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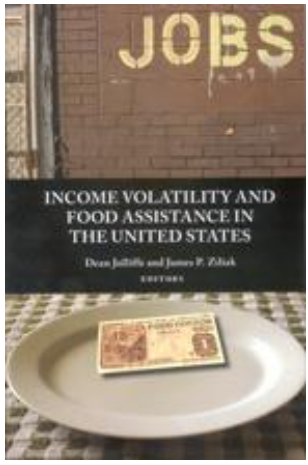

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The Age Gradient in Food Stamp Program Participation: Does Income Volatility Matter?

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With the passage of welfare reform in 1996, the Food Stamp Program became the sole program in the safety net that resembles an entitlement. Subject to basic income and asset tests, individuals are eligible to receive food stamps throughout their lifetimes, irrespective of family structure (as in Temporary Assistance for Needy Families), disability status (as in Supplemental Security Income), and employment status (except for able-bodied adults with no dependents). Total expenditures on the program, including administrative costs, exceeded $32 billion in fiscal year 2006, making it comparable in size to the Earned Income Tax Credit and Supplemental Security Income programs. Still, nonparticipation among eligibles is rampant, and rates of participation, unadjusted for other factors, decline with age. Indeed, Cunnyngham (2003) reports that in 2001 the participation rate among elderly persons eligible for food stamps was 28 percent, versus an average participation rate of about 62 percent for the full population. This lower participation rate holds despite the fact that the elderly do not have to meet the gross income test and they have higher asset limits than the nonelderly.

Numerous studies have been conducted on the determinants of participation in the Food Stamp Program, focusing on a variety of factors such as the business cycle and welfare reform (Wallace and Blank 1999; Ziliak, Gundersen, and Figlio 2003), recertification length (Kabbani and Wilde 2003), nutritive need for food stamps (Haider, Jacknowitz,

and Schoeni 2003), and rates of food insecurity (Gundersen and Oliveira 2001). However, none of the research to date has focused on participation across the life course or on the role of income volatility. Knowledge of how participation varies across the life course is important to policymakers given the pending retirement of the first years of the post–World War II baby boom generation. This demographic bulge may lead to higher rates of participation at older ages than in the past because this is the first generation to grow up with the Food Stamp Program, which began in its modern form as part of the Great Society programs of the mid-1960s and became a national program in 1974. That is, historically participation has declined with age, but this could be a cohort phenomenon that may not carry forward in the future as younger generations have more exposure to the program and utilize it at higher rates. Many authors have documented a rise in earnings and income volatility over the past two decades (Blundell and Pistaferri 2003; Gottschalk and Moffitt 1994; Gundersen and Ziliak 2003; Haider 2001). Identifying the role of income volatility both on average and across the life course of food stamp participation is important to program design because participation is income-conditioned and strict reporting requirements apply to those participants who work and whose income varies. If potential recipients view the Food Stamp Program as an assistance program to be used in the face of negative income fluctuations but not when incomes are permanently low, changes in income volatility may be a factor. Because income volatility likely varies over the life cycle, we might expect the effect of volatility on the decision to use food stamps to vary across the age gradient.

In this chapter we narrow the gap in the literature by estimating the effects of age, birth cohort, and income volatility on Food Stamp Program participation. We use data from the 1980 to 2003 waves of the Panel Study of Income Dynamics (PSID), along with standard measures of income volatility from Gottschalk and Moffitt (1994) and a correlated random effects estimator for the linear probability model (Hausman and Taylor 1981). The correlated random effects estimator is advantageous in this context because it permits identification of both time-varying and time-invariant regressors, the latter of which include birth cohort and some of our measures of income volatility. For the sake of robustness we also estimate a correlated random effects estimator without birth cohorts and a standard fixed-effects linear probability

model, which still permits identification of both the age gradient and the effect of volatility along the gradient.

We find that participation in food stamps is U-shaped across the life course, contrary to the conventional wisdom of simple summary statistics, which show participation declining monotonically across the age gradient. Consistent with the idea of greater familiarity with the Food Stamp Program encouraging participation, we find that younger birth cohorts have higher rates of food stamp participation than earlier birth cohorts. We also find that, in general, food stamp participation is higher across the age gradient among those with higher levels of income volatility.

PATTERNS OF FOOD STAMP PARTICIPATION AND INCOME VOLATILITY OVER THE LIFE COURSE

We begin our analysis with a description of our data and then present basic patterns of food stamp participation and income volatility over the life course.

Data

The data we use come from the Panel Study of Income Dynamics (PSID) for interview years 1980–2003 (calendar years 1979–2002). The survey has followed a core set of households since 1968, plus it has followed newly formed households as members of the original core have split off into new families. We begin in 1979 because this is when the Food Stamp Program ended the so-called purchase requirement, where recipients needed to pay for a set amount of discounted food stamps and the price was directly related to a household's income. The PSID is advantageous because it contains detailed information on income and household composition, which permits us to construct long time series of income for various age groups and family structures.

The sample we use is an unbalanced panel treating missing observations as random events. By eliminating only a missing person-year of data, the time series for each household can be of different lengths within 1980–2003. To be included in the full sample, the household

head must 1) be in the sample at least three consecutive years, 2) not have year-to-year increases in real income[1] exceeding 300 percent or declines exceeding 75 percent, and 3) have annual family income of more than $1,000 in inflation-adjusted terms. We define date-of-birth cohorts in 10-year intervals in the PSID in order to maintain adequate within-cohort sample sizes. There are 72,311 person-years in the full sample. This sample is useful to gauge population-level statistics of food stamp participation and income volatility.

One disadvantage to the full sample is that many of the persons in this sample are unlikely ever to be eligible for food stamps. As a consequence, our estimates of the effects of income volatility and birth cohort on food stamp participation could be understated and less informative for policy. For example, if income volatility is very high but income levels are always above the food stamp eligibility cutoff, the volatility will not influence the participation decision. In response, we create a series of samples that contain households more likely to enter the Food Stamp Program. One is an *income-eligible sample*, where we only include households that in any given year have incomes below 130 percent of the poverty line, which is the gross income cutoff for food stamps. (The criteria for food stamp eligibility are defined in the next section.) There are 11,535 persons in this sample. Another is an *ever income-eligible sample*, where we broaden the income-eligible sample to contain households whose annual incomes dipped below 130 percent of the poverty line at least once during the sample period. There are 30,305 persons in this ever income-eligible sample. The income samples permit us to make statements on the effect of volatility on participation conditional on income eligibility.

Given our interest in the effect of income volatility, one may be concerned that choosing a sample based on income would impart an endogeneity bias into our estimated coefficients. This endogeneity bias could arise because eligibility for food stamps is income-conditioned and thus we are selecting a sample based on a variable that is correlated with the dependent variable. As an alternative we select a subsample of family heads with less than a high school diploma (a *low education sample*). The advantage of using education is that it is exogenous to the food stamp eligibility formula but at the same time is a common proxy in economics for permanent income; that is, this sample is likely to select individuals with low permanent incomes and thus a high ex

ante probability of food stamp participation relative to family heads with higher levels of formal schooling (Bhattarai, Duffy, and Raymond 2005; Gundersen and Oliveira 2001). There are 17,560 person-years in this sample.

One potential drawback to the PSID is the smaller number of elderly persons in comparison to other surveys. In particular, it is smaller than the Survey of Income and Program Participation (SIPP) and the Health and Retirement Survey (HRS). Despite this smaller sample size, the PSID is the only data set with sufficient number of years to 1) adequately measure income volatility and 2) incorporate the effects of birth cohorts over an extended time period.

Food Stamp Participation

The Food Stamp Program, with a few exceptions, is available to all persons who meet income and asset tests. To receive food stamps, households must meet three financial criteria: 1) a gross income test, 2) a net income test, and 3) an asset test. A household's gross income before taxes in the previous month cannot exceed 130 percent of the poverty line, and net monthly income cannot exceed the poverty line.[2] Finally, income-eligible households with assets of less than $2,000 qualify for the program. The value of a vehicle above $4,650 is considered an asset unless it is used for work or for the transportation of disabled persons. Households receiving Temporary Assistance for Needy Families (TANF) and households where all members receive Supplemental Security Income (SSI) are categorically eligible for food stamps and do not have to meet these three tests. There are two distinctions for older persons. First, persons over the age of 60 do not have to meet the gross income test. (But they do have to meet the net income test.) Second, the asset limit for persons over the age of 60 is $3,000 rather than $2,000.

A large fraction of households eligible for food stamps do not participate. In 2005, for example, official estimates indicate that 35 percent of eligible households do not participate (Wolkwitz 2007). A common argument made for the existence of eligible nonparticipation is that there may be a stigma associated with receiving food stamps. Stigma encompasses a wide variety of sources, from a person's own distaste for receiving food stamps, to the fear of disapproval from others when redeeming food stamps, to the possible negative reaction of caseworkers

(Daponte, Sanders, and Taylor 1999; Moffitt 1983). Another reason often suggested is that transaction costs can diminish the attractiveness of participation.[3] A household faces these costs on a repeated basis when it must recertify its eligibility. Additionally, weighed against these costs, the benefit level may be too small to induce participation; food stamp benefits can be as low as $10 a month for a family. In light of the low participation rates of the elderly, these factors may be especially relevant for them.

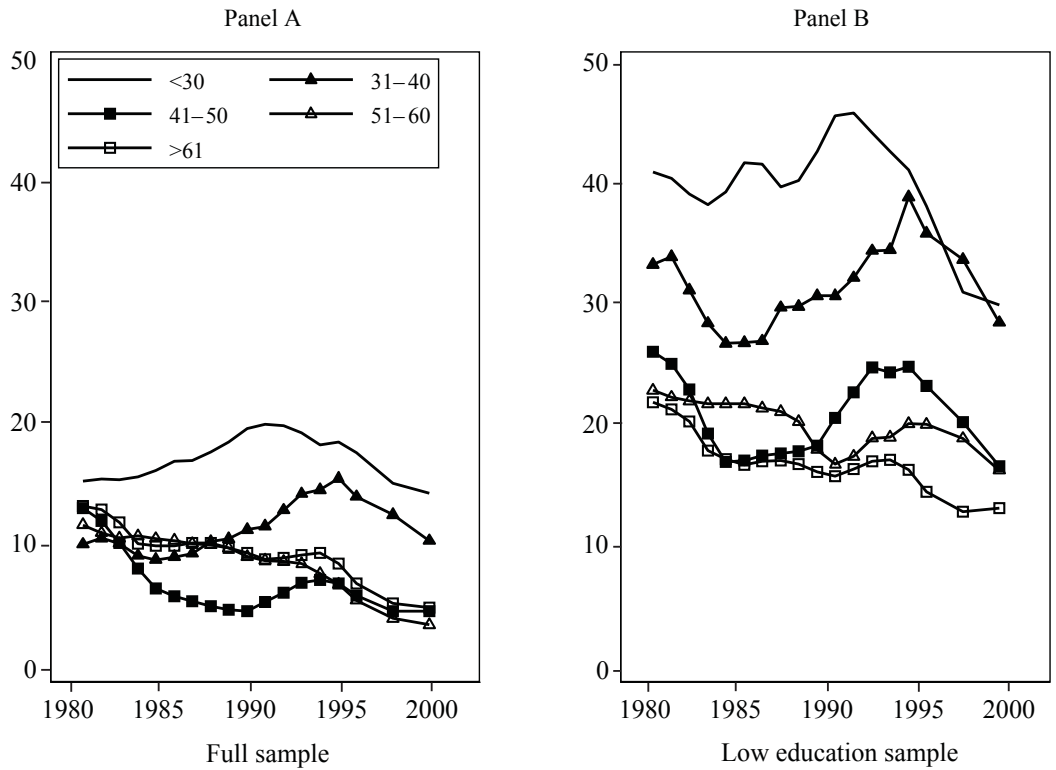
In our first set of figures we display food stamp participation rates by year for five separate age categories: 1) under 30, 2) between 31 and 40, 3) between 41 and 50, 4) between 51 and 60, and 5) 61 and older. These age categories are defined for the head of household. Figure 7.1, Panel A, is for the full sample and Figure 7.1, Panel B, is for the low education sample. In each panel, the food stamp participation rate is calculated as the number of food stamp participants divided by the number of households in the sample. The rates are not weighted and thus the levels are likely upper-bound estimates, given the oversampling of the poor in the Survey of Economic Opportunity (SEO) subsample of the PSID. For both samples the participation rate of households headed by someone under the age of 30 exceeds that of all the other age categories (except the last two years in the low education sample) and, in some years, the under-30 versus over-30 gap can be quite large. Given the larger number of small children among households headed by someone under the age of 30 and the positive relationship between the presence of children and food stamp participation (Bartfeld 2003; Bollinger and David 1997; Hagstrom 1996), this is not entirely unexpected. Part of this age gap also likely arises from categorical eligibility for food stamps among families receiving AFDC/TANF; the latter program tends to be dominated by young families. Panels A and B of Figure 7.2 show our two income-based samples—income-eligible and ever income-eligible. The results for the latter look similar to the results for the low education sample in Figure 7.1. For the income-eligible sample in Panel A there are two primary differences with the other figures. First, the higher participation rates for households headed by someone under the age of 30 do not always hold. Second, the participation rates for households headed by someone over the age of 60 are substantially lower than for other groups.

In addition, the trends in Figures 7.1 and 7.2 shed some light on the demographic composition of the caseload underlying the much-studied rise in Food Stamp Program participation in the early 1990s followed by the subsequent decline in the late 1990s (Ziliak, Gundersen, and Figlio 2003). The increase in the late 1980s and early 1990s appears to have been initially driven by a surge in participation among families whose head was under age 30, followed by an increase in participation for families headed by someone in the 31–40 age group. However, participation among families with heads in the under 30 group started to decline around 1993 even though the peak in aggregate participation was not reached until 1995. Figures 7.1 and 7.2 suggest that the continued upward push came from those families whose heads were between the ages of 31 and 50. Participation then fell for all groups through 2001.

In Figures 7.3 and 7.4 we consider the influence of birth cohort on food stamp participation for the same samples as above. We separate the sample into six birth cohorts depending on whether the family head was born prior to 1919, between 1919 and 1928, between 1929 and 1938, between 1939 and 1948, between 1949 and 1958, or after 1958. In Panels A and B of Figure 7.3, when we do not condition on income, the lines reveal a cohort effect for those heads born after 1958. In Panel A, a head born in the most recent cohort is on average at least 50 percent more likely to participate in food stamps than heads from earlier cohorts, and this cohort gap more than doubles when the most recent cohort is compared to the 1939-to-1948 cohort. Among the low education sample (Panel B) the cohort effect between those born after 1958 and those born between 1949 and 1958 is narrower than in the full sample, but the differences are still rather stark. Once we condition on income, in Figures 7.4, Panels A and B, the higher food stamp participation rates among later cohorts no longer hold to the extent that they do in Figure 7.3. Instead, a pronouncedly lower participation rate holds for the earliest birth cohort (before 1918), especially in the income-eligible sample.

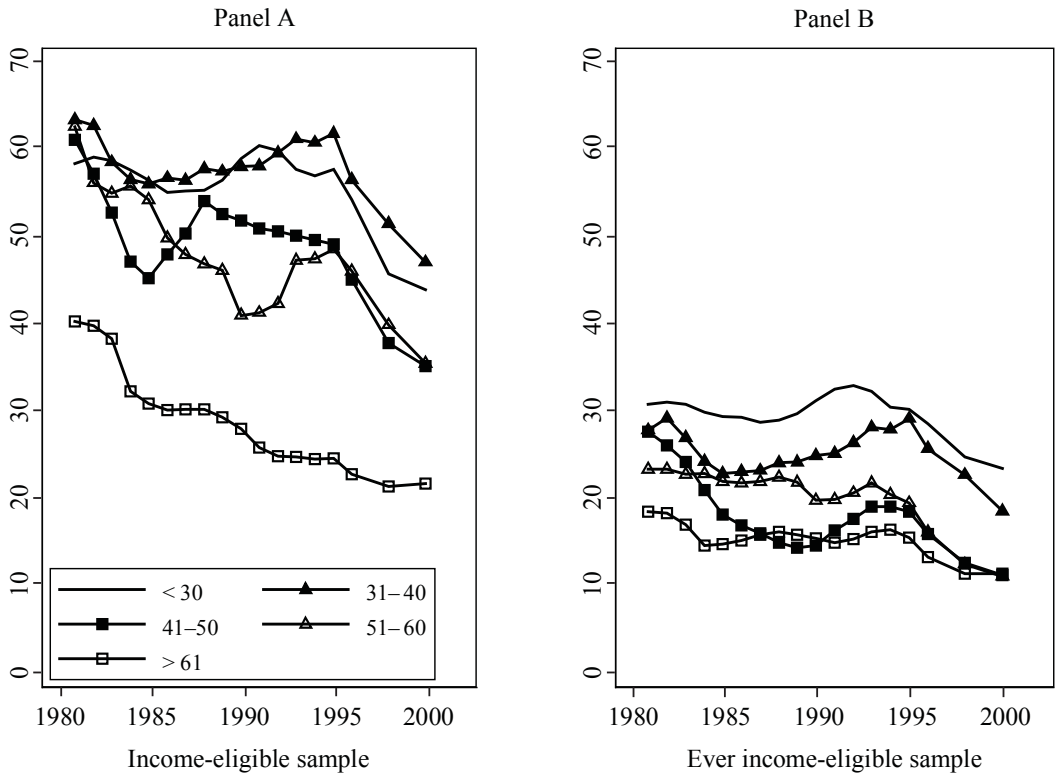
The post-1995 decline in food stamp participation is generally most pronounced among the post-1958 cohort and the pre-1919 cohort. The former is likely due to the strong macroeconomy and welfare reform–related reductions in AFDC/TANF participation (given the categorical eligibility of AFDC/TANF recipients for food stamps). However, the

Figure 7.1 Food Stamp Participation Rates by Age (%)



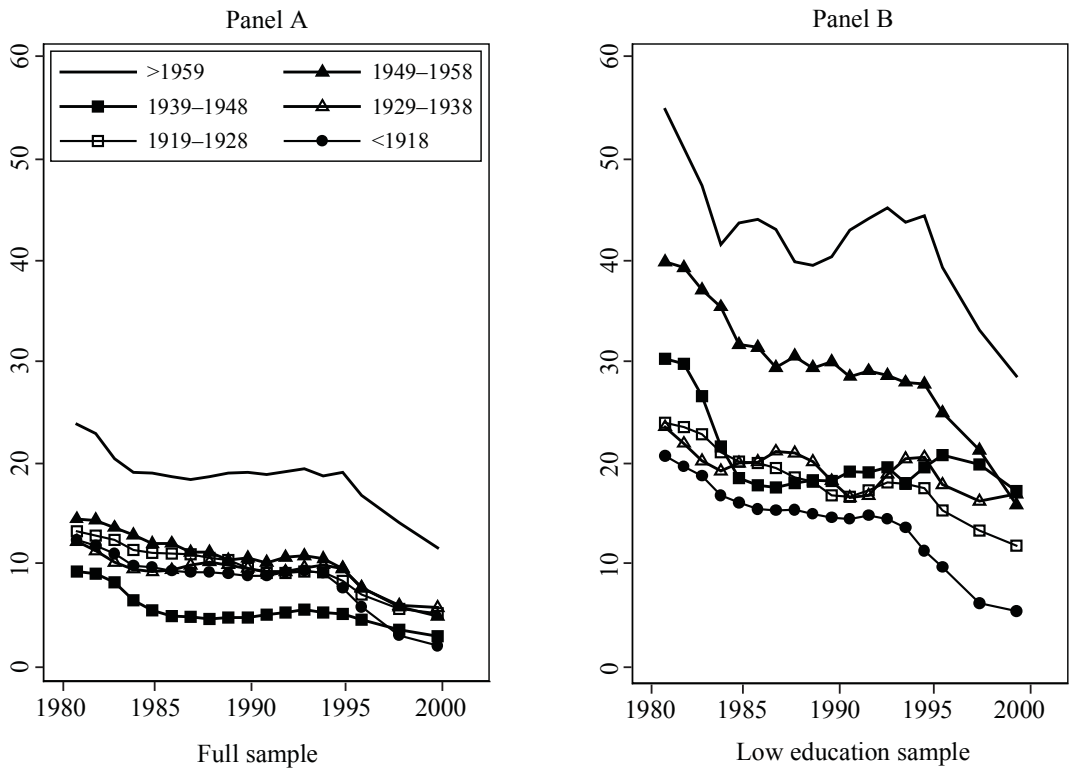
SOURCE: Authors' construction using data from 1980–2003 Panel Study of Income Dynamics.

Figure 7.2 Food Stamp Participation Rates by Age, Eligible Samples (%)



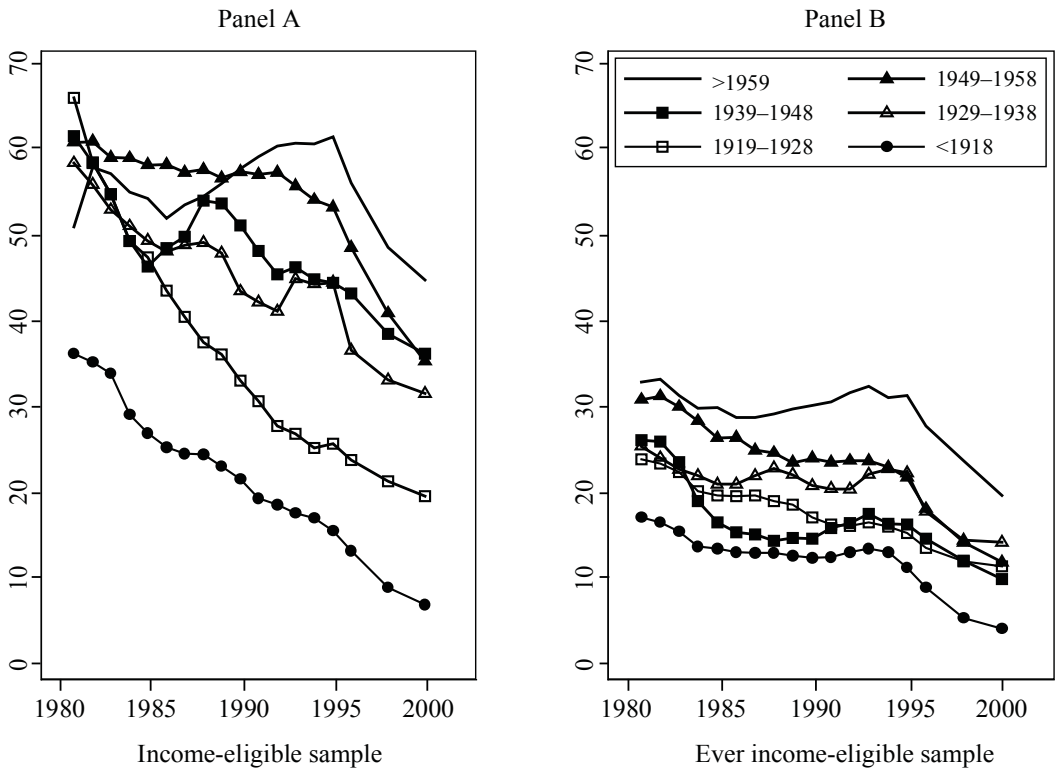
SOURCE: Authors' construction using data from 1980–2003 Panel Study of Income Dynamics.

Figure 7.3 Food Stamp Participation Rates by Birth Cohort (%)



SOURCE: Authors' construction using data from 1980–2003 Panel Study of Income Dynamics.

Figure 7.4 Food Stamp Participation Rates by Birth Cohort, Eligible Samples (%)



SOURCE: Authors' construction using data from 1980–2003 Panel Study of Income Dynamics.

decline among the pre-1919 cohort is quite surprising given that this demographic group is likely retired and thus was largely immune from the labor market effects of the expanding macroeconomy as well as welfare reform–related changes in the Food Stamp Program. At the same time, the late 1990s was also a time of nearly unprecedented growth in asset values, and thus the liquid asset test of $3,000 may have been binding for an increasing proportion of older Americans. These figures reveal possibly important cohort effects affecting both the level and trend in Food Stamp Program participation.

Income Volatility

We next examine basic trends in income volatility over the past two decades. For our analysis we adopt standard measures of income volatility as utilized in Dynarski and Gruber (1997), Gottschalk and Moffitt (1994), and Gundersen and Ziliak (2003), among others, by decomposing income into permanent and transitory components. Let y_{it} be the natural log of income for person i, $i = 1, \ldots, N$, in time period t, $t = 1, \ldots, T$, so that

$$(7.1) \quad y_{it} = \mu_i + \varepsilon_{it},$$

where μ_i is the permanent component and ε_{it} is the transitory component. The corresponding person-specific and time-invariant measure of transitory income volatility is given by

$$(7.2) \quad \sigma^2_{\varepsilon_i} = \frac{1}{(T_i - 1)} \sum_{t=1}^{T_i} (y_{it} - \bar{y}_i)^2,$$

where $\bar{y}_i = \frac{1}{T_i} \sum_{t=1}^{T_i} y_{it}$ is the person-specific time mean and T_i reflects the fact that the panel is unbalanced so that individuals are present in the sample for different lengths of time. The measure of permanent volatility is given by

$$(7.3) \quad \sigma^2_{\mu} = \frac{1}{N - 1} \sum_{i=1}^{N} (\bar{y}_i - \bar{y})^2 - \frac{\sigma^2_{\varepsilon}}{\bar{\bar{T}}},$$

where $\bar{y}$ is the overall sample mean, σ^2_{ε} is the average across i of

the transitory income variances in Equation (7.2), and $\bar{T}$ is the average across the number of time periods T_i. The transitory variance in Equation (7.2) reflects within-group time series variation in income, whereas the permanent variance in Equation (7.3) reflects between-group variation. Following the methodology used in Gottschalk and Moffitt (1994), for each of our four samples we purge income of life-cycle age effects by replacing y in Equations (7.2) and (7.3) with the residuals from a regression of income on a quartic in age. Purging volatility of age effects also prevents the confounding of direct age effects on food stamp participation with the indirect effects of age through income volatility.[4]

We consider two variants of Equations (7.2) and (7.3), one based on all sample periods pooled together and one where we take higher-frequency measures of instability from 1980–1984, 1985–1989, 1990–1994, and 1995–2002. One way to view the low-frequency versus high-frequency estimates of transitory variances in Equation (7.2) is that the low-frequency estimates (which could be based on upwards of 20 years of data) are akin to person-specific permanent variances and the high-frequency estimates are more reflective of traditional transitory variances. Gottschalk and Moffitt (1994) split their sample into nine-year intervals to portray changes in earnings instability between the 1970s and 1980s. Although we are less interested in exploring broad, decadal trends in income volatility in the detail of Gottschalk and Moffitt, we do highlight some important trends and interactions of income volatility with food stamp participation.

In Table 7.1 we depict transitory and permanent low-frequency income volatility for each of our four samples. By columns, we consider these measures for all households within any given sample, followed by the same age breakdowns as in Figures 7.1 and 7.2. The volatility measures broken down by age use the residuals from a pooled regression across all ages—i.e., the regression coefficients are not allowed to vary by age; thus, the estimates in Table 7.1 reflect changes in sample composition and not changes in age-earnings profiles per se. There are a number of observations that should be noted about Table 7.1. First, permanent income volatility is substantially higher than transitory volatility regardless of sample. Second, transitory income volatility among the income-eligible, ever income-eligible, and low education samples exceeds that for the full sample across the age spectrum (with one exception). This is to be expected, given the greater labor market churning

Table 7.1 Transitory and Permanent Low Frequency Income Volatility by Age Groups

	All	Under 30	31–40	41–50	51–60	Over 61
			Full sample			
Transitory	0.15	0.16	0.15	0.14	0.15	0.15
Permanent	0.60					
			Low education sample			
Transitory	0.19	0.22	0.22	0.19	0.18	0.15
Permanent	0.51					
			Income-eligible sample			
Transitory	0.27	0.29	0.28	0.44	0.41	0.13
Permanent	0.54					
			Ever income-eligible sample			
Transitory	0.32	0.32	0.31	0.35	0.45	0.24
Permanent	0.62					

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

among poorly educated and low-income adults in the United States. Third, in general, income volatility is lowest for the over-61 group across all four samples.

Table 7.2 replicates the results in Table 7.1 for the high-frequency income volatility measures. A comparison of Tables 7.1 and 7.2 demonstrates that the estimated high-frequency volatility across all age groups is substantially smaller than the level of volatility measured at low frequency (again, with only one exception). This is consistent with our conjecture that estimates from Equation (7.2) based on all sample years are more akin to a person-specific permanent volatility measure. (Note that the levels of volatility, even at five-year intervals, exceed those in Gottschalk and Moffitt [1994]. This occurs because they use earnings as opposed to income and they restrict their sample to white male heads of household while we admit nonwhites and female-headed families.) We also note that for most age groups income volatility spikes in the mid-1990s, though it did so a bit earlier among the currently income-eligible population, which may have helped spur the growth in caseloads in the early 1990s.

We conclude our descriptive section by examining a simple bivariate relationship between income volatility and Food Stamp Program participation. Specifically, in Table 7.3 we split the sample by quartiles

Table 7.2 Transitory and Permanent High-Frequency Income Volatility by Age Groups

	All	Under 30	31–40	41–50	51–60	Over 61
			Full sample			
			1985			
Transitory	0.08	0.10	0.07	0.07	0.08	0.08
Permanent	0.57					
			1990			
Transitory	0.07	0.09	0.07	0.05	0.08	0.06
Permanent	0.67					
			1995			
Transitory	0.09	0.13	0.08	0.07	0.09	0.10
Permanent	0.71					
			2000			
Transitory	0.08	0.10	0.08	0.08	0.08	0.08
Permanent	0.63					
			Low education sample			
			1985			
Transitory	0.09	0.12	0.08	0.10	0.10	0.08
Permanent	0.64					
			1990			
Transitory	0.09	0.13	0.10	0.07	0.10	0.07
Permanent	0.62					
			1995			
Transitory	0.11	0.14	0.14	0.10	0.11	0.10
Permanent	0.59					
			2000			
Transitory	0.10	0.12	0.11	0.11	0.12	0.07
Permanent	0.62					
			Income-eligible sample			
			1985			
Transitory	0.12	0.25	0.08	0.10	0.08	0.04
Permanent	0.66					
			1990			
Transitory	0.17	0.20	0.30	0.09	0.25	0.03
Permanent	1.00					
			1995			
Transitory	0.14	0.10	0.24	0.09	0.11	0.12
Permanent	0.80					

(continued)

Table 7.2 (continued)

	All	Under 30	31–40	41–50	51–60	Over 61
			Income-eligible sample			
			2000			
Transitory	0.07	0.08	0.08	0.09	0.08	0.04
Permanent	0.29					
			Ever income-eligible sample			
			1985			
Transitory	0.17	0.23	0.13	0.28	0.21	0.09
Permanent	0.65					
			1990			
Transitory	0.20	0.25	0.19	0.12	0.42	0.12
Permanent	0.93					
			1995			
Transitory	0.21	0.22	0.24	0.12	0.32	0.21
Permanent	0.92					
			2000			
Transitory	0.11	0.12	0.01	0.11	0.12	0.09
Permanent	0.65					

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

Table 7.3 Food Stamp Participation by Quartiles of Transitory Income Volatility

	First quartile	Second quartile	Third quartile	Fourth quartile
	Low-frequency income volatility			
Full sample	0.04	0.06	0.12	0.21
Low education sample	0.15	0.19	0.25	0.36
Income-eligible sample	0.27	0.43	0.58	0.58
Ever income-eligible sample	0.18	0.19	0.23	0.28
	High-frequency income volatility			
All income sample	0.06	0.07	0.10	0.18
Low education sample	0.20	0.18	0.24	0.32
Income-eligible sample	0.30	0.44	0.53	0.55
Ever income-eligible sample	0.19	0.17	0.22	0.28

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

of transitory income volatility (at high and low frequencies) and then for each quartile we depict the level of food stamp participation for each of our samples. The results indicate that food stamp participation is increasing in income volatility. The difference is especially clear when comparing the fourth and first quartiles across each of the samples. This suggests that, in addition to age and cohort, income volatility may be an important determinant of food stamp use.

The Age Gradient in Food Stamp Program Participation

Estimation methods

The standard static model of welfare participation in economics is to postulate that participation occurs if and only if the net utility gain is positive—that is, if the utility of participating less the cost of participating and less the utility of not participating is positive. Defining

$$V(y_{it}^{1}; FSP_{it} = 1)$$

as the indirect utility obtained from income y_{it}^{1} while on food stamps ($FSP_{it} = 1$), and

$$V(y_{it}^{0}; FSP_{it} = 0)$$

as the corresponding indirect utility when not participating in food stamps, then the individual participates if

$$V(y_{it}^{1}; FSP_{it} = 1) - V(y_{it}^{0}; FSP_{it} = 0) > 0.$$

Note that for simplicity we assume the indirect utility function as defined incorporates any direct utility costs of program participation such as the stigma and transaction costs described above. If direct preferences are additive over time, then under two-stage budgeting (whereby the individual equates the discounted marginal utility of wealth across periods and then maximizes current period preferences over consumption, leisure, and welfare participation), the static model of welfare participation is "life cycle–consistent" (Blundell and Macurdy 1999). This implies that all lifetime preference parameters are identified except for the time discount rate and the intertemporal substitution elasticity. As

the latter parameters are typically not focal parameters of interest in welfare applications, the static model is fairly general.

To estimate the roles of age and income volatility in the food stamp decision we adopt a reduced-form, index-function version of food stamp participation. Let

$$(7.4)\quad FSP_{it} = 1 \text{ if } FSP_{it}^{*} = Z_{it}\pi + X_i\gamma + u_{it} > 0;$$

$$FSP_{it} = 0 \text{ otherwise},$$

where FSP_{it}^{*} is the latent propensity to participate in food stamps, Z_{it} is a $(1 \times L)$ vector of time-varying variables determining participation, X_i is a $(1 \times L)$ vector of time-invariant variables, and π and γ are vectors of unknown parameters to estimate, and u_{it} is a compound-error term equal to $u_{it} = \alpha_i + \eta_{it}$. The elements of Z_{it} include the age gradient as represented by the same series of indicators as in Figures 7.1 and 7.2—interactions between transitory income volatility and the age gradient, marital status, homeownership status, and family size. Elements of X_i include the race of the head, whether the head is a high school graduate, date-of-birth cohorts as defined in Figures 7.3 and 7.4, and transitory income volatility as defined in Equation (7.2). Permanent volatility will be absorbed in the constant term. When we use income volatility defined over five-year time horizons, this measure will be included in Z_{it}.

Because the model is in reduced form we assume that

$$E[\eta_{is} \mid Z_{it}, X_i] = 0 \forall s, t,$$

which is the typical strict exogeneity assumption between covariates and the time-varying idiosyncratic error term. However, α_i, which represents latent time-invariant preferences for Food Stamp Program participation, is in general not uncorrelated with the regressors, i.e.,

$$E[\alpha_i \mid Z_{it}, X_i] \neq 0.$$

This correlated random effect can arise for a number of reasons, including preferences for welfare participation that vary across education levels or birth cohorts.

Estimation of nonlinear discrete choice models in the presence of correlated unobserved heterogeneity is complicated because simple transformations such as first differencing do not eliminate the time-invariant unobserved heterogeneity, α_i, the exception being the conditional logit estimator of Chamberlain (1980). Most estimators such as the panel probit estimator require a large number of time periods for consistent estimation of both $\hat{\pi}$ and $\hat{\alpha}_i$. A transparent alternative is a panel version of the linear probability model. A concern with this estimator is that predictions may lie outside the unit interval. However, this concern is not germane to this chapter insofar as the focus is on the effects of age and income volatility on food stamp participation and not on the predicted probability of participation per se.

Admitting unrestricted correlation between unobserved heterogeneity and the covariates would lead one to apply OLS to the transformed model

$$(7.5)\quad \widetilde{FSP_{it}} = \widetilde{Z_{it}}\pi + \widetilde{\eta_{it}} \ ,$$

where

$$\widetilde{FSP_{it}} = FSP_{it} - \overline{FSP_i} \ , \qquad \widetilde{Z}_{it} = Z_{it} - \overline{Z}_i \ , \qquad \widetilde{\eta_{it}} = \eta_{it} - \overline{\eta}_i$$

are the deviations from time means, with the person-specific time means defined as

$$\overline{FSP_i} = \frac{1}{T_i}\sum_{t=1}^{T_i} FSP_{it}, \overline{Z}_i = \frac{1}{T_i}\sum_{t=1}^{T_i} Z_{it} \ .$$

Estimation of Equation (7.5) yields the so-called within or fixed-effects estimator. Although providing consistent estimates of π, the cost of this approach is that it is no longer possible to identify the coefficients on the time-invariant variables X_i. This implies that it is still possible to identify the interaction between time-invariant low-frequency income volatility and the age gradient, but not the level effects of low-frequency volatility, education, or cohort on food stamp participation. (Level effects of high-frequency volatility from the five-year estimates are identified given sufficient time series variation.)

To identify the effect of time-invariant factors, we use the correlated random effects estimator of Hausman and Taylor (1981). The idea here is to exploit the fact that some of the regressors are correlated with the unobserved heterogeneity and some are not.[5] Any time-varying variables that are uncorrelated with the latent heterogeneity α_i can be used as instrumental variables for time-invariant variables that are correlated. Provided that the number of uncorrelated time-varying variables is at least as large as the number of correlated time-invariant variables, the coefficients on the latter are identified.

More specifically, let

$$Z_{it} = [Z_{it}^1, Z_{it}^2] \ ,$$

where Z_{it}^1 is a $(1 \times K_1)$ vector of time-varying variables uncorrelated with

$$\alpha_i, E[\alpha_i \mid Z_{it}^1] = 0,$$

and Z_{it}^2 is a $(1 \times K_2)$ vector of time-varying variables correlated with

$$\alpha_i, E[\alpha_i \mid Z_{it}^2] \neq 0 .$$

Likewise, let

$$X_i = [X_i^1, X_i^2]$$

be the corresponding $(1 \times L_1)$ and $(1 \times L_2)$ vectors of time-invariant regressors, with

$$E[\alpha_i \mid X_i^1] = 0 \text{ and } E[\alpha_i \mid X_i^2] \neq 0 .$$

Ignoring for the moment the fact that our panel is unbalanced, we rewrite the estimating equation of interest in matrix form as

$$(7.6) \quad FSP = Z\pi + X\gamma + \alpha + \eta,$$

where FSP is $(NT \times 1)$, Z is $(NT \times [K_1 + K_2])$, and X is $(NT \times [L_1 + L_2])$.

Then let

$$\text{cov}(\alpha+\eta)=\sigma_\eta^2\Omega, \qquad \Omega^{-1}=Q_a+\theta^2P_a, \qquad \Omega^{-1/2}=Q_a+\theta P_a\ ,$$

$$Q_a=I_{NT}-P_a,\ P_a=I_N\otimes T^{-1}e_Te_T', \qquad \text{and } \theta=\left[\frac{\sigma_\eta^2}{\sigma_\eta^2+T\sigma_\alpha^2}\right]^{1/2},$$

where Q_a is the within (deviation from time mean) transformation, P_a is the time-mean operator, I_N and I_{NT} are $(N \times N)$ and $(NT \times NT)$ identity matrices, and e_T is a $(T \times 1)$ vector of ones. Letting $D = [Z, X]$ be the matrix of regressors and $\Gamma = [\pi, \gamma]$ be the vector of parameters, then in order to make the error covariance matrix in Equation (7.6) homoskedastic it is necessary to premultiply both sides of the equation by $\Omega^{1/2}$, as follows:

$$(7.7)\quad \Omega^{-1/2}FSP=\Omega^{-1/2}D\Gamma+\Omega^{-1/2}(\alpha+\eta).$$

Hausman and Taylor (1981) then suggest the following instrumental variables estimator for Equation (7.7):

$$(7.8)\quad \hat{\Gamma}=[D'\Omega^{-1/2}P_w\Omega^{-1/2}D]^{-1}D'\Omega^{-1/2}P_w\Omega^{-1/2}FSP,$$

where $P_w = W(W'W)^{-1}W'$ is the projection matrix of instruments W. For instruments they suggest

$$W=[Q_aZ_1,Q_aZ_2,P_aX_1,P_aZ_1];$$

that is, the deviation from time means Q_aZ_1, Q_aZ_2 are instruments for Z_1 and Z_2, while the time mean of Z_1, P_aZ_1, serves as an instrumental variable for the correlated time-invariant regressor X_2. The time mean of X_1 is an instrument for itself. So long as the order condition $K_1 > L_2$ is met then all model parameters are identified. As our base case we categorize the regressors as follows:

$$Z_{it}^1=[Age_{it}^j,\hat{\sigma}_{\varepsilon_i}^2 * Age_{it}^j, year_t]\ ,$$

$$Z_{it}^2=[married_{it}, owner_{it}, family_{it}]\ ,$$

$$X_i^1=[\hat{\sigma}_{\varepsilon_i}^2, race_i]\ ,$$

and

$$X_i^2 = [education_i, cohort_i] \ ,$$

where Age_{it}^j represents the various indicators for the age gradient (j = ≤ 30, > 30 and ≤ 40 , > 40 and ≤ 50, >50 and ≤ 60, > 60). We assume that preferences for marriage, home ownership, family size, and education are correlated with latent preferences to participate in food stamps, and that different birth cohorts through varied socialization mechanisms have different (and possibly correlated) preferences for food stamp use. We have no strong priors to assume that race is correlated with latent preferences to participate conditional on the other covariates and therefore assume it is uncorrelated. Likewise, we assume that income volatility is uncorrelated with unobserved heterogeneity. Note that this does not imply that the *level* of income is uncorrelated with α_1, but the variance is assumed to be uncorrelated. This is a standard assumption that is justified provided that volatility is driven by demand-side market forces or other factors unrelated to time-invariant latent heterogeneity.

To make the estimator operational we first need to replace θ with a consistent estimate. It is recommended that initial consistent estimates be obtained by the within-fixed-effects estimator (FE) and that the variance terms be constructed as

$$\hat{\sigma}_\eta^2 = \frac{1}{NT - N - K} \sum_i \sum_t (\widetilde{FSP_{it}} - \tilde{D}_{it}\hat{\Gamma}_{FE})^2$$

and

$$\hat{\sigma}_\alpha^2 = \frac{1}{N} \sum_i (\overline{FSP_i} - \bar{D}_i\hat{\Gamma}_{FE})^2 - T^{-1}\hat{\sigma}_\eta^2 \ ,$$

whereas, before,

$$\widetilde{FSP}_{it} = FSP_{it} - \overline{FSP_i}$$

and

$$\tilde{D}_{it} = D_{it} - \bar{D}_i$$

were the deviations from time mean. Under the correlated random effects structure this estimator is asymptotically more efficient than the

within estimator. However, in the event that the assumed lack of correlation between Z_{it}^1 and α_1 is violated, then the Hausman and Taylor estimator is inconsistent. For robustness, then, we compare our results to those estimated from the within estimator. We also compare our results with a Hausman and Taylor estimator, which does not include birth cohorts. It is well known that separate identification of age, year, and cohort effects is complicated without strong functional form assumptions (Heckman and Robb 1985), though in our case the presence of an unbalanced panel aids in identification because new cohorts enter the panel later in the sample period. That said, we are interested in understanding how sensitive the estimated age gradient is to the inclusion of cohort effects.

Results

Our results from the Hausman and Taylor estimator with endogenous cohort effects are presented in Table 7.4 for our four samples. Here we look at the low-frequency measures of income volatility; below we consider the high-frequency measures. Recall that in the low-frequency model transitory volatility is time-invariant and thus is an element of X_i^1, whereas in the high-frequency model transitory volatility varies over time for each individual and thus is an element of Z_i^1. The respective transitory income volatility measures are de-meaned prior to interacting with the age gradient, implying that the direct effect of volatility yields the mean effect and the interactions reflect deviations from the mean. In both cases permanent volatility is absorbed into either the constant term or year dummies and thus is not identified.

The results in Table 7.4 indicate that there is a U-shaped pattern to food stamp participation across the age gradient for the full, low education, and ever income-eligible samples. Across all three of the samples, the bottom of the U is for those between the ages of 41 and 50. The peak for all three samples is for households headed by someone over the age of 60. These results suggest that, controlling for other factors, Food Stamp Program participation is not monotonically declining across the age gradient. The results for the income-eligible sample are not U-shaped, nor are they decreasing across the age gradient. Instead they are flat across the age gradient.

The direct effect of transitory income volatility on food stamp participation at the mean level of volatility depends on the sample. For the

Table 7.4 The Effect of Age and Income Volatility on Food Stamp Participation: Hausman-Taylor with Endogenous Cohort Effects, Low Frequency Income Volatility

	Full sample	Low education sample	Income-eligible sample	Ever income-eligible sample
Age between 31 and 40	−0.02	−0.04	0.00	−0.02
	(0.00)	(0.01)	(0.02)	(0.01)
Age between 41 and 50	−0.02	−0.07	−0.01	−0.04
	(0.01)	(0.02)	(0.02)	(0.01)
Age between 51 and 60	0.02	0.00	0.07	0.03
	(0.01)	(0.02)	(0.04)	(0.02)
Age greater than 60	0.04	0.01	0.05	0.04
	(0.01)	(0.03)	(0.05)	(0.02)
Income volatility	0.23	0.07	−0.06	−0.02)
	(0.03)	(0.07)	(0.02)	(0.01)
Age between 31 and 40 × income volatility	0.03	0.08	0.03	0.01
	(0.01)	(0.04)	(0.01)	(0.01)
Age between 41 and 50 × income volatility	0.00	0.18	0.05	0.03
	(0.02)	(0.05)	(0.02)	(0.01)
Age between 51 and 60 × income volatility	0.05	0.42	0.04	0.02
	(0.03)	(0.07)	(0.02)	(0.01)
Age greater than 60 × income volatility	−0.21	0.14	0.07	0.03
	(0.03)	(0.08)	(0.02)	(0.01)
Homeowner	−0.03	−0.03	−0.06	−0.05
	(0.00)	(0.01)	(0.02)	(0.01)

Married	−0.02	−0.02	−0.01	−0.03
	(0.00)	(0.01)	(0.02)	(0.01)
High school graduate	−0.08		−1.12	−0.02
	(0.08)		(0.13)	(0.17)
White	−0.14	−0.17	0.00	−0.18
	(0.02)	(0.03)	(0.04)	(0.04)
Family size	0.02	0.03	0.04	0.04
	(0.00)	(0.00)	(0.00)	(0.00)
Born between 1949 and 1958	−0.07	−0.14	0.03	−0.09
	(0.02)	(0.07)	(0.08)	(0.04)
Born between 1939 and 1948	−0.10	−0.16	−0.24	−0.07
	(0.02)	(0.08)	(0.10)	(0.07)
Born between 1929 and 1938	−0.07	−0.20	−0.59	−0.16
	(0.07)	(0.12)	(0.18)	(0.15)
Born between 1919 and 1928	−0.19	−0.29	−0.48	−0.11
	(0.08)	(0.14)	(0.22)	(0.17)
Born before 1918	−0.03	−0.13	−0.83	−0.16
	(0.10)	(0.13)	(0.21)	(0.19)

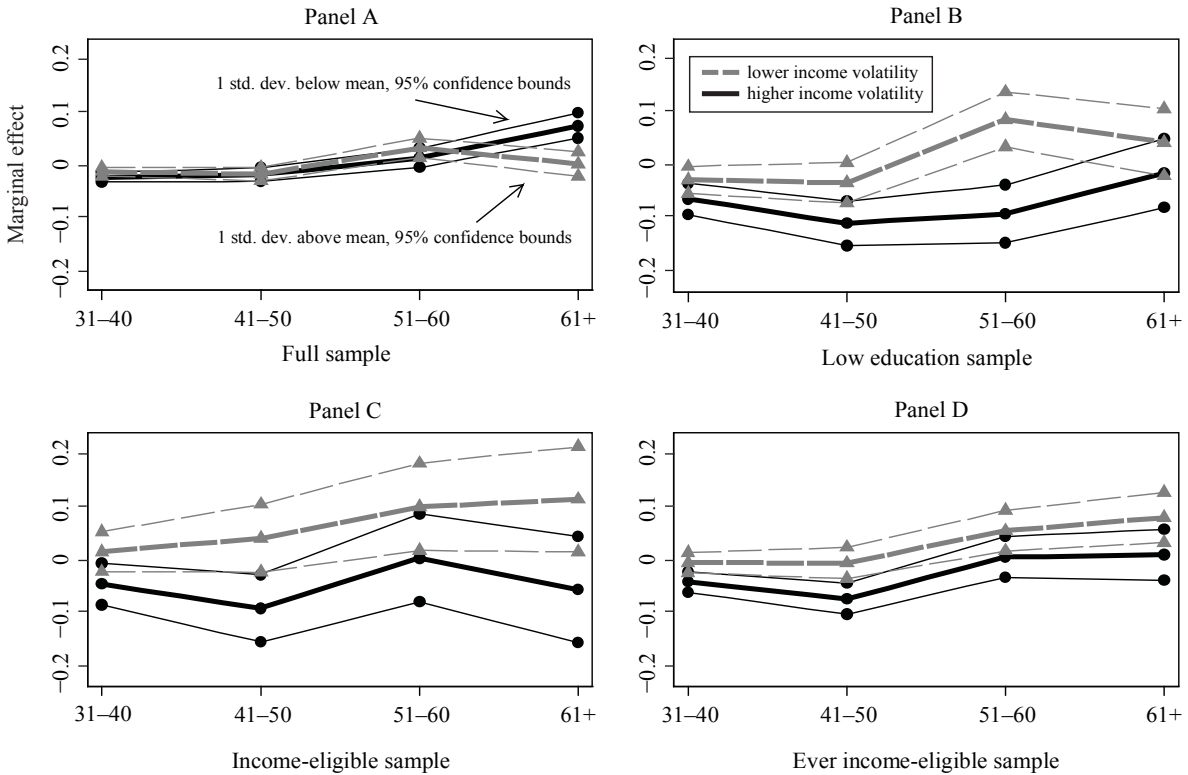
NOTE: Standard errors are in parentheses. There are 72,150 person-years in the full sample, 17,463 in the low education sample, 11,535 in the income-eligible sample, and 30,305 in the ever income-eligible sample. Each model controls for a vector of year dummies. Blank = not applicable.

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

full sample, persons with high levels of volatility over long time horizons—i.e., permanently high volatility—are more likely to participate in the Food Stamp Program. In the low education sample this effect is also positive but it is statistically insignificant. That food stamp use is higher among those with high volatility over low frequencies is in accord with Blundell and Pistaferri (2003), who find that food stamps are very effective in smoothing consumption in the face of permanent income shocks. In contrast, for the income-eligible and the ever income-eligible samples the effect of income volatility is negative and significant. Across the different samples, as the probability of being eligible for food stamps increases, there is a corresponding decline in the effect of income volatility. One possible explanation for these differences for the samples that may not always be eligible for food stamps (i.e., for all the samples except the income-eligible sample) is that higher volatilities among those at greater risk of food stamp participation include spells above the food stamp eligibility cutoff, which highlights the possible endogeneity of this sample selection.

We now consider the effects of income volatility across different ages. To do so, we depict the total effect of age and interactions of age with income volatility (along with the respective 95 percent confidence interval) for a representative individual at each age range, with income volatility one standard deviation below or one standard deviation above the mean level of volatility. Panels A–D of Figure 7.5 refer to the four samples at low-frequency volatility. For the full sample, the effect of income volatility is relatively constant across the age spectrum with the exception of those over age 61 with lower income volatility—they have higher probabilities of food stamp participation in comparison to those younger than 30. For the low education sample, lower income volatility is associated with lower probabilities of food stamp participation for those aged 31–50 in comparison to those younger than 30, and higher income volatility is associated with higher probabilities of food stamp participation for those aged 51–60. More consistent patterns emerge for the income-eligible samples: there, household heads aged 51 and older with higher income volatilities are more likely to participate in the Food Stamp Program. One caution in interpreting these results is that the distributions of both low- and high-frequency income volatility are skewed and widely dispersed so that one standard deviation above the mean is in the far right tail of the distribution.

Figure 7.5 Effects of Low Frequency Income Volatility on Food Stamp Program Participation



SOURCE: Authors' construction using data from 1980–2003 Panel Study of Income Dynamics.

Figure 7.5, Panels A and B, also provides insights into the role of income volatility at any given age. Comparisons of income volatilities one standard deviation above the mean and below the mean indicate that in general households with higher income volatility are more likely to receive food stamps.

While the effect of age on food stamp participation is U-shaped, the effect of birth cohort is generally declining with respect to earlier birth cohorts. In comparison to the base group (those born after 1959), for each of the samples every birth cohort either has statistically the same probability of food stamp participation or a lower probability. In terms of other variables in the regression model they generally align as expected; namely, food stamp participation is lower among those with a high school diploma or more, among white families, among homeowners, among married couples, and among those with small families.

We now turn to the results (Table 7.5) where we use a high-frequency measure of income volatility. Like the results for the low-frequency measures, the effect of age is still, except for the income-eligible sample, U-shaped, but this is primarily due to dips in participation rates in the ages between 31 and 50 rather than increases in the post-50 age group. The effect of high-frequency income volatility is statistically insignificant with the exception of the low education sample, where it is negative and significant. As seen in the flat lines in Figure 7.6, Panels A–D, the effect of income volatility at all age levels is insignificant. At any given age, the differences between higher and lower levels of income volatility are much more narrow than is the case with low-frequency income volatilities. Earlier birth cohorts, as in Table 7.4, are in general as likely or less likely to receive food stamps in comparison to more recent birth cohorts, for all samples.

As mentioned previously, separate identification of age, period, and cohort effects is generally achieved by imposing functional form restrictions on the respective parameters. One such restriction is to zero out the cohort effects and examine how the age coefficients change with the omission of controls for birth cohort. In Table 7.6 we present the results from the Hausman-Taylor estimator without cohort effects under low-frequency income volatility. One primary difference in the results in Table 7.4 is that, for the low education and income-eligible samples, across all age groups participation in food stamps is lower than for the

under 30 group. In other words the U-shaped pattern for the former sample and the flat age profile for the latter sample no longer hold.

An alternative restriction that can be imposed to eliminate birth cohorts is to assume that all covariates are correlated with the unobserved propensity to participate in food stamps, though at the cost of no longer identifying other time-invariant variables such as our measure of low-frequency income volatility. In Table 7.7 we impose this assumption for the low-frequency income volatility measures and present results from fixed-effects linear probability models. Here, the results regarding the relationship between the age profile and food stamp participation are more similar to those found in Table 7.4.

In Tables 7.8 and 7.9 we repeat the exercises from Tables 7.6 and 7.7, only now for the high-frequency income volatility measure. One key difference from the results for Table 7.5 is that income volatility has a positive and significant effect on food stamp participation in the low education sample in Tables 7.8 and 7.9 while it has a negative and significant effect in Table 7.5.

CONCLUSION

We used data from the Panel Study of Income Dynamics over the past two decades to estimate the effect of age, income volatility, and interactions of age and volatility on the probability of participating in the Food Stamp Program. We employed the correlated random effects estimator of Hausman and Taylor (1981), which permits identification of parameters on both time-varying and time-invariant regressors. We found that participation in food stamps is U-shaped across the life course and that younger birth cohorts have higher rates of food stamp participation than earlier birth cohorts. We also find that, in general, food stamp participation is higher across the age gradient among those with higher levels of income volatility.

Our results have four main implications for policymakers and Food Stamp Program administrators. First, contrary to common expectations, we found that, after controlling for relevant factors, older persons actually have higher rates of participation than younger persons, especially in comparison to those between the ages of 31 and 50. While outreach

Table 7.5 The Effect of Age and Income Volatility on Food Stamp Participation: Hausman-Taylor with Endogenous Cohort Effects, High Frequency Income Volatility

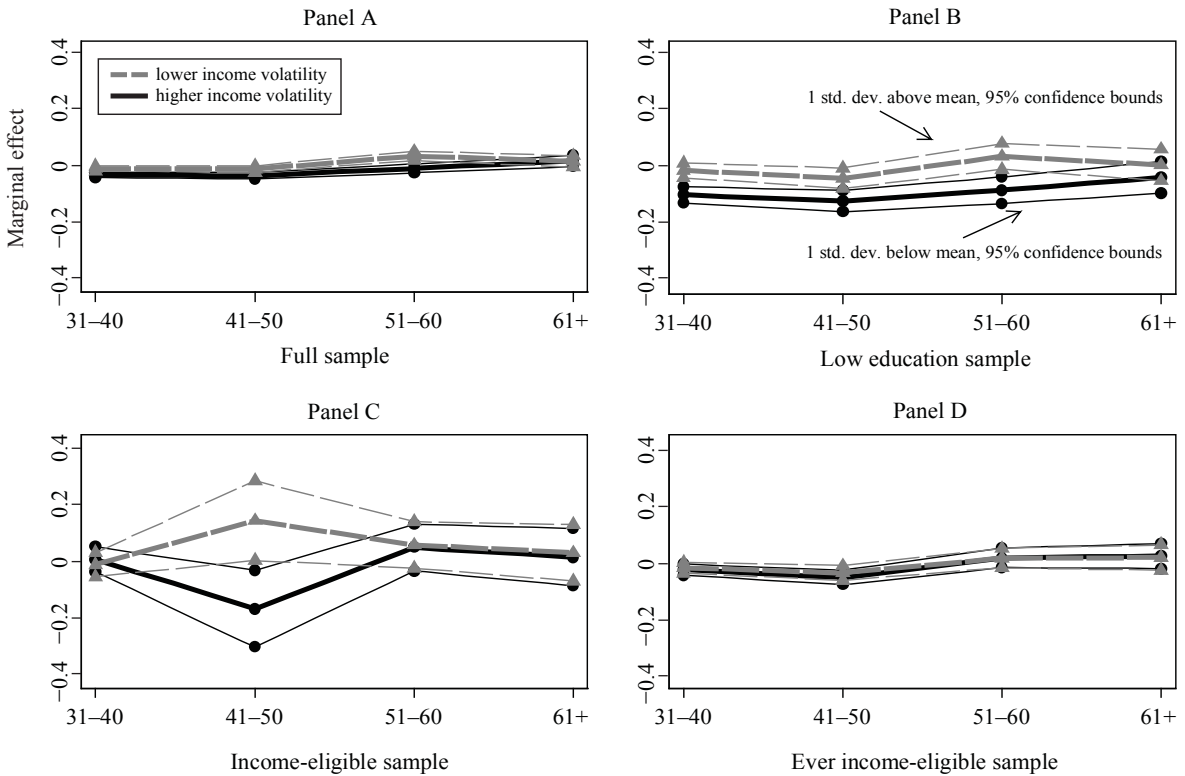
	Full sample	Low education sample	Income-eligible sample	Ever income-eligible sample
Age between 31 and 40	−0.02	−0.05	0.00	−0.03
	(0.00)	(0.01)	(0.02)	(0.01)
Age between 41 and 50	−0.02	−0.08	−0.01	−0.05
	(0.01)	(0.02)	(0.03)	(0.01)
Age between 51 and 60	0.01	−0.02	0.05	0.01
	(0.01)	(0.02)	(0.04)	(0.02)
Age greater than 60	0.02	−0.01	0.02	0.02
	(0.01)	(0.03)	(0.05)	(0.02)
Income volatility	−0.02	−0.18	−0.02	0.00
	(0.02)	(0.05)	(0.02)	(0.01)
Age between 31 and 40 × income volatility	0.09	0.32	−0.01	0.00
	(0.02)	(0.06)	(0.02)	(0.01)
Age between 41 and 50 × income volatility	0.09	0.30	0.21	0.01
	(0.02)	(0.07)	(0.09)	(0.01)
Age between 51 and 60 × income volatility	0.15	0.44	0.01	0.00
	(0.03)	(0.07)	(0.02)	(0.01)
Age greater than 60 × income volatility	−0.01	0.16	0.01	0.00
	(0.02)	(0.06)	(0.02)	(0.01)
Homeowner	−0.03	−0.03	−0.06	−0.05
	(0.00)	(0.01)	(0.02)	(0.01)

Married	−0.02	−0.03	0.00	−0.03
	(0.00)	(0.01)	(0.03)	(0.01)
High school graduate	−0.48		−1.20	−0.11
	(0.13)		(0.14)	(0.12)
White	−0.06	−0.19	0.04	−0.17
	(0.04)	(0.03)	(0.04)	(0.03)
Family size	0.02	0.03	0.04	0.04
	(0.00)	(0.00)	(0.00)	(0.00)
Born between 1949 and 1958	−0.02	−0.04	0.17	−0.02
	(0.04)	(0.08)	(0.08)	(0.04)
Born between 1939 and 1948	−0.09	−0.21	−0.29	−0.13
	(0.05)	(0.08)	(0.11)	(0.05)
Born between 1929 and 1938	−0.14	−0.04	−0.50	0.04
	(0.13)	(0.12)	(0.20)	(0.10)
Born between 1919 and 1928	−0.23	−0.36	−0.40	−0.34
	(0.15)	(0.13)	(0.22)	(0.12)
Born before 1918	−0.20	0.01	−0.80	0.03
	(0.18)	(0.12)	(0.21)	(0.12)

NOTE: Standard errors are in parentheses. There are 72,150 person-years in the full sample, 17,463 in the low education sample, 11,535 in the income-eligible sample, and 30,305 in the ever income-eligible sample. Each model controls for a vector of year dummies. Blank = not applicable.

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

Figure 7.6 Effects of High Frequency Income Volatility on Food Stamp Program Participation



SOURCE: Authors' construction using data from 1980–2003 Panel Study of Income Dynamics.

to the elderly may remain an important policy intervention for other reasons, our results demonstrate that concerns about low participation rates among the elderly may be overstated. Second, if any age group should be targeted for outreach, it is probably those between the ages of 31 and 50, perhaps by improving the application and recertification procedures to better accommodate the working-age population. Third, our results show that later birth cohorts have higher rates of participation than earlier birth cohorts. As a consequence, in the absence of other factors, in the future there may be a permanent increase in the number of food stamp recipients. Fourth, our results show some evidence that lower income volatility is associated with lower probabilities of receiving food stamps. One possible reason for this result is that potential recipients with low but steady incomes may perceive food stamps as a program to be used only in response to negative income shocks. In response, outreach to those known to have more constant income patterns may be worthwhile.

We conclude with a few suggestions for future research directions. Although we have taken reports of food stamp participation as accurate in this chapter, previous work has established that food stamp receipt is underreported in surveys (Bollinger and David 1997, 2001, 2005; Marquis and Moore 1990). This underreporting can have consequences for the understanding of the relationship between food stamps and various outcomes of interest (Gundersen and Kreider 2008). Moreover, even though income in the PSID is among the best measured in social surveys, there is some evidence of income misreporting, and if this is correlated with food stamp participation then our results may be biased. Future research should explore the dual roles of income and food stamp misreporting on both the determinants of participation and other correlated outcomes. Finally, we have not explored the possible role of risk aversion with respect to the food stamp participation decision. In the 1996 wave of the PSID several questions were asked regarding risk aversion, and these variables could potentially be utilized to better understand how food stamp recipients respond to income volatility. These and related issues portend a vibrant research agenda on food assistance for many years to come.

Table 7.6 The Effect of Age and Income Volatility on Food Stamp Participation: Hausman-Taylor without Birth Cohort Effects, Low Frequency Income Volatility

	Full sample	Low education sample	Income-eligible sample	Ever income-eligible sample
Age between 31 and 40	−0.03	−0.07	−0.03	−0.03
	(0.00)	(0.01)	(0.01)	(0.01)
Age between 41 and 50	−0.03	−0.11	−0.08	−0.06
	(0.01)	(0.01)	(0.02)	(0.01)
Age between 51 and 60	0.00	−0.07	−0.07	0.00
	(0.01)	(0.02)	(0.03)	(0.01)
Age greater than 60	0.01	−0.08	−0.15	0.01
	(0.01)	(0.02)	(0.04)	(0.02)
Income volatility	0.26	0.08	−0.03	−0.01
	(0.03)	(0.06)	(0.02)	(0.01)
Age between 31 and 40 × income volatility	0.03	0.09	0.03	0.01
	(0.01)	(0.04)	(0.01)	(0.01)
Age between 41 and 50 × income volatility	0.00	0.18	0.03	0.02
	(0.02)	(0.05)	(0.02)	(0.01)
Age between 51 and 60 × income volatility	0.05	0.40	0.02	0.02
	(0.03)	(0.07)	(0.02)	(0.01)
Age greater than 60 × income volatility	−0.22	0.11	0.05	0.02
	(0.03)	(0.08)	(0.02)	(0.01)
Homeowner	−0.03	−0.04	−0.07	−0.05
	(0.00)	(0.01)	(0.01)	(0.01)

Married	−0.03	−0.02	−0.02	−0.04
	(0.00)	(0.01)	(0.02)	(0.01)
High school graduate	0.01		−0.28	0.13
	(0.03)		(0.08)	(0.05)
White	−0.17	−0.17	−0.16	−0.21
	(0.01)	(0.02)	(0.03)	(0.02)
Family size	0.02	0.03	0.04	0.04
	(0.00)	(0.00)	(0.00)	(0.00)

NOTE: Standard errors are in parentheses. There are 72,150 person-years in the full sample, 17,463 in the low education sample, 11,535 in the income-eligible sample, and 30,305 in the ever income-eligible sample. Each model controls for a vector of year dummies. Blank = not applicable.

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

Table 7.7 The Effect of Age and Income Volatility on Food Stamp Participation: Fixed Effects Estimator, Low Frequency Income Volatility

	Full sample	Low education sample	Income-eligible sample	Ever income-eligible sample
Age between 31 and 40	−0.02	−0.04	0.00	−0.02
	(0.00)	(0.01)	(0.02)	(0.01)
Age between 41 and 50	−0.02	−0.07	−0.01	−0.04
	(0.01)	(0.02)	(0.03)	(0.01)
Age between 51 and 60	0.02	0.00	0.07	0.03
	(0.01)	(0.02)	(0.04)	(0.02)
Age greater than 60	0.04	0.01	0.05	0.04
	(0.01)	(0.03)	(0.05)	(0.02)
Age between 31 and 40 × income volatility	0.03	0.09	0.03	0.02
	(0.03)	(0.06)	(0.01)	(0.00)
Age between 41 and 50 × income volatility	0.00	0.20	0.02	0.03
	(0.03)	(0.09)	(0.02)	(0.01)
Age between 51 and 60 × income volatility	0.05	0.47	0.01	0.02
	(0.05)	(0.11)	(0.02)	(0.01)
Age greater than 60 × income volatility	−0.22	0.21	0.04	0.03
	(0.06)	(0.13)	(0.03)	(0.01)
Homeowner	−0.03	−0.03	−0.06	−0.05
	(0.00)	(0.01)	(0.02)	(0.01)
Married	−0.02	−0.02	0.00	−0.03
	(0.00)	(0.01)	(0.03)	(0.01)

Family size	0.02	0.03	0.04	0.04
	(0.00)	(0.00)	(0.01)	(0.00)

NOTE: Standard errors are in parentheses. There are 72,150 person-years in the full sample, 17,463 in the low education sample, 11,535 in the income-eligible sample, and 30,305 in the ever income-eligible sample. Each model controls for a vector of year dummies.
SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

Table 7.8 The Effect of Age and Income Volatility on Food Stamp Participation: Hausman-Taylor without Birth Cohort Effects, High Frequency Income Volatility

	Full sample	Low education sample	Income-eligible sample	Ever income-eligible sample
Age between 31 and 40	−0.03	−0.07	−0.03	−0.03
	(0.00)	(0.01)	(0.01)	(0.01)
Age between 41 and 50	−0.04	−0.12	−0.09	−0.06
	(0.01)	(0.01)	(0.02)	(0.01)
Age between 51 and 60	−0.02	−0.08	−0.08	−0.01
	(0.01)	(0.02)	(0.03)	(0.02)
Age greater than 60	−0.02	−0.08	−0.17	−0.01
	(0.01)	(0.02)	(0.04)	(0.02)
Income volatility	0.00	0.33	−0.01	0.00
	(0.02)	(0.06)	(0.02)	(0.01)
Age between 31 and 40 × income volatility	0.09	0.30	0.20	0.01
	(0.02)	(0.07)	(0.08)	(0.01)
Age between 41 and 50 × income volatility	0.09	0.44	−0.01	0.00
	(0.02)	(0.07)	(0.02)	(0.01)
Age between 51 and 60 × income volatility	0.14	0.15	0.00	0.00
	(0.03)	(0.06)	(0.02)	(0.01)
Age greater than 60 × income volatility	−0.03	−0.18	−0.01	0.00
	(0.02)	(0.05)	(0.02)	(0.01)
Homeowner	−0.03	−0.03	−0.08	−0.05
	(0.00)	(0.01)	(0.02)	(0.01)

Married	−0.02	−0.03	−0.01	−0.03
	(0.00)	(0.01)	(0.02)	(0.01)
High school graduate	−0.14		−0.33	0.05
	(0.03)		(0.08)	(0.05)
White	−0.14	−0.18	−0.15	−0.20
	(0.01)	(0.02)	(0.03)	(0.02)
Family size	0.02	0.03	0.04	0.04
	(0.00)	(0.00)	(0.00)	(0.00)

NOTE: Standard errors are in parentheses. There are 72,150 person-years in the full sample, 17,463 in the low education sample, 11,535 in the income-eligible sample, and 30,305 in the ever income-eligible sample. Each model controls for a vector of year dummies. Blank = not applicable.

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

Table 7.9 The Effect of Age and Income Volatility on Food Stamp Participation: Fixed Effects Estimator, High Frequency Income Volatility

	Full sample	Low education sample	Income-eligible sample	Ever income-eligible sample
Age between 31 and 40	(0.02)	(0.05)	(0.01)	(0.03)
	(0.00)	(0.01)	(0.02)	(0.01)
Age between 41 and 50	(0.02)	(0.08)	(0.01)	(0.05)
	(0.01)	(0.02)	(0.03)	(0.01)
Age between 51 and 60	0.01	(0.02)	0.06	0.01
	(0.01)	(0.02)	(0.04)	(0.02)
Age greater than 60	0.02	(0.01)	0.03	0.02
	(0.01)	(0.03)	(0.05)	(0.02)
Income volatility	(0.02)	0.31	0.00	0.00
	(0.03)	(0.08)	(0.02)	(0.00)
Age between 31 and 40 × income volatility	0.09	0.30	0.19	0.01
	(0.03)	(0.10)	(0.12)	(0.00)
Age between 41 and 50 × income volatility	0.10	0.44	(0.00)	0.00
	(0.04)	(0.09)	(0.02)	(0.00)
Age between 51 and 60 × income volatility	0.15	0.17	0.01	(0.00)
	(0.04)	(0.08)	(0.02)	(0.00)
Age greater than 60 × income volatility	(0.00)	(0.19)	(0.02)	(0.01)
	(0.03)	(0.07)	(0.02)	(0.00)
Homeowner	(0.02)	(0.03)	(0.07)	(0.05)
	(0.00)	(0.01)	(0.02)	(0.01)

Married	(0.02)	(0.02)	0.01	(0.03)
	(0.00)	(0.01)	(0.03)	(0.01)
Family size	0.02	0.03	0.03	0.04
	(0.00)	(0.00)	(0.01)	(0.00)

NOTE: Standard errors are in parentheses. There are 72,150 person-years in the full sample, 17,463 in the low education sample, 11,535 in the income-eligible sample, and 30,305 in the ever income-eligible sample. Each model controls for a vector of year dummies. Blank = not applicable.

SOURCE: Data are from the 1980–2003 Panel Study of Income Dynamics (PSID).

Notes

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1. Income is the sum of labor earnings plus income from rent, interest, and dividends. Transfers include social insurance (Social Security, SSI, Aid to Families with Dependent Children [AFDC], and veterans' benefits) and private transfers (child support, alimony, and gifts from relatives).
2. Net income is calculated by subtracting a standard deduction from a household's gross income. In addition to this standard deduction, households with labor earnings deduct 20 percent of those earnings from their gross income. Deductions are also taken for child care and care for disabled dependents, medical expenses, and excessive shelter expenses.
3. Examples of such costs include travel time to a food stamp office and time spent in the office, the burden of transporting children to the office or paying for child care services, and the direct costs of paying for transportation.
4. Another approach is to not purge income of these life-cycle age effects. To test the robustness of our results, we also considered this alternative approach. While the coefficients on our income volatility measures and their interactions with age did change under this alternative approach, the combined effects were very similar to the combined effects in the preferred model. Results are available from the authors upon request.
5. For example, Hausman and Taylor (1981) assume that age in an earnings regression is not correlated with the latent heterogeneity but that education is correlated.

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