *Microeconometrics: Methods and Applications*. New York: Cambridge University Press.

Coe, R. 1978. "Dependency and Poverty in the Short and Long Run." In *Five Thousand American Families: Patterns of Economic Progress*, edited by G.J. Duncan and J.N. Morgan, pp. 273–296. Ann Arbor: Institute for Social Research.

Consumer Expenditure Survey (2001-2004) U.S. Department of Labor, Bureau of Economic Analysis. Retrieved on April 7, 2005 from the World Wide Web: http://www.bls.gov/cex/

Duncan, G.J., R. Coe, and M.S. Hill. 1984. "The Dynamics of Poverty." In *Years of Poverty, Years of Plenty*, pp. 33–70. Ann Arbor: Institute for Social Research.

Gundersen, C. and V. Oliviera, 2001 "The Food Stamp Program and Food Insufficiency" American" *Journal of Agricultural Economics* 83

Gundersen, C., and J. P. Ziliak. 2003. "The Role of Food Stamps in Consumption Stabilization." *Journal of Human Resources*, 38(4): 1051-1079.

Hoynes, H.W., M.E. Page, and A.H. Stevens. 2006. "Poverty in America: Trends and Explanations." *Journal of Economic Perspectives*, 20(1): 47-68.

Jalan, J., and M. Ravallion. 2000. "Is Transient Poverty Different? Evidence from Rural China." *Journal of Development Studies*, 36(6), 82-99.

Jolliffe, D., C. Gundersen, L. Tiehen, and J. Winicki. 2005. "Food Stamp Benefits and Child Poverty." *American Journal of Agricultural Economics*, 87(3): 569-581.

Jorgenson, D. 1998. "Did We Lose the War on Poverty?" *Journal of Economic Perspectives*, 12(1): 79-96.

Kabbani, N. S., and M. Y. Kmeid., 2005 "The Role of Food Assistance in Helping Food Inscure Households Escape Hunger" *Review of Agricultural Economics* 27:3: 439-445.

Lusardi, A. 1996. "Permanent Income, Current Income, and Consumption: Evidence from Two Panel Data Sets." 14(1): 81-90.

Meyer, Bruce and James X. Sullivan. "Measuring the Well-being of the Poor Using Income and Consumption." Journal of Human Resources. 38 (2003): 1180-1220.

Meyer, Bruce D. and James X. Sullivan, "The Effects of Welfare and Tax Reform: The Living Conditions of Single Mothers in the 1980s and 1990s," NBER Working Paper No. 8298, May 2001.

Miller, K.K., and B.A. Wever. 2003. *Persistent Poverty Across the Rural – Urban Continuum*. Rural Poverty Research Center Working Paper 03-01, Oregon State University

.

Moffit, R.A. 1983. "An Economic Model of Welfare Stigma." *American Economic Review*, 73(5): 1023-1035.

Rodgers, R., and J.L. Rodgers. 1993. "Chronic Poverty in the United States." *Journal of Human Resources*, 28(1): 25-54.

Sen, A.K. 1976. "Poverty: An Ordinal Approach to Measurement." *Econometrica*, 44(2): 219-231.

Slesnick, D.T. 1993. "Gaining Ground: Poverty in the Postwar United States." *Journal of Political Economy*, 1901(1): 1-38.

Wilde, P., P. McNamara, and C. Ranney. 1999. "The Effect of Income and Food Programs on Dietary Quality: A Seemingly Unrelated Regression Analysis with One-Way Error Components." *American Journal of Agricultural Economics*, 81(4): 959-971.

Table 1. Annual Incidence and Severity of Poverty

	Incidence			Severity		
Year	Transient	Chronic	Total	Transient	Chronic	Total
2001	0.076	0.074	0.15	0.0019	0.0041	0.006
2002	0.066	0.08	0.146	0.0018	0.0042	0.006
2003	0.066	0.088	0.155	0.0019	0.0048	0.007
2004	0.06	0.076	0.136	0.0014	0.005	0.006
Total	0.065	0.083	0.148	0.0018	0.0044	0.006

Source: Consumer Expenditure Survey (2001-2004)

Table 2. Food Stamp Benefits

Year	FSP Participation Rate	S.E	$ If Participated [a]	S.E
Total	0.0499	0.0015	1937.67	13.05
Transient Poor	0.1923	0.0045	2126.48	50.48
Chronic Poor	0.2832	0.0070	2242.47	49.14

Source: Consumer Expenditure Survey (2001-2004)
Note: [a] indicates in 2004 real dollars.

Table 3. Descriptive Statistics

Variable	Mean	S.E
Food Stamp Caseloads per Capita	0.0235	0.0001
Non Income Receipts ($1000)	53.5040	5.5781
Consults Records Always	0.0526	0.0016
Consults Records Almost Always	0.1173	0.0023
Consults Records Mostly	0.1220	0.0023
Consults Records Occasionally	0.1767	0.0027
Consults Records Almost Never	0.1178	0.0023
Consults Records Never	0.3639	0.0034
Missing Answer on Record Consulting	0.0497	0.0015
Family Size	2.6046	0.0106
Addition to Family	0.0729	0.0018
Reduction in Family	0.0706	0.0018
Number of Children	0.6869	0.0077
Number of Children Squared	1.6676	0.0284
Number of Persons Older than 64	0.3565	0.0046
Age of Reference Person	50.7160	0.1190
Family Head is Male	0.4835	0.0035
Family Head is Married	0.5835	0.0035
Single Mother Household	0.0716	0.0018
Divorce Occurred During The Year	0.0020	0.0003
Head Graduated College	0.3317	0.0033
Head Some College no Degree	0.2937	0.0032
Head Graduated High School	0.2516	0.0031
African American	0.1071	0.0022
Hispanic	0.0885	0.0020
Other non White	0.0477	0.0015
Head was Involuntarily Unemployed Last Year	0.0566	0.0053
Spouse was Involuntarily Unemployed Last Year	0.0231	0.0034
Head was Involuntarily Unemployed This Year	0.0622	0.0056
Spouse was Involuntarily Unemployed This Year	0.0201	0.0032
Rural Residence	0.0981	0.0021
Rural South	0.0455	0.0015

Source: Consumer Expenditure Survey (2001-2004)

Table 4. Transient Poverty System

	Transient Poverty				Food Stamp Benefits			
	Reduced	S.E		Structural		Reduced	S.E		Structural	
Intercept	0.0055	0.0012	**	0.0085	**	0.1462	0.0533	**	0.1134	
Food Stamps ($1000)				-0.0202	**					
Transient Poverty									0.5955	
Non Income Receipts ($1000)	-0.0008	0.0008		-0.0009	*	-0.0049	0.0383			
Food Stamp Caseloads P.C.	-0.0450	0.0213	**			2.2233	0.9814	**	2.4914	*
Family Size	-0.0005	0.0001	**	-0.0007	**	-0.0054	0.0046		-0.0022	
Addition to Family	0.0008	0.0003	**	0.0014	**	0.0303	0.0123	**	0.0257	*
Reduction in Family	0.0004	0.0003	*	0.0007	*	0.0151	0.0118		0.0125	
Number of Children	0.0006	0.0002	**	0.0004		-0.0106	0.0087		-0.0141	
Number of Children Squared	0.0001	0.0000	**	0.0005	**	0.0205	0.0018	**	0.0198	**
Number Persons Older than 64	0.0002	0.0001	**	0.0005	**	0.0124	0.0067	*	0.0112	*
Age of Reference Person	0.0003	0.0000	**	0.0000		-0.0125	0.0028	**	-0.0143	*
Family Head is Male	-0.0002	0.0001		-0.0003	*	-0.0051	0.0063		-0.0040	
Family Head is Married	-0.0016	0.0002	**	-0.0017	**	-0.0037	0.0085		0.0058	
Single Mother Household	-0.0005	0.0003		0.0051		0.2761	0.0143	**	0.2791	**
Divorce Occurred This Year	0.0034	0.0015	**	0.0032		-0.0101	0.0675		-0.0303	
Head Graduated College	-0.0034	0.0002	**	-0.0061	**	-0.1349	0.0113	**	-0.1147	
Head Some College no Degree	-0.0030	0.0002	**	-0.0054	**	-0.1205	0.0110	**	-0.1028	
Head Graduated High School	-0.0025	0.0002	**	-0.0042	**	-0.0866	0.0109	**	-0.0719	
African American	0.0017	0.0002	**	0.0025	**	0.0390	0.0106	**	0.0287	
Hispanic	0.0021	0.0003	**	0.0026	**	0.0224	0.0153		0.0098	
Other non White	0.0017	0.0003	**	0.0020	**	0.0124	0.0120		0.0021	
Head was Involuntarily Unemployed Last Year	0.0040	0.0009	**	0.0071	**	0.1568	0.0414	**	0.1332	*
Spouse was Involuntarily Unemployed Last Year	0.0002	0.0014		0.0051	*	0.2404	0.0635	**	0.2390	**
Head was Involuntarily Unemployed This Year	0.0034	0.0009	**	0.0093	**	0.2963	0.0396	**	0.2763	**
Spouse was Involuntarily Unemployed This Year	-0.0007	0.0015		-0.0018		-0.0507	0.0680		-0.0463	
Rural Residence	0.0006	0.0004		0.0001		-0.0201	0.0194		-0.0234	
Rural South	0.0003	0.0007		0.0005		0.0103	0.0301		0.0087	
Consults Records Almost Always	0.0000	0.0003		-0.0004		-0.0161	0.0159		-0.0159	
Consults Records Mostly	0.0002	0.0003		-0.0001		-0.0149	0.0159		-0.0159	
Consults Records Occasionally	0.0000	0.0003		-0.0002		-0.0114	0.0152		-0.0115	
Consults Records Almost Never	0.0002	0.0003		0.0002		-0.0042	0.0161		-0.0057	
Consults Records Never	0.0010	0.0003	**	0.0010	**	-0.0005	0.0144		-0.0063	
Missing Answer on Record Consulting	0.0010	0.0004	**	0.0006		-0.0162	0.0193		0.0001	
Variance	0.0092	0.0000	**			0.4242	0.0021	**		
Covariance	0.0540	0.0071	**							
N=19950										
Log Likelihood =-54046										

Note: ** and * indicate significance at the *P=0.05* and *P=0.1* levels respectively

Table 5. Chronic Poverty System

	Chronic Poverty					Food Stamp Benefits				
	Reduced	S.E		Structural		Reduced	S.E		Structural	
Intercept	0.0134	0.0030	**	0.0187	*	0.1462	0.0533	**	0.1186	
Food Stamps ($1000)				-0.0366						
Chronic Poverty									0.2064	
Non Income Receipts ($1000)	-0.0815	0.0561		-0.0026	*	-0.0049	0.0383			
Food Stamp Caseloads P.C.	-0.0024	0.0022				2.2233	0.9814	**	2.3914	*
Family Size	-0.0016	0.0003	**	-0.0018	**	-0.0054	0.0046		-0.0020	
Addition to Family	0.0003	0.0007		0.0014		0.0303	0.0123	**	0.0298	**
Reduction in Family	0.0001	0.0007		0.0006		0.0151	0.0118		0.0149	
Number of Children	0.0015	0.0005	**	0.0011		-0.0106	0.0087		-0.0137	
Number of Children Squared	0.0006	0.0001	**	0.0013	**	0.0205	0.0018	**	0.0193	**
Number Persons Older than 64	-0.0002	0.0004		0.0003		0.0124	0.0067	*	0.0128	**
Age of Reference Person	0.0012	0.0002	**	0.0007		-0.0125	0.0028	**	-0.0149	
Family Head is Male	-0.0009	0.0004	**	-0.0011	**	-0.0051	0.0063		-0.0032	
Family Head is Married	-0.0038	0.0005	**	-0.0039		-0.0037	0.0085		0.0042	
Single Mother Household	-0.0012	0.0008		0.0089		0.2761	0.0143	**	0.2786	**
Divorce Occurred This Year	-0.0029	0.0039		-0.0033		-0.0101	0.0675		-0.0042	
Head Graduated College	-0.0134	0.0006	**	-0.0184	**	-0.1349	0.0113	**	-0.1073	
Head Some College no Degree	-0.0129	0.0006	**	-0.0173	**	-0.1205	0.0110	**	-0.0940	
Head Graduated High School	-0.0113	0.0006	**	-0.0145	**	-0.0866	0.0109	**	-0.0633	
African American	0.0065	0.0006	**	0.0079	**	0.0390	0.0106	**	0.0255	
Hispanic	0.0054	0.0009	**	0.0062	**	0.0224	0.0153		0.0113	
Other non White	0.0035	0.0007	**	0.0039	**	0.0124	0.0120		0.0053	
Head was Involuntarily Unemployed Last Year	0.0071	0.0024	**	0.0129	**	0.1568	0.0414	**	0.1420	*
Spouse was Involuntarily Unemployed Last Year	-0.0003	0.0036		0.0085		0.2404	0.0635	**	0.2411	**
Head was Involuntarily Unemployed This Year	0.0116	0.0023	**	0.0225	**	0.2963	0.0396	**	0.2723	**
Spouse was Involuntarily Unemployed This Year	0.0042	0.0039		0.0023		-0.0507	0.0680		-0.0593	
Rural Residence	0.0026	0.0011	**	0.0019		-0.0201	0.0194		-0.0255	
Rural South	0.0003	0.0017		0.0007		0.0103	0.0301		0.0096	
Consults Records Almost Always	0.0008	0.0009		0.0025		-0.0161	0.0159		-0.0056	
Consults Records Mostly	0.0006	0.0009		0.0002		-0.0149	0.0159		-0.0177	
Consults Records Occasionally	-0.0001	0.0009		0.0000		-0.0114	0.0152		-0.0161	
Consults Records Almost Never	0.0009	0.0009		-0.0006		-0.0042	0.0161		-0.0111	
Consults Records Never	0.0025	0.0008	**	0.0008	**	-0.0005	0.0144		-0.0061	
Missing Answer on Record Consulting	0.0024	0.0011	**	0.0018	**	-0.0162	0.0193		0.0001	
Variance	0.0242	0.0001				0.4242	0.0021	**		
Covariance	0.1384	0.0069	**							
N=19950										
Log Likelihood =- 34899										

Note: ** and * indicate significance at the *P=0.05* and *P=0.1* levels respectively

Essay 3

Food Insecurity and the Food Stamp Program

Introduction

The United States Department of Agriculture spent nearly $53 billion on 15 food assistance programs in 2006. The Food Stamp Program (FSP) is the largest food assistance program with a total cost of $32.8 billion (USDA, 2007). Despite these efforts, many U.S. households continue to report food insecurity and hunger. [15] For instance, in 2005, 12.6 million households comprising 11 percent of all U.S. households reported being food insecure. Over one-third of food insecure households (4.4 million, or 3.9 percent of all U.S. households) had at least one reported member who experienced hunger (Nord, Andrews, and Carlson, 2006).

A better understanding of the causes of food insecurity and its response to food assistance is crucial for the design of effective food assistance policies. In fact, considerable attention has been devoted to measuring the impact of Food Stamp Program (FSP) use on food insecurity in recent years. Most studies examining the relationship between food insecurity and food assistance find either no significant relationship between FSP use and food insecurity or, in some cases, a paradoxical positive correlation. Identifying the effect of FSP participation on the severity of food insecurity has proven difficult due to two empirical problems.[16] First, FSP participation and household food insecurity may be simultaneously determined, as FSP participation may improve food insecurity but food insecure households are more likely to

[15] Food insecurity is commonly defined as the experiencing of difficulty in providing enough food to sustain a healthy diet for all household members due to a lack of resources. Most of the recent literature on U.S. food insecurity uses measures derived from survey questions, most often the USDA Food Security/Hunger Core Module, regarding conditions and behaviors common among households having difficulty meeting basic food needs. The responses to these questions are used to classify households in three categories, food secure, food insecure, and food insecure with hunger. For a detailed discussion see (Bickel at al. 2000).

[16] Kabbani and Yazbeck (2005) Wilde and Nord (2005) and Huffman and Jensen (2006) provide thorough reviews of the literature on the impact of food assistance on food insecurity and insufficiency.

participate in the program. Simultaneity is accounted for in several studies through two-stage estimators in which predicted program participation replaces actual participation in the food security equation (Gundersen and Oliveira, 2001; Kabbani and Yazbeck, 2004). Similarly, Huffman and Jensen (2006) employ a structural model of food insecurity, participation in food assistance programs, participation in labor markets, and wages. These studies do not find a statistically significant structural impact of food assistance on food insecurity.

Second, omitted variables may exist that distort the observed empirical relationship between food insecurity and FSP participation. To account for the impact of omitted variables Ribar and Hamrick (2003) use longitudinal data to examine the impact of food assistance on transitions of food sufficiency.[17] The study finds a paradoxical negative impact of FSP participation on food sufficiency. Wilde and Nord (2005), on the other hand, also use longitudinal data to estimate the impact of FSP participation on food insecurity with a household-fixed effects model. This approach controls for time invariant omitted variables but does not remedy true simultaneity of program participation and food insecurity. Thus the current state of the literature suggests the FSP has little impact on the most commonly used measure of food insecurity.

Most of these studies, however, only account for the impact of physical assets, human capital, family demographics, and employment circumstances on food insecurity. The food insecurity scale is derived from a self assessment of the household's circumstances, thus often overlooked subjective perceptions and household choices may also influence measured food insecurity. For instance, households displaying higher risk tolerance may exhibit attitudes and behaviors that impacts food insecurity. Use of addictive substances such as tobacco may also

[17] Food Sufficiency is an older measure of food availability.

have an impact on food security directly through creating and inelastic demand for a non food item, or it may proxy for poor resource management ability of household members.

This paper uses Panel Study of Income Dynamics (PSID) data to estimate the structural relationship between food insecurity and FSP participation, while explicitly controlling for important and often previously omitted factors like risk tolerance, income variability, and inelastic expenditures on addictive substances that potentially affect this relationship. These estimates are developed in the rest of the paper as follows. Section 2 presents the empirical strategy and model specification. Section 3 presents the data and provides descriptive statistics on the study variables. Section 4 presents the results of the multivariate analysis, and section 5 concludes.

Empirical Model

In this study food security and FSP participation intensity are assumed to be jointly determined, as insecurity may motivate program participation and program benefits may reduce food insecurity. The food security and program participation decisions are, thus, jointly modeled as:

(1) $y_i^* = \gamma_1 F_i + x_{1i}^{'} \beta_1 + \varepsilon_{1i}$

(2) $F_i^* = \gamma_2 y_i + x_{2i}^{'} \beta_2 + \varepsilon_{2i}$

Where y_i^* is a latent continuous measure of food security applicable to the general population, F_i^* is a latent indicator of Food Stamp Program use, x_1 and x_2 are vectors of observed covariates, β_1, β_2, γ_1, and γ_2 are vectors of regression parameters, and ε_1 and ε_2 are regression errors. The reduced form of the above system can be written as:

(3) $y_i^* = x_1' \prod_{11} + x_2' \prod_{12} + w_1$

(4) $F_i^* = x_1' \prod_{21} + x_2' \prod_{22} + w_2$

Where

(5) $\prod_{11} = \frac{\beta_1}{1-\gamma_1\gamma_2}, \quad \prod_{12} = \frac{\gamma_1\beta_2}{1-\gamma_1\gamma_2}, \quad \prod_{21} = \frac{\gamma_2\beta_1}{1-\gamma_1\gamma_2}, \quad \prod_{22} = \frac{\beta_2}{1-\gamma_1\gamma_2}$

and

(6) $w_1 = \frac{\gamma_1\varepsilon_2 + \varepsilon_1}{1-\gamma_1\gamma_2}, and\ w_2 = \frac{\gamma_2\varepsilon_1 + \varepsilon_2}{1-\gamma_1\gamma_2}$

This paper uses a categorical measure of food insecurity status that classifies families in 3 ordered categories (food secure, food insecure, and food insecure with hunger). For the FSP use measure actual benefits are available. However the household really only makes a participation decision, and actual benefits, conditional upon participation, are a function of household characteristics that are included in x_2. Thus, to estimate the parameters of interest we employ the following discrete indicators of food insecurity and FSP use.

$Y_i = 0 \quad if \quad Y_i^* < \alpha_1$

$Y_i = 1 \quad if \quad \alpha_1 \le Y_i^* \le \alpha_2$

$Y_i = 2 \quad if \quad \alpha_2 \le Y_i^*$

and

$F_i = 0 \quad if \quad F_i^* \le 0$

$F_i = 1 \quad if \quad F_i^* \ge 0$

The reduced form parameters $\prod_{kj}$ are estimated using a seemingly unrelated ordered probit model. The structural parameters are then computed using the relationships in (5). As standard errors of structural parameters are difficult to derive analytically, statistical inference regarding the structural parameters of interest is based on bootstrapped 5 and 10 percent confidence intervals (Cameron and Trivedi, 2005).

Data Model Specification and Descriptive Statistics

The primary source of data for the study is the Panel Study of Income Dynamics (PSID) 1995-1999. The PSID is a panel of a nationally representative sample of US individuals and the households in which they reside. The survey started with a sample of 4800 U.S. individuals in 1968 and has traced these individuals annually (biannually since 1997), regardless of residence or who they reside with. The PSID included the food security index in 1999 making a recent sample available for the analysis. This study uses the 3,401households that are present in the panel and have information on all relevant variables in all survey rounds from 1995 to 1999. In addition to the food insecurity scale, a household risk tolerance measure is available for 1996, while information on household income, assets, FSP participation, employment situation, state of residence as well as composition and demographic characteristics of the households are available for all years. The data is also supplemented with state level FSP participation data from the U.S. Census Bureau's Small Area Income and Poverty Estimates. This information is attached to PSID households based on the state of residence.

Food Insecurity Measure

Food insecurity is measured by a one dimensional index derived from 18 survey questions regarding experiences and conditions related to the ability to afford a healthy diet, and behaviors undertaken to cope with adversity in the food supply. The responses to the 18 survey questions are used to generate an interval-level measure called the food security interval score. An additional ordered categorical measure that identifies families as food secure, food insecure without hunger, and food insecure with hunger. The latter is used in this study.

Identifying Food Insecurity and FSP use Covariates

Five groups of covariates are included in both the food insecurity and the FSP use equations. 1-Household income and assets, 2-Educational assets and demographic characteristics, 3-Changes in income, and spells of unemployment, 4-Local economic conditions, 5-Attitudes towards economic risk.

The study accounts for household physical assets by including the household's total wealth and current income in both the food insecurity and FSP use equations. Educational assets and demographic characteristics include education, gender, age, marital status, and indicators of race of the household head from the 1999 survey. Household size and number of children present are also included in the analysis. Stability of income and employment are accounted for by the inclusion of a coefficient of variation of household's income over years 1995-1999 and months of unemployment of the head and the spouse during the 1999 survey year.[18] Food stamp program participants per capita in the respondent's state of residence in 1999 are also included in the food insecurity and the FSP use equation as a proxy for local economic conditions.

Household attitudes towards economic risk are controlled for through a risk tolerance index reported in 1996. To compute the index, respondents were asked questions on whether they are willing to take new jobs with different income prospects. The new job will have the same non-monetary attributes as their current job, but with a 50 percent chance to double earnings and a 50 percent chance to reduce earnings by one third. If the respondents answer 'yes', they are asked if they are willing to take the same job but with the prospect of reducing income in the case of the negative outcome by a greater share until the respondent changes the answer to 'No'. If the answer to the original question is 'No' then respondents are asked if they

[18] As in standard labor definitions the PSID collects information on unemployment and non-participation in the labor force through separate questions, so the unemployment variable used in this study is likely closely related with involuntary unemployment due to loss of a job.

would take a 20 percent cut, and then a 10 percent cut. The responses ultimately place respondents in one of 10 categories of risk tolerance using the risk tolerance index of Barsky, Juster, Kimball and Shapiro (1997). One concern regarding the data is that 1551 of the 4968 households that were present in all survey rounds were dropped because they were missing information on risk tolerance either because they did not answer the risk questions or because they were not on the labor force. These non responses may be correlated with food insecurity, causing the analysis to produce biased results. To account for the possible non random sample the probability of households remaining in the final sample is estimated, then each observation in the final sample is re-weighted by the inverse of that probability. The parameter estimates from the re-weighted sample are presented as an additional spesification.

System Identification

State-level per-capita rates of participation in the FSP in 1998 are included in the FSP use equation but excluded from the food insecurity equation, in order to identify the structural parameters estimates in the food insecurity equation. Transaction costs, including stigma, are likely to play an important role in the FSP use decision (Moffit, 1983). These transaction costs are hypothesized to decline in a favorable food assistance climate as measured by lagged state rates of FSP participation. As a proper identifying restriction, state FSP participation rates need to be uncorrelated with food insecurity except through their impact on household FSP participation. This assumption would fail if state FSP participation rates, in addition to being correlated with program accessibility, were also influenced by other factors that are correlated with family food insecurity, such as state-level poverty rates. However, the inclusion of the 1999 state FSP participation rates accounts for current state-level conditions that may affect food insecurity.

The FSP participation equation is identified by including an indicator of household difficulties with obtaining an adequate food supply in 1997 in the food insecurity equation, and exclusion of this variable from the FSP use equation.[19] The rationale for including the indicator is that problems obtaining foods needed in the past increases reported current food insecurity, but only impacts current FSP use through its impact on current food insecurity.

Means and standard errors of all study variables are presented in table 1. The share of households classified as food insecure in the raw sample is 5.7 percent, while 1.1 percent of the households reported at least one member experiencing hunger. The corresponding shares in the weighted sample are 6.3 and 1.3 respectively. FSP participation rate is 3.3 percent in the raw sample, and it is higher at 4.0 percent in the weighted sample. The differences in average food insecurity and FSP participation are perhaps attributable to the fact that households that did respond to the risk questions are relatively better off, as both normalized income and wealth are higher in the raw sample.

Results

Table 2 presents the reduced form and the structural parameter estimates of the multivariate system of equations. Structural parameter estimates indicate that FSP participation significantly reduces household food insecurity *(p=0.1)*. In fact, the parameter estimates imply 18 percent and 52 percent lower predicted probability of being classified as food insecure and food insecure with hunger, respectively, with FSP participation.[20]

[19] The indicator is equal to 1 if the respondent answered the following question in the affirmative in 1997: "In the last twelve months, did you ever run out of the foods that you needed to make a meal and didn't have money to get more?"

[20] The severity of food insecurity was predicted with and without FSP participation. Then the percentage of households that would be classified as food insecure and food insecure with hunger, respectively, were compared under each scenario.

Several other factors have significant impacts on self assessed food insecurity. For instance, as expected, accumulated wealth and income both reduce household food insecurity *(p = 0.05)*. Male headed households also experience less severe food insecurity compared to otherwise similar female headed households *(p=0.05)*. Higher risk tolerance on the other hand is associated with greater household food insecurity. The result is perhaps indicative of unobserved risky behavior, noting that risk tolerance is significant even after controlling for income volatility. On the other hand, exposure to food insecurity may make households more tolerant toward risk. In addition, households are more food insecure *(p=0.1)* if the household head smokes cigarettes. Smoking habits may be indicative of poor resource management abilities of households or it could increase food insecurity through creating inelastic demand for a non food product. Households that experienced difficulties in obtaining enough food in 1997 also show significantly higher food insecurity in 1999, indicating that food insecurity may exhibit some persistence over time at the household level, even after controlling for current conditions.

Turning to the parameter estimates in the FSP participation equation, the parameter estimate associated with food insecurity is positive but not statistically significant at conventional levels. Several other variables do, however, have a statistically significant effect on the household FSP participation decision. For instance, higher wealth and income significantly decrease FSP participation. FSP participation is also lower in male headed households. Higher education of the household head also decreases FSP use. One noticeable finding is that the gender and education of the household head significantly reduce FSP use even after controlling for all the determinants of FSP eligibility; namely, income, wealth, household size, and number of children. These significant parameter estimates suggest that male household heads and more educated household heads may have higher welfare stigma. Interestingly the number of children

is associated with lower FSP participation, after controlling for the positive significant effect of overall household size on FSP participation. FSP participation is also higher for more risk tolerant households *(p=0.1)*. As expected the lagged FSP participation rate in the households' sate of residence is positively associated with FSP use.

Errors of the two equations are positively correlated, indicating positive self selection of the food insecure households in to the FSP.

Alternative Specifications and Robustness

As noted, exclusions from the sample due to non response to the risk questions may be correlated with food insecurity. Table 3 presents estimates of the results of an alternative specification that weighs each observation by the inverse of the estimated probability of responding to the risk questions. The impact of food stamp use on food insecurity remains statistically significant at the *p=0.1* level, but the estimated impact is smaller in magnitude. The other parameter estimates are similar to the original specification.

Income and wealth are strongly correlated with, and often consequences of, more basic household attributes such as education and employment options. These variables may also have a discontinuous effect on FSP use, as if income and wealth increase beyond a threshold households are no longer eligible to participate in the FSP. Table 4 presents the estimation results of an alternative specification that omits income and wealth variables.

Under this alternative specification the impact of FSP use on food insecurity remains negative and statistically significant *(p=0.1)*, but it is smaller in magnitude. While the parameter estimate for the impact of food insecurity on FSP use is positive and significant at the *p=0.1* under the alternative specification. It is also worth noting that education of the household head is statistically significant in the food insecurity equation under the alternative specification but

statistically insignificant under the original specification. This suggests that education mainly affects food insecurity through an impact on income and accumulated assets.

One additional concern is that only a small share of the households in the sample is classified as food insecure with hunger. The study also estimates an alternative model, where households are only classified in to food secure and food insecure. The reduced form is estimated as a seemingly unrelated bivaraite probit. Results are not reported but all parameter estimates are similar in sign and magnitude to the original model.[21]

Conclusions and Discussion

This study finds that the use of the FSP results in structurally significant reductions in household food insecurity. Further, program effects appear to be larger for households that experience more severe food insecurity. Thus the FSP helps households alleviate concerns about a steady and sufficient food supply. Furthermore, investment in activities that encourage FSP participation and/or help inform food insecurity-vulnerable households on potential benefits from social assistance, as well as policies that reduce the burden of program participation are likely to continue to reduce food insecurity in the U.S. Promoting activities that enhance incomes and asset accumulation, through enhanced employment opportunities and educational attainment are also likely to reduce food insecurity.

It is also important to note that findings suggest that food insecurity may also be caused by risky behaviors and household preferences such as smoking. Policies that promote counseling and education can thus also play a role in reducing food insecurity through their influence on such behaviors and preferences.

[21] Estimation results are available upon request from the authors.

References

Barsky, Robert B.; Kimball, Miles S.; Juster, F. Thomas; Shapiro, Matthew D., "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the HRS." *Quarterly Journal of Economics*. May 1997, 112, S537 - S579.

Bickel, G., M. Nord, C. Price, W. Hamilton, and J. Cook., 2000, *Guide to Measuring Household Food Security*, revised. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service, Technical Report.

Cameron, C.A. and P.K. Trivedi. 2005. *Microeconometrics: Methods and Applications*. New York: Cambridge University Press.

Gundersen, C. and V. Oliviera, 2001 "The Food Stamp Program and Food Insufficiency" American" *Journal of Agricultural Economics* 83: 875-87.

Kabbani Nader S. and Myra Yazbeck Kmeid (2005) "The Role of Food Assistance in Helping Food Insecure Households Escape Hunger" *Review of Agricultural Economics Volume 27,* Number 3—Pages 439–445

Moffit, R.A. 1983. "An Economic Model of Welfare Stigma." *American Economic Review*, 73(5): 1023-1035.

Nord Mark, Margaret Andrews, and Steven Carlson (2006). "Household Food Security in the United States, 2005" *Measuring Food Security*, United States Department of Agriculture, Economic Research Service. ERS report number 29.

Panel Study of Income Dynamics (1995-1999) Institute for Social Research, University of Michigan, An Arbor, MI. Retrieved on November 11, 2006 from the World Wide Web: http://psidonline.isr.umich.edu/

Ribar, D. and K. Hamrick. *Dynamics of Poverty and Food Sufficiency*. Washington DC: U.S. Department of Agriculture, ERS FANRR 36, September 2003.

U.S. Department of Agriculture, Economic Research Service. "The Food Assistance Landscape FY 2006 Annual Report" Economic Information Bulletin 6-4 February 2007

Wilde Parke, and Mark Nord (2005) "The Effect of Food Stamps on Food Security: A Panel Data Approach" *Review of Agricultural Economics*—Volume 27, Number 3 Pages 425–432

Table 1. Descriptive Statistics

	Raw Sample		Weighted Sample	
Variable	Mean	Std. Dev.	Mean	Std. Dev.
Food Insecurity Status				
Insecure	0.057	0.004	0.063	0.004
Insecure with Hunger	0.011	0.002	0.013	0.002
FSP Participation	0.033	0.003	0.040	0.003
Wealth ($10K)	21.459	1.441	19.480	1.342
Normalized Income	4.909	0.094	4.652	0.085
Coefficient of Variability of Income	0.444	0.039	0.144	0.016
Months Unemployed (Head)	0.138	0.015	0.128	0.016
Months Unemployed (Spouse)	0.076	0.012	0.075	0.012
Risk Aversion	0.993	0.034	0.985	0.034
Respondent Smokes	0.233	0.007	0.241	0.007
Household Size	3.606	0.025	3.550	0.026
Number of Children	1.453	0.022	1.429	0.022
Age of Head	43.078	0.173	42.990	0.179
Head is Male	0.835	0.006	0.795	0.007
Education of Head	13.040	0.052	12.932	0.053
Head is Black	0.303	0.008	0.322	0.008
Head is Other non White	0.017	0.002	0.017	0.002
Head is Married	0.752	0.007	0.708	0.008
FSP Recipients per Capita (State 99')	0.025	0.000	0.025	0.000
FSP Recipients per Capita (State 98')	0.026	0.000	0.026	0.000
Problems Obtaining Enough Food (97')	0.050	0.004	0.056	0.004

Source: Panel Study of Income Dynamics 1995-1999

Table 2. Multivariate Regression Results

	Food Insecurity					FSP participation				
	Reduced Form	S.E.		Structural		Reduced Form	S.E.		Structural	
FSP Participation				-0.835	*					
Food Insecurity Status									0.102	
Wealth ($10K)	-0.022	0.006	**	-0.063	**	-0.065	0.019	**	-0.062	**
Normalized Income	-0.132	0.028	**	-0.381	**	-0.389	0.06	**	-0.375	**
Coefficient of Variability of Income	-0.045	0.063		-0.108		-0.099	0.065		-0.094	
Months Unemployed (Head)	0.028	0.032		0.037		0.014	0.039		0.011	
Months Unemployed (Spouse)	0.087	0.041	**	0.153		0.104	0.055	**	0.095	
Risk Aversion	0.041	0.018	**	0.077	**	0.057	0.026	**	0.053	*
Respondent Smokes	0.293	0.088	**	0.388	*	0.15	0.13		0.12	
Household Size	0.081	0.065		0.246		0.258	0.081	**	0.25	**
Number of Children	-0.025	0.079		-0.137		-0.174	0.102	*	-0.171	*
Age of Head	-0.005	0.004		-0.011		-0.01	0.006		-0.009	
Head is Male	-0.271	0.124	**	-0.696	**	-0.664	0.188	**	-0.637	**
Education of Head	-0.009	0.013		-0.042		-0.051	0.017	**	-0.05	**
Head is Black	-0.098	0.093		-0.022		0.119	0.146		0.129	
Head is Other non White	0.233	0.276		0.25		0.027	0.506		0.003	
Head is Married	-0.117	0.139		-0.139		-0.036	0.208		-0.024	
FSP Recipients per Capita (State 99')	25.132	13.319	*	5.87		-30.09	17.126	*	-32.710	
FSP Recipients per Capita (State 98')	-25.209	14.184	*			39.376	18.969	**	41.934	**
Problems Obtaining Enough Food (97')	1.071	0.109	**	1.141	**	0.109	0.17			

N=3401
L=-868
LR test of indep. eqns. : chi2(1) = 3.80 Prob > chi2 = 0.0511

Note ** and * denote statistical significance at the p = 0.05 and p = 0.1 respectively

Table 3. Weighted Sample Estimates

	Food Insecurity					FSP participation				
	Reduced Form	S.E.		Structural		Reduced Form	S.E.		Structural	
FSP Participation				-0.508	*					
Food Insecurity Status									0.097	
Wealth ($10K)	-0.023	0.005	**	-0.056	**	-0.065	0.015	**	-0.063	**
Normalized Income	-0.131	0.022	**	-0.323	**	-0.378	0.047	**	-0.366	**
Coefficient of Variability of Income	-0.029	0.048		-0.074		-0.088	0.053	*	-0.085	
Months Unemployed (Head)	0.023	0.026		0.035		0.024	0.030		0.022	
Months Unemployed (Spouse)	0.091	0.034	**	0.140		0.098	0.045	**	0.089	
Risk Aversion	0.044	0.015	**	0.073	**	0.056	0.021	**	0.052	*
Respondent Smokes	0.284	0.071	**	0.353	**	0.136	0.102		0.109	
Household Size	0.090	0.051	*	0.235	*	0.286	0.061	**	0.278	**
Number of Children	-0.037	0.063		-0.129		-0.183	0.079	**	-0.179	*
Age of Head	-0.006	0.003	*	-0.010		-0.009	0.005	*	-0.009	
Head is Male	-0.264	0.098	**	-0.605	**	-0.672	0.148	**	-0.646	**
Education of Head	-0.006	0.011		-0.035		-0.055	0.014	**	-0.055	**
Head is Black	-0.121	0.075		-0.078		0.086	0.115		0.098	
Head is Other non White	0.268	0.219		0.231		-0.071	0.414		-0.097	
Head is Married	-0.138	0.112		-0.177		-0.077	0.166		-0.063	
FSP Recipients per Capita (State 99')	22.163	10.650	**	5.400		-33.008	13.438	**	-35.161	*
FSP Recipients per Capita (State 98')	-21.389	11.378	*			42.117	14.901	**	44.195	**
Problems Obtaining Enough Food (97')	1.064	0.087	**	1.117	**	0.103	0.133			

N=3401
L=-1388
LR test of indep. eqns. : chi2(1) = 6.34 Prob > chi2 = 0.0118
Note ** and * denote statistical significance at the p = 0.05 and p = 0.1 respectively

Table 4. Alternative Specification

	Food Insecurity				FSP participation			
	Reduced Form	S.E.		Structural	Reduced Form	S.E.		Structural
FSP Participation				-0.603 *				
Food Insecurity Status								0.267 *
Months Unemployed (Head)	0.049	0.032		0.085	0.059	0.037		0.046
Months Unemployed (Spouse)	0.091	0.040	**	0.149	0.096	0.050	*	0.072
Risk Aversion	0.045	0.017	**	0.089 **	0.074	0.022	**	0.062 *
Respondent Smokes	0.321	0.085	**	0.470	0.247	0.116	**	0.162 **
Household Size	0.076	0.063		0.199	0.205	0.075	**	0.185 **
Number of Children	0.024	0.077		0.001	-0.038	0.093		-0.045
Age of Head	-0.011	0.004	**	-0.019	-0.013	0.006	**	-0.010
Head is Male	-0.304	0.121	**	-0.671 **	-0.609	0.172	**	-0.528 **
Education of Head	-0.034	0.012	**	-0.077 **	-0.070	0.014	**	-0.061 **
Head is Black	0.076	0.089		0.347	0.451	0.124	**	0.431 **
Head is Other non White	0.161	0.267		0.213	0.087	0.411		0.044
Head is Married	-0.310	0.132	**	-0.542	-0.384	0.187	**	-0.302 **
FSP Recipients per Capita (State 98')	-21.335	13.750			35.381	16.868	**	41.069 **
FSP Recipients per Capita (State 99')	20.998	12.903		4.3455	-27.617	15.268	*	-33.215 *
Problems Obtaining Enough Food (97')	1.198	0.107	**	1.3905 **	0.319	0.160	**	

N=3401
L=-943
LR test of indep. eqns. : chi2(1) = 11.15 Prob > chi2 = 0.0008
Note ** and * denote statistical significance at the p = 0.05 and p = 0.1 respectively