

Income Volatility and Household Consumption: The Impact of Food Assistance Programs

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Abstract

The impact of food assistance programs (food stamps) in a period of rising income inequality in the US is analyzed using 1978-1992 PSID data. We assess to what extent food assistance can be viewed as an effective insurance to permanent shocks to income. The results show that the program has a substantial consumption smoothing effect in the low-income population: the response of food consumption to a permanent income shock is a third lower after accounting for the monetary value of food stamps.

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I. Introduction

There is an extensive literature of theoretical and empirical research that has analyzed the role of various insurance mechanisms for household consumption: extended family networks (Kotlikoff and Spivak, 1981; Attanasio and Rios-Rull, 2000), added worker effects (Stephens, 2002), the timing of durable purchases (Browning and Crossley, 2001), progressive income taxation (Mankiw and Kimball, 1992, Auerbach and Feenberg, 2001, and Kniesner and Ziliak, 2002), personal bankruptcy laws (Fay, Hurst, and White, 2002), insurance within the firm (Guiso, Pistaferri, and Schivardi, 2002), financial markets (Davis and Willen, 2000), mortgage refinancing (Hurst and Stafford, 2003), and the role of government public policy programs, such as unemployment insurance schemes (Engen and Gruber, 2001), Medicaid (Gruber and Yelowitz, 1999), and AFDC (Gruber, 2000).

In this paper we consider the effectiveness of the Food Stamp Program, the largest food assistance program in the US, as an insurance mechanism against income shocks for low income households.¹ The program allows low-income individuals to purchase a nutritionally adequate diet. The benefits can be used to purchase food and nonalcoholic beverages at participating stores.² Eligibility requires households to have gross family income at or below 130 percent of the poverty line and assets totaling less than \$2,000 (\$3,000 for households with elderly members); the value of the house and of a car (if worth less than \$4,500) are, however, disregarded. The amount of benefits is based on the assumption that a household contributes 30 percent of its income toward food expenditure. Benefits are adjusted for family size and composition. In 1998 an eligible family of four with no net income would receive little more than \$5,000 a year in food stamp benefits.³

It is important to understand the insurance role played by food assistance programs in a period characterized by rising income inequality and increased income volatility, as is the case in the US in the last three decades. Ensuring that all individuals can afford adequate nutrition is a primary goal of public policy, and the link between income inequality and food stamp use is almost mechanically set by the program's features. A greater dispersion in the income distribution (greater inequality) implies that is more likely for a household to receive income shocks that push them below the eligibility threshold and therefore trigger food assistance. However, different food stamp use probabilities are generated by different types of shocks.

To induce participation, income shocks must be fairly persistent because the program includes both an income- and an asset-test requirement. Transitory shocks that push individuals below the poverty line may still not provide eligibility for food assistance if assets are sufficiently high before the arrival of the shock and used as a buffer against shocks. But permanent shocks may exhaust assets very rapidly and therefore satisfy both tests. Thus we ask in this paper to what extent the food stamp program is successful in helping households smooth food consumption in response to permanent income shocks.

Our analysis builds on the earlier work on income uncertainty and consumption inequality by Blundell and Preston (1998) and places it in a panel data context. In Blundell, Pistaferri and Preston (2002) it is shown how the additional information in panel data on consumption and income can identify 'partial insurance' parameters and can measure the degree to which households are able to insure against income shocks.

In the application to food assistance programs reported in this paper, consumption is measured via the food at home expenditure recorded in the PSID. Since food itself is a necessity, the reaction of food expenditure to income shocks is naturally attenuated through the income

elasticity. We focus on two contrasts: The first is between a food consumption measure where we include food assistance and one in which we do not. The second is between a medium-high income group (where food assistance should have little impact) and a low-income group to which the food assistance program is directed. Even though we focus on food consumption we show that these two contrasts alone are sufficient to identify the “insurance” impact of food assistance for low income households.

The layout of the paper is as follows. The next section continues with an illustration of the model we estimate and of the identification strategy we use. In Section 3 we discuss data issues. Section 4 contains a discussion of the results. Section 5 concludes.

II. Income and consumption dynamics

A. Self-insurance

This section follows Blundell, Pistaferri, and Preston (2002) closely, although our focus here is on food consumption and on the insurance provided by food assistance programs for low-income households. The aim of this work is to use panel data on income dynamics to recover the structure of income shocks and to use this together with consumption data to examine the degree of consumption smoothing with respect to these income shocks. This is purely an empirical exercise although its interpretation can best be viewed within a simple life-cycle consumption smoothing paradigm which we develop below. This provides a consistent framework for understanding the relationship between income shocks and consumption choices over the life-cycle.

The unit of analysis is a household, comprised of a prime-age couple and, possibly, their children. Our sample selection focuses on income risk and we do not model divorce, widowhood, and other household breaking-up factors. We recognize that these may be important omissions that limit the interpretation of our study. For instance, over the 1980s only about 30 percent of the total Food Stamp Program caseload were two-parent families (50 percent were female heads, and 20 percent elderly). However, by focusing on stable households and the interaction of consumption and income we are able to develop a complete identification strategy. Moreover, the stratification of our sample into medium/high- and low-income households will go some way toward identifying the effects of the food stamp program on the target population. For an analysis of the effect of the food stamp program on single parents and the elderly, we refer to Keane and Moffitt (1998) and Haider, Schoeni, and Jacknowitz (2002), respectively.

We assume that the main source of uncertainty faced by the consumer is income (defined as the sum of labor income and cash transfers, that is, welfare payments excluding the monetary value of food stamps). For the present analysis we also assume that labor is supplied inelastically. To set the scene imagine that the optimization problem faced by household i consists of

$$(1) \max E_t \sum_{j=0}^{\infty} (1 + \delta)^{-j} u(C_{it+j}, Z_{it+j})$$

subject to the intertemporal budget constraints and the initial and the *no-Ponzi-game* conditions on financial assets

$$(2) A_{it+j+1} = (1 + r)(A_{it+j} + Y_{it+j} - C_{it+j})$$

$$(3) A_{it} \text{ given and } \lim_{t \rightarrow \infty} \frac{A_{it}}{(1+r)^t} = 0$$

In the above consumer allocation problem C_{it+j} represents the consumption of household i in period $t+j$, the term Z_{it+j} includes observable and unobserved taste shifts, δ is the subjective discount rate, A_{it+j} the real value of assets at the beginning of period $t+j$, r the real interest rate, and Y_{it+j} household income. We assume infinite horizon and that there is no interest rate uncertainty.

The income process we consider is

$$(4) y_{it} = Z_{it}'\phi + P_{it} + v_{it}$$

where t indexes time, and $y = \log Y$ is the log of real income. Equation (4) decomposes current income into a deterministic component $Z_{it}'\phi$, a permanent component P_{it} , and a mean-reverting component, v_{it} . Given our focus on the impact of permanent shocks on food consumption and the fact that transitory shocks and measurement errors in income are not separately identifiable, we assume that the component v_{it} is entirely due to measurement error in income. We consider relaxing this assumption in the empirical analysis.

For consistency with previous empirical studies (MaCurdy, 1982; Abowd and Card, 1989; Moffitt and Gottschalk, 1994; Meghir and Pistaferri, 2002), we assume that the permanent component P_{it} follows a martingale process of the form

$$(5) P_{it} = P_{it-1} + \zeta_{it}$$

where ζ_{it} and v_{it} are serially and mutually uncorrelated. It follows that income growth is

$$(6) \Delta y_{it} = \Delta Z_{it}' \boldsymbol{\phi} + \zeta_{it} + \Delta v_{it}$$

If preferences are of the CRRA form ($u(C, Z) = \frac{C^{1-\gamma}}{1-\gamma} e^{Z\vartheta}$), and $r = \delta$, then one obtains the approximate consumption growth equation (see Blundell, Pistaferri, and Preston, 2002, for more details on the approximation)

$$(7) \Delta c_{it} \cong \Gamma_t + \Delta Z_{it}' \vartheta + \pi_{it} \zeta_{it}$$

where $c = \log C$ is the log of real consumption and π_{it} the share of future labor income in the present value of lifetime wealth. The term Γ_t is the slope of the consumption path.

For an individual a long time from the end of their life with the value of current financial assets small relative to remaining future labor income, $\pi_{it} \approx 1$, and permanent shocks pass through more or less completely into consumption. Precautionary saving can provide effective insurance against permanent shocks only if the stock of assets built up is large relative to future labor income, which is to say π_{it} is appreciably smaller than unity, in which case there will be some smoothing of permanent shocks through self insurance (dissaving). From here onwards we assume $\pi_{it} \approx 1$ in which no part of permanent shocks is insured; furthermore, y and c should be interpreted as the income and consumption components after removing demographic characteristics and aggregate effects. The terms Z_{it} and Γ_t will thus be omitted from now on.

Equations (6) and (7) can be used to derive the following covariance restrictions as in Hall and Mishkin (1982) and Blundell, Pistaferri, and Preston (2002):

$$(8) \text{cov}(\Delta y_t, \Delta y_{t+s}) = \begin{cases} \sigma_\zeta^2 + 2\sigma_v^2 & \text{for } s = 0 \\ -\sigma_v^2 & \text{for } |s| = 1 \\ 0 & \text{for } |s| > 1 \end{cases}$$

where cov denotes a cross-sectional covariance (the index i is consequently omitted). The restrictions on consumption growth from (7) are as follows:

$$(9) \text{cov}(\Delta c_t, \Delta c_{t+s}) = \sigma_\zeta^2$$

for $s = 0$ and zero otherwise (due to the martingale assumption). Finally, the covariance between income growth and consumption growth at various lags:

$$(10) \text{cov}(\Delta y_{t+s}, \Delta c_t) = \sigma_\zeta^2$$

for $s = 0$ and zero otherwise (due to the fact that consumption does not respond to noise in income).

B. Smoothing income shocks

Consider now the possibility of insurance and suppose there are mechanisms (such as public policy programs) that allow insurance of a fraction $(1-\phi)$ of permanent shocks. In the life-cycle expected utility framework outlined above, we might expect ϕ to be close to unity in the absence of insurance. However, as outlined in the introduction there may be many mechanisms by which households are able to avoid the full impact of permanent income shocks. For low income households, food assistance programs could provide an important source of smoothing for food consumption. In this case $\phi < 1$. As noted above, precautionary saving itself might also allow partial insurance of permanent shocks ($\phi < 1$) if assets were large enough relative to future labor income (that is $\pi < 1$).

In the smoothing case residual income and consumption growth can be written, respectively, as

$$(11) \Delta y_{it} = \zeta_{it} + \Delta v_{it}$$

$$(12) \Delta c_{it} \equiv \phi \zeta_{it}$$

The economic interpretation of the smoothing parameter is such that it nests the two polar cases of full insurance of permanent shocks ($\phi = 0$), as contemplated by the complete markets hypothesis, and no insurance ($\phi = 1$), as predicted by the PIH with just self-insurance through savings. A value $0 < \phi < 1$ is consistent with partial insurance with respect to permanent shocks. The lower the coefficient, the higher the degree of insurance.

As noted above, because we are using food consumption these parameters will be scaled down by the (permanent) income elasticity of demand for food. However, the size of the parameters will still reflect the degree of insurance to income shocks. As we will be comparing

the size of these parameters with and without the food assistance programs, the difference will exactly measure the relative degree of insurance provided by the program.

The theory imposes the following restrictions on the consumption and income moments

$$(13) \begin{aligned} \text{var}(\Delta y_t) &= \sigma_\zeta^2 + 2\sigma_v^2 \\ \text{cov}(\Delta y_t, \Delta y_{t-1}) &= -\sigma_v^2 \\ \text{var}(\Delta c_t) &= \phi^2 \sigma_\zeta^2 \\ \text{cov}(\Delta c_t, \Delta y_t) &= \phi \sigma_\zeta^2 \end{aligned}$$

These generalize the moment conditions derived in Blundell and Preston (1998) to the case of panel data.

Identification is better understood in the exactly identified case. Note that:

$$(14) \phi = \frac{\text{var}(\Delta c_t)}{\text{cov}(\Delta c_t, \Delta y_t)}$$

identifies the extent of insurance against permanent shocks. The availability of panel data on income and consumption results in more efficient estimates because of the availability of overidentifying restrictions. For example,

$$(15) \phi = \frac{\text{cov}(\Delta c_t, \Delta y_t)}{\text{cov}(\Delta y_t, \Delta y_{t+1} + \Delta y_t + \Delta y_{t-1})}$$

Thus ϕ is generally overidentified. Overidentifying restrictions can be tested using standard methods.⁴

As a matter of interpretation, note that the numerator of (14) captures the variance of shifts in consumption. In a model with no transitory shock effects on consumption, consumption growth volatility depends on the arrival of permanent shifts in income and the availability of insurance mechanisms above self-insurance. The denominator of (14) measures the association between consumption growth and income growth. In this case consumption growth tracks income growth only through its long run component. In the absence of partial insurance mechanisms,⁴ the numerator and the denominator will be measuring exactly the same (permanent) variability in income. Recall that in the self-insurance, infinite-horizon case any permanent shift in the variance of the distribution of income is paralleled by an equivalent permanent shift in the variance of the distribution of consumption. With partial insurance, however, the latter is attenuated by the fact that permanent income shocks translate less than one-for-one in consumption; the amount of attenuation (given by the ratio in 14) is exactly measured by the parameter ϕ .

In our application we focus on two contrasts: the first between the estimate of ϕ where we include food assistance in the measure of food consumption and one in which we do not; the second between a medium/high-income group (where food assistance should have little impact) and a low-income group to which the food assistance program is arguably directed. With food assistance included in the consumption measure we might expect to see a lower value for this insurance parameter indicating that consumption is smoother, relative to permanent income shocks, after food assistance. Together these two contrasts therefore identify the insurance value of food assistance for low income households.

The model discussed above is a simplified version of the one we actually estimate. In particular, in estimation we allow for classical multiplicative measurement error in consumption ($c_{it}^* = c_{it} + u_{it}$, where c is true consumption, c^* is measured consumption, and u an i.i.d. measurement error), a random taste shock to consumption growth (ξ_{it}), and MA-type serial correlation in the measurement error of income: $y_{it} = Z_{it}'\phi + P_{it} + v_{it}$, with $v_{it} = \varepsilon_{it} + \theta\varepsilon_{it-1}$. The Euler equation for consumption (7) with smoothing parameters included thus rewrites as

$$(16) \Delta c_{it}^* \cong \Gamma_t + \Delta Z_{it}'\vartheta + \xi_{it} + \phi\zeta_{it} + \Delta u_{it}$$

The variance of the measurement error in consumption (σ_u^2) can be identified using the first order autocovariance of consumption growth; the variance of the taste shock (σ_ξ^2) from the fact that taste shocks enter the expression for consumption growth but not that for income growth.

III. The data

Our empirical analysis is conducted on the 1978-1992 Panel Study of Income Dynamics (PSID). Since the PSID has been widely used for microeconomic research, we shall only sketch the description of its structure in this section.⁵

The PSID started in 1968 collecting information on a sample of roughly 5,000 households. Of these, about 3,000 were representative of the US population as a whole (the core sample), and about 2,000 were low-income families (the Census Bureau's SEO sample). Thereafter, both the original families and their split-offs (children of the original family forming

a family of their own) have been followed. We use data after 1978 because before 1978 food stamps have a purchase requirement. We use data for 1978 and earlier to construct a measure of average (permanent) income, and classify households as poor if their pre-sample permanent income is within 200 percent of the average poverty guideline (adjusted for age and family size) for the pre-sample years where we have observations on the households.⁶ In our final sample 22 percent of the households are classified as poor. The fact that households are allocated to the two groups based on pre-sample income levels removes selection based on current income shocks. An alternative splitting criteria is to use the SEO households (classified as low-income in 1967 when the PSID started), or some demographic indicators of low-income status, such as education.⁷

The PSID includes a variety of socio-economic characteristics of the household, including age, education, labor supply, and income of household members. It also includes some (limited) information about consumption items: food at home and food away from home and, in few years, utilities. Households in the PSID report their taxable family income (which includes transfers and financial income). Our measure of income is the sum of household wages and transfers (excluding the monetary value of food stamps and income from assets); monetary values are deflated using the CPI-U in 1982-84 dollars. Education level is computed using the PSID variable with the same name. Individuals who changed their education level during the sample period are allocated to the highest grade achieved.

The objective of our sample selection is to focus on a sample of continuously married couples headed by a male (with or without children). The step-by-step selection of our PSID sample is illustrated in Table 1. We eliminate households facing some dramatic family composition change over the sample period. In particular, we keep only those with no change,

and those experiencing changes in members other than the head or the wife (children leaving parental home, say). We next eliminate households headed by a female. We also eliminate households with a missing report on education and region,⁸ and those with top-coded income (even though this happens only once in the panel). We keep continuously married couples and drop some income outliers.⁹ Finally, we drop those aged less than 25 or more than 65. This is to avoid problems related to changes in family composition and education, in the first case, and retirement, in the second. The final sample used in the minimum distance exercise below is composed of 26,253 observations and 2,469 households.

We construct two samples: medium/high- and low-income households. Descriptive statistics for the two samples and for selected years are reported in Table 2. As expected, the two samples differ greatly in terms of race (there are more blacks among low-income households), geographic location (there are more low-income households living in the South), and education. Expenditure on food at home and away from home is lower among low-income households; the monetary value of food coupons in the low-income sample in 1992 is about \$170 unconditionally and \$1,500 per household conditioning on receiving coupons. Labor market attachment of both spouses is greater among medium/high-income households.

As stated above the PSID lacks a comprehensive consumption measure. In a companion paper (Blundell, Pistaferri, and Preston, 2002), we construct an imputed measure of non durable consumption matching the PSID and the CEX on the basis of a structural demand for food equation. In the present paper we use expenditure on food at home as our measure of consumption; this has value as the public policy program we study is food stamps, intended to smooth food consumption and having only accidentally a smoothing effect on other goods (absent if food choice is constrained by household resources conditioning on receiving food

stamps). Many researchers have argued that the timing of the survey questions on food expenditure is ambiguous (Hall and Mishkin, 1982; Altonji and Siow, 1987). Typically, the PSID asks how much is spent on food in an average week. Since interviews are usually conducted around March, it is perhaps conceivable that people report their food expenditure for an average week around that period, rather than for the previous calendar year as is the case for family income. Nevertheless, we assume that food reported in the survey year t refers to $t-1$.¹⁰ We will consider two measures of food. The first is out-of-pocket food expenditure; the second is total food use (the sum of out-of-pocket food expenditure and the monetary value of food stamps).

In principle, food stamps have two possible effects on the household's budget constraint. On the one hand, they are simply a form of fungible income and act to smooth the effects of changes in labor or total income. On the other hand, the mechanisms might revolve around the fact that food stamps are earmarked for food. Previous research has shown that food stamp participants are *inframarginal*, implying that food consumption exceeds the value of food stamps.

IV. The results

The PSID data set contains longitudinal records on income and expenditure on food at home (or simply consumption, from now on). We remove the effect of deterministic factors on log consumption and income by separate regressions on a set of observable family characteristics (a quartic in age, education dummies, year dummies, race dummies, family size, number of children, dummies for self-employment and employment status, and region dummies). These

regressions control for household fixed effects. We then work with the residuals of these regressions, Δc_{it} and Δy_{it} .

We estimate the parameters that characterize the income and consumption process by optimal minimum distance. This amounts to minimizing the distance between the empirical and the theoretical consumption and income autocovariances. Theoretical autocovariances impose the restrictions outlined in Section II.B. Blundell, Pistaferri, and Preston (2002) show that the variance of consumption growth increases quite strongly in the early 1980s, peaks in 1984 and then it is essentially flat afterwards (see also Cutler and Katz, 1992). Consistently with this evidence, we report the results of a simple non-stationary model where the parameters vary across time; in particular, we estimate our parameters separately for the 1979-84 and the 1985-92 periods.

There are several parameters to estimate: the variances of the permanent income shock (σ_ζ^2), the variance of measurement error in income (σ_ε^2), the MA coefficient θ of the measurement error in income, the variance of taste shocks (σ_ξ^2) and measurement error in consumption (σ_u^2),¹¹ and the partial insurance coefficient for the permanent shock (ϕ).

Panel A of Table 3 reports the results for the key parameters of the model for the medium/high-income households. In the first two columns we use the out-of-pocket food expenditure definition of consumption; in the last two columns we add the monetary value of food stamps.

Starting with income growth parameters, note that the variance of the permanent shock slightly declines after 1985, while the variance of measurement error increases but the latter becomes slightly less persistent over time. Turning to consumption parameters, note that the measurement error absorbs a large amount of the cross-sectional variability in consumption in

the PSID, around 0.06. The variance of the measurement error σ_u^2 is always precisely measured.

The variance of taste shocks is also sizable and well measured.

In the medium/high-income sample the estimate of ϕ , the partial insurance coefficient for the permanent income shock, rejects the complete markets assumption ($\phi = 0$). As mentioned above, since we are using food expenditure and since the elasticity of food to permanent income is less than 1 (if food is a necessity), we would expect a value for ϕ that is less than unity.¹² We will simply use this insurance parameter estimate as a basis for comparison with the low-income sample. Note that the insurance coefficient ϕ increases between the early 1980s and the late 1980s-early 1990s, suggesting that the degree of insurance has declined over this period. This may also reflect the nature of the permanent shocks that occurred over this period rather than a change in the insurance mechanisms themselves. The χ^2 goodness of fit statistics reveal some support for our model specification despite its simplicity.

For the medium/high-income households the food assistance program is irrelevant. As Table 2 showed, food stamps contribute very little to the income of the medium/high-income group of households (couples). This is confirmed in the last two columns of Panel A of Table 3, where we use a measure of total food use (which includes the monetary value of food stamps). The results are essentially the same as in the first two columns. As we would expect, the food assistance does not appear to provide any additional insurance over and above personal savings for this sample. This places us in a good position to turn investigating the impact on this conclusion of analyzing the low-income sample. If food assistance provides insurance against permanent income shocks for low income households the ϕ estimate should fall once the monetary value of food stamps enters the definition of consumption.

Panel B reports the results for the low-income sample. As before, in the first two columns we report the results of using the out-of-pocket food expenditure definition of consumption. Several facts are worth noting. First, the variance of permanent income shocks falls in the second period although by not very much. The degree of persistence and the variance of measurement error also go down in the second period. Perhaps more importantly though, the sensitivity of food to permanent shocks is higher in this low income sample. This suggests that in general poor households have less ability to insure against permanent income shocks than medium or high-income households. This may be reflecting worse access to informal sources of insurance such as credit markets or family networks. It may also reflect lower accumulated wealth to be used as a buffer against shocks, or even the disincentive effect of means-tested programs. Note finally that there is some evidence of a change in insurance opportunities over the two sub-periods (generally insurance falls in the second half of the sample). Kniesner and Ziliak (2002) point to federal income tax reform of the mid-1980s as one possible source of reduced insurance, though other channels may also have declined.

What is the effect of considering a more comprehensive measure of consumption (total food use)? From the last two columns we see that, unlike the medium/high-income sample, food stamps have now a large and significant effect on the reaction of consumption to income shocks. The sensitivity of consumption to permanent income shocks declines, on average, by about one-third. This is consistent with the notion that food stamp use (and the ensuing insurance effect) is triggered by long-run income innovations.¹³

The higher sensitivity of food to permanent income shocks in the low-income sample partly reflects the fact that low-income households are in a more income-sensitive portion of the Engel curve for food. Using our measure of average (permanent) income (see note 6), we

estimate an Engel curve for food separately for the two groups and find an income elasticity of 0.22 for medium/high-income households and of 0.61 for low-income households. For 1979-84, this translates into a partial insurance coefficient ϕ of about 0.7 for the rich and of about 1 for the poor. However, group differences in income elasticities are not responsible for the change in the estimate of ϕ that we find –just for the low-income group– when a measure of total food use is used. This difference reflects the insurance effect of food stamps.

We have made the assumption that temporary fluctuations of income are entirely due to noise. Since we cannot separately identify measurement error and transitory shocks, the alternative assumption (and one that still allows us to identify the parameters of interest) is that all temporary fluctuations are genuine economic transitory shocks. In the life-cycle framework of Section II, this adds additional theoretical restrictions on the joint distribution of income and consumption growth. In particular, if households have access to credit markets for saving and borrowing, the effect of transitory shocks on consumption should be close to zero. A large effect of transitory shocks is sometimes associated to the presence of binding liquidity constraints. Blundell, Pistaferri, and Preston (2002) consider this more general model and allow for partial insurance of transitory shock, but find that they have little impact on consumption growth. This is consistent with the theory of self-insurance. Their sample does not separate households on the basis of permanent income. In our sample of poor households, we find that the effect of transitory shocks on food consumption is near zero, statistically insignificant, and it changes very little or not at all if we allow for the insurance effect of food stamps.¹⁴ We should also note that our estimates of the insurance parameter ϕ are robust to more general stochastic specifications for the process for v_{it} .¹⁵

Altonji and Segal (1996) warn against the use of optimal minimum distance when estimating the parameters of covariance structures in small samples. They suggest several alternatives, including equally weighted minimum distance (EWMD, corresponding to an OLS weighting scheme in the linear case) and diagonal weighted minimum distance (DWMD, corresponding to a WLS weighting scheme in the linear case). The results using the latter, however, are qualitatively similar to the ones reported above.¹⁶

Finally, we have experimented selecting only the households with at least five years of pre-sample data, as to make our stratification rule less dependent on pre-sample temporarily low incomes. The results are again similar.¹⁷

V. Conclusions

In this paper we have analyzed the impact of food assistance programs (food stamps) on food expenditure in a period of rising income inequality using 1978-1992 PSID data. Our framework allowed for self-insurance, in which consumers smooth idiosyncratic shocks through saving. It also considered the complete markets assumption in which all idiosyncratic shocks are insured. These two models sit amidst a wide range of missing insurance opportunities. We were able to assess the degree of insurance over and above self-insurance through savings. We did this by contrasting shifts in the cross-sectional distribution of income growth with shifts in the cross-sectional distribution of food consumption growth, and analyzing the way these two measures of household welfare correlate over time.

To summarize, we find that as expected the program has no effect on food smoothing with respect to income shocks in a sample of medium to high-income households. We find a

stronger sensitivity of food consumption to permanent income shocks in the low-income sample. When we include the monetary value of food stamps in the definition of food consumption, there is no effect in the high income sample, while in the low income sample the response of food to a permanent income shock is on average a third lower. Even though poor households are less able to smooth permanent shocks to their income, both conditionally and unconditionally, it is encouraging to find that food assistance programs such as food stamps reduce, though they do not completely eliminate, the effect of permanent income shocks upon low-income families.

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Table 1

Sample selection

Case	Number of observations dropped	Number of observations remaining	Number of families
Initial sample (1967-1992)	145,940	145,940	12,218
Enter the sample after 1978	117,071	28,969	7,679
Pre-1978 observations	52,408	64,663	5,695
Change in family composition	13,047	51,616	4,708
Female head	15,061	36,555	3,263
Missing values and topcoding	28	36,527	3,256
Change in marital status	3,373	33,120	2,883
Income outliers	2,087	31,033	2,732
Aged less than 25 or more than 65	4,780	26,253	2,469

Table 2

Sample means

	Medium/High-income					Low income				
	1980	1983	1986	1989	1992	1980	1983	1986	1989	1992
Age	40.85	42.37	44.42	46.46	48.46	41.75	42.78	44.45	46.36	48.07
Family size	3.51	3.55	3.57	3.49	3.38	4.91	4.68	4.39	4.14	3.96
Number of children	1.25	1.28	1.28	1.18	1.01	2.25	1.92	1.68	1.48	1.25
White	0.79	0.8	0.81	0.81	0.81	0.41	0.45	0.48	0.51	0.53
HS dropout	0.19	0.17	0.16	0.14	0.12	0.58	0.56	0.54	0.51	0.49
HS graduate	0.34	0.34	0.34	0.34	0.33	0.29	0.28	0.3	0.31	0.31
College dropout	0.47	0.49	0.5	0.52	0.55	0.14	0.15	0.16	0.17	0.2
Northeast	0.19	0.2	0.2	0.2	0.2	0.1	0.09	0.08	0.09	0.09
Midwest	0.28	0.27	0.27	0.27	0.28	0.16	0.17	0.18	0.18	0.19
South	0.36	0.36	0.36	0.36	0.35	0.66	0.67	0.66	0.64	0.62
West	0.17	0.17	0.17	0.16	0.17	0.08	0.08	0.08	0.09	0.09
Family income	37,678	37,673	41,890	44,390	45,505	20,211	19,857	23,265	25,124	25,960
Food at home	4,225	3,868	3,849	3,786	3,707	3,896	3,367	3,234	3,073	3,095
Food away	899	931	1,043	1,083	1,149	386	389	448	585	636
Food stamps	11	18	13	11	15	329	301	192	166	166
Food stamp (participant)	581	708	881	710	1,012	1,223	1,344	1,291	1,278	1,432
Husband's participation	0.95	0.93	0.93	0.92	0.91	0.88	0.86	0.85	0.84	0.8
Wife's participation	0.68	0.71	0.73	0.75	0.75	0.62	0.6	0.64	0.66	0.69

Notes: Family income, Food at home, Food away from home, and Food stamps are deflated by the Consumer Price Index for Urban Consumers (CPI-U), equal to 100 in 1982-84. Low-income households have “permanent income” within 200% of the “permanent poverty line” (see the text).

Table 3

Minimum distance results

<i>Panel A: Medium/high-income households</i>				
	Out-of-pocket food expenditure		Total food use	
	1979-84	1985-92	1979-84	1985-92
σ_u^2	0.0565 (0.0025)	0.0554 (0.0037)	0.0563 (0.0025)	0.0553 (0.0036)
σ_ξ^2	0.0128 (0.0017)	0.0139 (0.0038)	0.0124 (0.0016)	0.0126 (0.0035)
σ_ε^2	0.0290 (0.0020)	0.0337 (0.0020)	0.0290 (0.0021)	0.0338 (0.0020)
θ	0.1622 (0.0362)	0.1351 (0.0253)	0.1627 (0.0366)	0.1387 (0.0256)
σ_ζ^2	0.0196 (0.0019)	0.0177 (0.0015)	0.0195 (0.0019)	0.0176 (0.0015)
ϕ	0.1685 (0.0383)	0.3092 (0.0603)	0.1591 (0.0369)	0.3203 (0.0593)
χ^2	97.22 [0.0255]	137.47 [0.0003]	100.17 [0.0158]	136.97 [0.0003]
<i>Panel B: Low-income households</i>				
	Out-of-pocket food expenditure		Total food use	
	1979-84	1985-92	1979-84	1985-92
σ_u^2	0.0923 (0.0071)	0.0785 (0.0089)	0.0812 (0.0058)	0.0524 (0.0066)
σ_ξ^2	0.0376 (0.0074)	-0.0094 (0.0092)	0.0157 (0.0046)	0.0141 (0.0062)
σ_ε^2	0.0528 (0.0040)	0.0414 (0.0032)	0.0514 (0.0041)	0.0406 (0.0033)
θ	0.1668 (0.0415)	0.1216 (0.0472)	0.1187 (0.0461)	0.1165 (0.0460)
σ_ζ^2	0.0203 (0.0033)	0.0169 (0.0025)	0.0227 (0.0036)	0.0180 (0.0026)
ϕ	0.7944 (0.1481)	0.9125 (0.1634)	0.5689 (0.1055)	0.4767 (0.1181)
χ^2	99.30 [0.0182]	130.79 [0.0010]	90.84 [0.0662]	122.06 [0.0052]

Notes: this table reports optimal minimum distance estimates of the parameters of interest: σ_u^2 is

the variance of the measurement error in consumption, σ_ξ^2 the variance of idiosyncratic taste

shocks/innovation to the conditional variance of consumption growth, σ_{ζ}^2 the variance of permanent shocks to income, σ_{ε}^2 the variance of measurement error in income, θ the MA(1) coefficient of the measurement error component of income, and ϕ the partial insurance coefficient with respect to permanent income shocks. Asymptotic standard errors in parenthesis. χ^2 is the goodness of fit statistics of the model (p-value in square bracket). Low-income households have “permanent income” within 200% of the “permanent poverty line” (see the text).

Endnotes

¹ There are two other food assistance programs of some relevance: the WIC (Special Supplemental Nutrition Program for Women, Infants and Children), and the NSL (National School Lunch Program). See Currie (2000) for an overview.

² Until 1996 benefits were in the form of coupons; after the 1996 welfare reforms recipients are issued with Electronic Transfer Benefits cards.

³ For more details on the Food Stamp Program, see the USDA website at <http://www.fns.usda.gov>.

⁴ Blundell, Pistaferri and Preston (2002) show that this measure of the insurance parameter is robust to independent measurement error in consumption and income.

⁵ See Hill (1992), for example, for more details about the PSID.

⁶ Thus a family is classified as low-income if $t_i^{-1} \sum_{s=1}^{t_i} Y_{is} \leq 2 \times t_i^{-1} \sum_{s=1}^{t_i} P_s$, where Y is gross income, P the poverty line (adjusted for age and family size), and t_i the number of observations before 1979 ($1 \leq t_i \leq 12$). Y and P are deflated using the CPI-U (U.S. city average, all items) in 1982-84 dollars. Data on P are drawn from the U.S. Census Bureau at <http://www.census.gov/hhes/poverty/histpov/hstpov1.html>. We also experiment using only those with $t_i \geq 5$. The results of this experiment are reported below.

⁷ The conclusions presented below are robust to using the SEO split. These results are available from the authors on request.

⁸ When possible, we impute values for education and region of residence using adjacent records on these variables.

⁹ An income outlier is defined as a household with an income growth above 500 percent, below –80 percent, or with a level of income below \$100 a year or below the amount spent on food.

¹⁰ Blundell, Pistaferri and Preston (2002) perform a number of robustness checks including assuming a different timing. The results remain qualitatively similar.

¹¹ The variance of measurement error in consumption is estimated assuming consumption is a martingale with drift as in the PIH case. See Runkle (1991) for an analysis of measurement error in food expenditure in the PSID.

¹² In other words, what we are estimating is $\tilde{\phi} = \phi\eta$, where ϕ is the insurance parameter and η the income elasticity of food.

¹³ Our counterfactual may overstate the degree of insurance. Gundersen and Ziliak (2003) construct a different counterfactual, based on the notion that the decline in food consumption is less than the amount of food stamps removed. They find less insurance, as expected. However, they do not focus on the distinction between transitory and permanent shocks, which will tend to attenuate their estimates.

¹⁴ Ziliak (1998) argues that failure to find evidence for liquidity constraints is due to the use of food data instead of a more comprehensive measure of consumption. Moreover, if there is measurement error in income over and above transitory shocks, our estimate of the insurance coefficient with respect to transitory shocks is downward biased. Bound, Brown, Duncan and Rogers (1994) use the PSID-Validation Study and find that measurement error explains about 22 percent of the overall variability of earnings growth. Using this number, a simple back-of-the-envelope calculation shows that the probability limit of our estimator is roughly 70 percent of the true coefficient. This is still too small to generate any appreciable difference in interpretation.

¹⁵ Results that assume a transitory error with MA(0), MA(1) or MA(2), all give very similar results for the ϕ estimate. These results are available from the authors on request.

¹⁶ For instance, for 1979-84 the estimate of ϕ for the medium/high-income group is 0.17 (standard error 0.06) using out-of-pocket food expenditure and 0.12 (0.05) with total food use. The estimates for the low-income group are 0.99 (0.27) and 0.41 (0.16).

¹⁷ For instance, for 1985-92 the estimate of ϕ for the medium/high-income group is 0.27 (standard error 0.09) using out-of-pocket food expenditure and 0.28 (0.09) with total food use. The estimates for the low-income group are 1.10 (0.27) and 0.49 (0.17).