Effective Tax Rates and Guarantees in the Food Stamp Program

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Abstract

Identifying the roles of economic incentives and policy parameters in the decision to participate in the Food Stamp Program is critical to our understanding of program need, design, and effectiveness. In order to enhance our understanding of the determinants of Food Stamp Program participation this project addresses the following question: Are there state-specific differences in effective FSP benefit guarantees and effective tax rates on earned and unearned income, and if so, have these effective tax rates and guarantees changed over time? To answer this question I use administrative data from the Food Stamp Program Quality Control System from fiscal years 1983-2003. The quality control data are used to estimate family-size and state-specific effective benefit levels and effective tax rates for the Food Stamp Program. I find that once nonlinearities in the effective tax rate function are admitted there are few differences between statutory and effective benefit guarantees. However, there are substantial cross-state and over time differences in effective tax rates on earned and unearned income. I find that effective tax rates on earned and unearned income in the Food Stamp Program fell about 25 percent over the past decade. Given estimates in Ziliak (2007) of a large decline in effective tax rates in the TANF program, the results imply that cumulative effective tax rates fell as well for families combining food stamps with TANF. Future research examining the underlying causes of changes in effective tax rates should be a research priority.

I. Introduction

With passage of the Personal Responsibility and Work Opportunity Reconciliation Act in 1996 (PRWORA), the Food Stamp Program (FSP) is now at the fore of the social safety net in terms of potential macroeconomic stabilizers for low-income households. The FSP works under the principle that everyone has a right to food for themselves and their families and, hence, with few exceptions, the program is available to all citizens who meet income and asset tests. At its previous peak in fiscal year 1994, over 27 million individuals received food stamps at a cost of $24 billion. However, in the wake of the longest economic expansion on record and passage of PRWORA, the food stamp caseload plummeted nearly 40 percent by 2000. Nearly equally dramatic, subsequent to the onset of the recent economic downturn the aggregate food stamp caseload has again risen 50 percent between fiscal years 2000 and 2005. Indeed, participation reached an all-time high of nearly 30 million individuals in November 2005, the month after Hurricanes Katrina and Rita. These large swings in caseloads have renewed interest in identifying the fundamental factors determining participation in the FSP. In this project I focus on an understudied aspect of the FSP that may be an important determinant of participation, namely effective benefit guarantees and tax rates.

Much of the policy control over participation and work incentives in transfer programs stems from the generosity of the maximum benefit guarantee, the rate at which the benefit is reduced as earned and other unearned income increases, and the level and sources of income that can be excluded from benefit determination. The FSP exemplifies this basic programmatic design with its statutory parameters set at the Federal level. The benefit is tied to the Thrifty Food Plan, varies by family size, is fixed across the 48 contiguous states and the District of

Columbia (with upward adjustments for Alaska, Hawaii, Guam and the Virgin Islands), and is adjusted annually for changes in food prices. In fiscal year 2008 the maximum monthly benefit in the continental U.S. varied from $162 for a single person to $975 for a household of eight (and $122 for each additional person in the food stamp unit). In order to qualify for food stamps, households must pass three financial criteria known as the gross income test, the net income test, and the asset test.[1] Except for households with a disabled person or with someone over the age of 60, gross income before taxes in the previous month must be at or below 130 percent of the poverty line. After passing the gross income test, a household must have net monthly income at or below the poverty line. Net income is obtained by subtracting from gross income a standard deduction, 20 percent of earnings, and deductions for child care and/or care for disabled dependents, medical expenses, and excessive shelter expenses. Finally, net-income-eligible households must meet an asset test that includes liquid assets and vehicle value but excludes business and housing assets. The amount of food stamps a family receives is equal to the maximum food stamp benefit level minus 0.3 times its net income. The food stamp benefit formula implies that the statutory tax rate on unearned income is 30 percent, but the corresponding rate on earned income is 24 percent (0.3*(1-0.2)*earnings).[2]

Although the statutory tax rates and the family-size specific maximum food stamp benefit are federally set, there is reason to believe that there is cross-state and time series variation in *effective* tax rates and benefit guarantees, where effective is meant to reflect actual, average marginal tax rates and average benefits. Given that the Federal government establishes most rules governing the FSP how could actual tax rates and benefits differ from the official rates?

[1] Some individuals and families are categorically eligible for food stamps by virtue of their participation in other means tested programs and thus are not subject to the food stamp income and asset tests.
[2] These statutory rates are applicable for the case of no shelter deduction or at the maximum shelter deduction. At intermediate values of the shelter deduction the statutory tax rates jump to 36 and 45 percent for earned and unearned income, respectively (Hanson and Andrews 2005).

Statutory and effective rates and guarantees in the FSP could differ because of considerable State and local control of administration of the FSP, which increased markedly after the 1996 Welfare Reform Act. As noted in the 2004 *Green Book*:

> "The Federal Government is responsible for most of the rules that govern the program, and, with limited variations for Alaska, Hawaii, and the territories, these rules are nationally uniform. However, by law and regulation, States have a number of significant options to vary from Federal administrative, benefit calculation, and eligibility rules, especially for those who also are recipients of their State's cash welfare programs, and a number of waivers from regular rules and procedures have been (and continue to be) granted" (Chapter 15, p. 1)…… "States, the District of Columbia, Guam, and the Virgin Islands, through their local welfare offices, have primary responsibility for the day-to-day administration of the Food Stamp Program. They determine eligibility, calculate benefits, and issue food stamp allotments (using coupons or, in most cases, electronic benefit transfer cards) following Federal rules. They also have a significant voice in carrying out employment and training programs and in determining some administrative features of the program (e.g., the extent to which verification of household circumstances is pursued, the length of eligibility certification periods, the structure of EBT systems). Most often, the Food Stamp Program is operated through the same welfare agency and staff that runs the State's TANF Program." (Chapter 15, p. 2)

For example, if a state allows more disregards or interprets rules more liberally through mechanisms such as simplified reporting or categorical eligibility they will have, all else equal, lower effective tax rates than another state that follows statutory schedules more rigidly. Perhaps more important, as emphasized in McKinnish, et al. (1999), changes in the composition of the caseload—and the attendant sources of income received by remaining recipients—could cause deviations from official rates if income sources are shifted from taxable to deductible income. In addition, as noted by Moffitt (1979) many years ago, front-line caseworkers and applicants could make errors—either by choice or by chance—when confronted with complex rules for program eligibility and benefit levels. Such deviations between official tax rates and benefits and their effective counterparts have long been established in the AFDC program (Lurie 1974; Hutchens 1978; Moffitt 1979; Fraker, Moffitt, and Wolf 1985; McKinnish, Sanders, and Smith 1999;

Ziliak 2007). However, to my knowledge, no such relationship has been documented in the FSP, either in the cross section or longitudinally.[3]

Estimating effective tax rates and guarantees in the FSP is important for several reasons. First, policymakers need to know the levels and trends of effective program benefits, and the corresponding tax rates on earned and unearned income, in order to improve program design and target efficiency. A longstanding concern has been the possible work disincentive effects of high tax rates for families coupling work with transfer program benefits such as AFDC/TANF and the FSP. In the current "work first" policy environment where former AFDC/TANF recipients are encouraged to quickly find work, even if it is only temporary employment, reduced tax rates on recipients can stimulate work while simultaneously retaining a larger food stamp benefit for eligible households. To the extent that nonparticipation among eligible households is of policy concern, lower effective tax rates and higher effective benefits can possibly improve program outreach.

Second, a complete set of state-specific and time-varying effective tax rates and guarantees will be highly valued by the research community. The estimates for the AFDC program by Fraker, Moffitt, and Wolf (1985) have been used in numerous studies, including Fraker and Moffitt (1988); Graham and Beller (1989); Rosenzweig and Wolpin (1994), among others. In their paper on the effect of AFDC and food stamps on labor supply, Fraker and Moffitt (1988) model the complex, statutory budget set facing households in the FSP under the assumption that statutory benefits and tax rates are the actual ones faced, while they use effective tax rates and guarantees for the AFDC budget. Identification of the effects of FSP benefit and tax rate policies on food stamp participation and labor supply is difficult given the lack of spatial

[3] Moffitt (1979) is an exception in that he estimated effective tax rates for the Indiana food stamp caseload using data from the Gary Income Maintenance Experiment. No estimates exist for all states, or over time. See Wilde (2001) for an alternative decomposition of the average FSP benefit.

variation in statutory rules (aside from benefit differences across family size, adjustments for those living in Alaska or Hawaii, and possible area variation due to the excess shelter deduction). Indeed, a key reason that the recent state-level FSP caseload studies have not included controls for the FSP benefit (unless combined with the AFDC/TANF benefit) or tax rates is due to the lack of cross-state over time variation in federal policy. However, with estimates of family-size adjusted benefits across states and over time, along with effective tax rates on earned and unearned income, a whole new identification scheme becomes available for FSP researchers, which should stimulate further research on the economic incentives of FSP participation.

Using administrative data for Federal fiscal years 1983–2003 from the Food Stamp Quality Control System, in this paper I document trends in the effective tax rates and benefit guarantees in the Food Stamp Program through the first five years of welfare reform. It is largely a descriptive analysis and does not seek to isolate causal determinants of effective tax rates and guarantees. This analysis is distinct from the recent work of Hanson and Andrews (2005) and Wilde (2001), who also examine tax rates in the FSP. They model how the benefit reduction rate changes as earned and unearned income changes, and the notion of "effective" in their paper refers to statutory marginal tax rates net of statutory deductions. That is, they trace out the official budget constraint for a FSP participant, and thus construct what might be called a statutory effective tax rate. The tax rates constructed here are more akin to those from the AFDC effective tax rate literature in that they capture not only changes in official rules but also caseload composition, income composition, and possible errors in benefit determination, and thus I construct what might be construed as an actual effective tax rate.[4]

[4] As explained below, errors are possible contributors to the effective rates and guarantees because I use the respondent reports of food stamp benefit amounts on the FSP-QC data file and not the post-audit, corrected benefit.

Given data limitations in most social science surveys such as the Current Population Survey, the Panel Study of Income Dynamics, and the Survey of Income Program Participation, the effective tax rates and guarantees estimated in this paper likely provide more accurate estimates of benefits received by recipients than an approach of applying statutory rules to total income. Benefit levels in the FSP for a given family size are based on net income, that is, gross income less deductions. However, because most surveys do not contain enough information on deductions (e.g. medical deductions and child care expenses) to accurately construct statutory tax rates, the effective rates likely better reflect actual tax rates paid. In addition to lacking detailed data necessary to calculate statutory deductions, errors are made in benefit determination—either in the form of over-issuance or under-issuance of benefits. Indeed, the combined over- and under-issuance error rate averaged 9.77 percent of cases between 1983 and 2003.[5] The effective rates will net out these influences that cannot be easily measured with statutory rules.

A limitation of the estimated tax rates and guarantees is that since they are averages reflecting state rules and practice, as well as the demographic composition of the caseload, the estimates do not necessarily reflect marginal decision-making and thus do not possess any particular structural interpretation (McKinnish, et al. 1999). Specifically, the effective tax rates and guarantees may change in response to a change in income levels and income sources among recipients, but with no concurrent change in official policy or caseworker error. For example, if recipients switch to unearned income sources that do not reduce the size of the benefit then this would lead to a decline in effective tax rates on unearned income even though official rates were unchanged. As a consequence the estimates provided here are most useful for out-of-sample predictions if nonparticipants face the same budget constraint as participants. If they do not, the

[5] Author's calculation based on historical food stamp error rate data.

coefficients are still an improvement over the approach of total income with statutory rules, but caution on any structural interpretation is imperative. Of course, even in situations where a structural interpretation is not possible, the coefficients remain quite useful. For example, with individual-level data on earned and unearned income it is possible to predict FSP benefits out-of-sample or to construct net of transfer wage rates, each of which in turn can be used in a variety of research applications on FSP participation, labor supply, or family structure along the lines found in the AFDC literature (Fraker and Moffitt 1988; Gottschalk 1988; Hoynes 1996; Moffitt 1983; Rosenzweig and Wolpin 1994).

II. Background on Effective Tax Rates and Guarantees from AFDC/TANF

The research to date on effective tax rates and guarantees has focused on the AFDC, and more recently, TANF programs (Lurie 1974; Hutchens 1978; Fraker, Moffitt, and Wolf 1985; McKinnish, Sanders, and Smith 1999; Ziliak 2007). Because of this program-specific focus it is instructive to motivate the ensuing analysis on the FSP with the research results from AFDC/TANF.

In the AFDC program the maximum benefit guarantee was set at the state level, and there was considerable state variation in the generosity reflecting both income and cost-of-living differences and also voter preferences for redistribution (Ribar and Wilhelm 1999). The official tax rate on earned income after deductions was cut from 100 percent to 67 percent in the late 1960s, only to be raised back to 100 percent as part of OBRA 1981. The official tax rate on unearned income was also 100 percent. To determine benefits, it is illustrative to consider the statutory earnings test. Benefits for recipients were calculated using earnings minus a $90 work

expense disregard, followed by a disregard of $30 and 1/3 of remaining earnings. After four months of consecutive earnings, recipients were no longer eligible for the 1/3 disregard, so the disregard was simply $120. After eight additional months of consecutive earnings, recipients were no longer eligible for the $30 disregard, so the disregard was $90, after which earnings were taxed at 100 percent.

The compelling evidence found in Lurie (1974), Hutchens (1978), Fraker, et al. (1985), and McKinnish, et al. (1999) showed that whether by design, by changes in caseload composition, or by error the effective tax rate on earned and unearned income in AFDC was well below the statutory level and there was considerable cross-state heterogeneity. The key mechanism driving the wedge in the effective and official rates was the sources and levels of income disregarded from benefit determination. The more income disregarded, the lower the effective tax on that income. This variation in income disregards could be the result of official state policy, by reporting error by caseworkers or clients, or by shifting composition of income among recipients (Moffitt 1979; McKinnish, et al. 1999). Caseworkers and clients may make errors in reporting income and calculating deductions, possibly because of difficulties in implementing complex programmatic rules or in the case of clients by sheltering income (Edin and Lein 1997), but the effective rates will net out these influences that cannot be measured with statutory rules or microsimulation methods. Recent research by Leibman and Zeckhauser (2004) and Romich (2006) suggests that because of the complexity of statutory program rules many consumers only perceive effective rates. There are also large computational advantages with the effective tax rates and guarantees compared to microsimulation methods, especially if one is interested in analyses across states and over time. With the plethora of state-specific rules that vary over time under TANF, modeling the complete budget constraint facing a recipient is

prohibitive, and thus the effective tax rates and guarantees provide a succinct summary of constraints facing the average recipient.

To estimate the effective tax rates and guarantees in AFDC on single-mother recipient units the standard methodology established by Hutchens (1978), and subsequently adopted by Fraker, et al. (1985), McKinnish, et al. (1999), and Ziliak (2007), is to regress the AFDC benefit for recipient $i = 1,\ldots N$, in state $j = 1,\ldots J$, in time period $t = 1,\ldots T$ on the recipient's earned income, unearned income, and variables indicating family size. Specifically,

$$(1) \qquad B_{ijt} = \alpha^0_{jt} + \alpha^1_{jt} K2_{ijt} + \alpha^2_{jt} K3_{ijt} - t^e_{jt} E_{ijt} - t^n_{jt} N_{ijt} + \varepsilon_{ijt},$$

where *B* is the monthly benefit amount, *K2* is an indicator variable equaling one if there are two or more children in the recipient unit, *K3* is a variable equaling the number of children greater than two and equaling zero if there are two or fewer children in the assistance unit, *E* is earned income, *N* is unearned income, and ε is a random error term. The state-specific and time-varying intercepts (α^0_{jt}) reflect the effective benefit guarantee for a two person AFDC unit (e.g. a single mother with one assistance child), the sum $\alpha^0_{jt} + \alpha^1_{jt}$ reflects the effective guarantee for a three-person family, the sum $\alpha^0_{jt} + \alpha^1_{jt} + \alpha^2_{jt}$ is the effective guarantee for a unit with one adult and three children, and the sum $\alpha^0_{jt} + \alpha^1_{jt} + \alpha^2_{jt} * 2$ is the effective guarantee for a unit with one adult and four children, and so on. The coefficients t^e_{jt}, t^n_{jt} reflect effective tax rates on earned and unearned income. A truncated maximum likelihood estimator along the lines proposed by Hausman and Wise (1977) was adopted to estimate equation (1) because it accounts for the fact that the AFDC/TANF benefit has a statutory minimum of $10 and thus the data are truncated at $10. However, the OLS and truncated MLE estimates are quite similar in practice because of the high explanatory power in OLS models (e.g. in Ziliak (2007) the adjusted R^2s are at least 0.95).

In a companion paper I provided the most complete set of estimates on effective tax rates and guarantees in the AFDC program to date and also presented the first set of estimates for the TANF program (Ziliak 2007). I used administrative data for the twenty-year period spanning 1983–2002 from the AFDC Quality Control System from 1983–1997 (AFDC-QC) and the National TANF Data System (NTDS) from 1998–2002 (in 1998–1999 the transitional NTDS was called the Emergency TANF Data System). I found that effective tax rates on earnings in AFDC/TANF fell 50 percent after welfare reform, and that the tax on unearned income fell at least 70 percent. Moreover, while the decade-long slide in inflation-adjusted statutory benefit guarantees in AFDC/TANF abated after welfare reform, effective guarantees continued to decline. The implication is that the effective value of welfare declined and the attractiveness of work was reinforced. States that aggressively reformed their welfare programs, especially those states that implemented a stringent sanctions policy on benefits, experienced a more rapid reduction in effective tax rates and guarantees. In light of the substantial changes in effective tax rates and guarantees in AFDC/TANF in the 1990s it is quite possible these underlying policy parameters in the FSP changed as well.

III. Estimating Effective Tax Rates and Guarantees in the FSP

The specification for the FSP is similar to that in equation (1) with a few modifications. Unlike AFDC/TANF, it is not necessary to have dependent children in the household in order to qualify for food stamps. Thus, the appropriate metric is the size of the food stamp assistance unit and not the number of dependent children under the age of 18. As a consequence the modified model for food stamps is

$$(2) \qquad B_{ijt} = \alpha_{jt}^{0} + \alpha_{jt}^{1} F2_{ijt} + \alpha_{jt}^{2} F3_{ijt} + \alpha_{jt}^{3} F4_{ijt} + \alpha_{jt}^{4} F5_{ijt} - t_{jt}^{e} E_{ijt} - t_{jt}^{n} N_{ijt} + \varepsilon_{ijt},$$

where *F*2 is an indicator variable equaling one if there are at least two persons in the food stamp unit, *F*3 is an indicator variable equaling one if there are at least three persons in the food stamp unit, *F*4 is an indicator variable equaling one if there are at least four persons in the food stamp unit, *F*5 is a variable equaling the number of family members for those units with five or more members, and *E* and *N* refer to earned and unearned income.

The intercept, α_{jt}^{0}, reflects the effective guarantee for a one-person household, $\alpha_{jt}^{0} + \alpha_{jt}^{1}$ is the effective guarantee for a two-person household, $\alpha_{jt}^{0} + \alpha_{jt}^{1} + \alpha_{jt}^{2}$ is the effective guarantee for a three-person household, $\alpha_{jt}^{0} + \alpha_{jt}^{1} + \alpha_{jt}^{2} + \alpha_{jt}^{3}$ is the effective guarantee for a four-person household, $\alpha_{jt}^{0} + \alpha_{jt}^{1} + \alpha_{jt}^{2} + \alpha_{jt}^{3} + \alpha_{jt}^{4}$ for a five-person household, and so on. The statutory minimum food stamp benefit is $10 for units with one or two persons, but can drop to $0 for units with three or more persons. This implies that for part of the sample a truncated maximum likelihood estimator is consistent, while for the other part (households of 3 and more) OLS is unbiased and consistent. In practice little difference exists between the truncated MLE and OLS estimates. Consequently, I rely on OLS because of large costs savings in terms of computation time, especially in some of the sensitivity analyses described below where the number of parameters to estimate increases by over 200 from the base specification in equation (2).

IV. Data

In this project I use administrative data from the Food Stamp Program Quality Control System from fiscal years 1983-2003 (FSP-QC). The FSP-QC data are a stratified random sample

of all monthly food stamp households, where the strata are states or substate regions. The samples, weighted by the appropriate probability of inclusion, are designed to align with state-level administrative totals of food stamp households. The typical wave in the 1990s had about 50,000 food stamp households, though the public-use samples are considerably smaller in the 1980s. Beginning in 1996 the Mathematica Policy Research Corporation, under contract with the Food and Nutrition Service of the USDA, has made a cleaned-up version of the FSP-QC data along with codebooks available electronically at the URL: http://host4.mathematica-mpr.com/fns/fnsqcdata/index.htm . For years prior to 1996 Mathematica makes the FSP-QC data available via compact disc.

The FSP-QC data contains information for the survey month on the reported FSP benefit, earnings, unearned income from sources such as AFDC/TANF, SSI, Unemployment Insurance, Workers Compensation, and Social Security, the food stamp household size, age, gender, and other demographics. The FSP-QC data are used primarily as a tool to estimate error rates in state-level program administration. Errors generally arise from the granting of benefits to ineligible households, or the issuance of benefit amounts that are too high or too low given the household's resources and circumstances. States can then face federal penalties if their error rate exceeds the national average, or can receive financial rewards if their error rate is especially low. With this in mind, in estimating equation (2) I use the *reported* benefit provided by the food stamp unit denoted as "coupalot" from the 1983-1993 QC data and "rawben" from the 1994-2003 QC data, and not the corrected benefit "fsben" that the QC system provides after the benefit has been adjusted for errors. This means that the estimated effective tax rates likely capture some errors in determination.

Although the QC data span the population of food stamp recipients, I restrict the sample used in estimation of equation (2) to household heads that are at least 15 years old but less than 60 years old, and there must be no elderly members in the assistance unit (defined as 60 years and older for purposes of the FSP). The age-60 cap is used because benefit levels and eligibility rules differ for assistance units with members 60 and older and they are less likely to have earnings (but households with disabled members under age 60 are included). In addition there must be at least one member in the assistance unit and no missing values for variables used in estimation. For the first 5 years there are between 2,500 and 5,000 households used in estimation, and between 30,000 and 40,000 for the last 15 years. The relatively small sample sizes in the 1980s imply that estimates from the early years must be interpreted with caution.

Because the FSP-QC ceased collecting data on the Earned Income Tax Credit after 1996 I define earned income for all years consistently as the sum of wages and salaries, self-employment income, and other earned income for all members of the assistance unit. Until 1990 the EITC was taxable for food stamp purposes, but is exempt after 1990. This implies that omitting this income source will impart a slight upward bias in the estimated effective earned income tax rate, though because only about 1 percent of EITC recipients receive the advanced EITC monthly credit most will report no EITC income for the QC survey month and thus the bias will be minimal. For unearned income I sum up data from all available sources in the dataset including Social Security, railroad retirement, Supplemental Security Income, AFDC/TANF, unemployment insurance, workers compensation, veterans benefits, child support, general assistance, housing subsidies, education grants, other unearned income, other government assistance, and other deemed income. In the first five years of the sample unearned income is the sum of AFDC, SSI, Social Security, and unemployment compensation due to data

restrictions. The regressions are estimated separately by state and year, and in nominal income terms. However, in the ensuing analysis reported below all income sources are deflated by the personal consumption expenditure deflator (PCED) with 1983 base year, and food stamp benefit amounts are deflated by the Thrifty Food Plan Price Deflator with 1983 base year rather than the PCED because food stamps are inflated by the TFPD.

Table 1 shows summary statistics on selected characteristics for the food stamp households used in estimation for the years 1983, 1993, and 2003. In a typical year about 80–85 percent of FSP households were either white or African American, and the mix of each was fairly evenly split, the average recipient was in their mid 30s, had fewer than 3 members in the food stamp unit, and received under $140 per month in FSP benefits. The fraction employed was low, but increased over time, and a greater fraction of households reported some earnings even in cases where the household head did not work (the employment rate is missing in 2003 because Mathematica reports difficulties with this measure and discourages its use). Of note is the large drop in the fraction of households reporting unearned income in 2003 relative to 1983 and 1993. In the earlier years over 85 percent of households reported some form of unearned income, but this fell nearly 20 percentage points to 68 percent in 2003. This decline emanates in large part by the large reduction of FSP recipients reporting income from TANF (around 40 percent in 1993 compared to 17 percent in 2003 (Characteristics of the Food Stamp Program: Fiscal Year 2003)). Also of note is the large drop in average food stamp benefit amounts from $139 in 1993 to $112 in 2003. This is driven by the 60 percent increase from 24 to 38 percent in the fraction of food stamp assistance units containing only one person, many of whom also receive SSI.

Table 1 Summary Statistics for Food Stamp Households in Analysis
(Weighted Means, with Standard Deviations in Parentheses. Income is in $1983)

Year = 1983	
Percent White	41.1
Percent Black	42.7
Percent Hispanic	10.7
Age	34.1
	(10.9)
Size of Food Stamp Unit	2.8
	(1.6)
Monthly Benefit	128.1
	(70.7)
Percent Employed	11.6
Percent with Earned Income	16.4
Amount of Earned Income among those with earned income	396.4
	(288.9)
Percent with Unearned Income	85.9
Amount of Unearned Income among those with unearned income	334.5
	(172.9)
Number of Observations	3,454
Year = 1993	
Percent White	46.5
Percent Black	35.9
Percent Hispanic	13.4
Age	34.4
	(9.9)
Size of Food Stamp Unit	2.9
	(1.6)
Monthly Benefit	138.9
	(77.7)
Percent Employed	17.5
Percent with Earned Income	25.6
Amount of Earned Income among those with earned income	482.1
	(287.5)
Percent with Unearned Income	86.1
Amount of Unearned Income among those with unearned income	274.9
	(189.7)
Number of Observations	38,155
Year = 2003	
Percent White	45.2
Percent Black	40.5
Percent Hispanic	11.3
Age	36.3
	(10.9)
Size of Food Stamp Unit	2.4
	(1.4)
Monthly Benefit	111.9
	(72.9)
Percent Employed	—
Percent with Earned Income	28.7
Amount of Earned Income among those with earned income	450.4
	(274.1)
Percent with Unearned Income	68.5
Amount of Unearned Income among those with unearned income	300.2
	(174.9)
Number of Observations	30,257

V. Trends in Effective Tax Rates and Benefit Guarantees in the FSP, 1983–2003

I present results on changes in effective tax rates and guarantees in the FSP over the two decades 1983–2003. In each year there are up to 357 coefficients, and thus I follow the AFDC literature by focusing the discussion on major cross-state trends over time. In an Excel spreadsheet I provide the statutory and estimated effective guarantees for 1, 2, 3, 4, and 5 person FSP units, along with the effective tax rates on earned and unearned income, by state and by year (available at http://gatton.uky.edu/Faculty/Ziliak/workpap.htm) . I provide these point estimates for the base case as well as two sensitivity checks, along with a complete set of coefficients on the AFDC/TANF program from Ziliak (2007). In terms of model fit, the adjusted R-squared is consistently around 0.94.

A. Effective Benefit Guarantees

In Figures 1–4 I show the trends in the inflation-adjusted statutory and effective FSP benefit guarantees for 1-, 2-, 3-, and 4-person households, respectively. Recall that by statutory benefit I am referring to the legally established maximum Federal benefit guarantee at zero net income for a given family size in a given year, while the effective guarantee comes from the estimated intercept terms in equation (2) with earned and unearned income set to zero and reflects an average across households of a given size. Following McKinnish, et al. (1999) and Ziliak (2007) I also present the average guarantees weighted by the number of FSP recipients in the given state-year. This is a weighted mean, where the weights are administrative food stamp caseload levels, and not guarantees from a weighted regression model. The unweighted means refer to the average state in a given year, while the weighted means refer to the average recipient in a given state and year.

As anticipated the inflation-adjusted statutory benefit is roughly constant over the period. This constancy is expected because the food stamp guarantee is adjusted annually for food inflation (the series in Figures 1–4 are deflated by the Thrifty Food Plan deflator with 1983 base year), though the USDA periodically deviates from the mechanical increase as in the late 1980s and early 1990s. For example, prior to 1988 and after 1996 the maximum benefit was set at 100 percent of the Thrifty Food Plan, but in the intervening years was set at 103 percent of the TFP, and this could account for some of the time series patterns. There is virtually no difference between the benefit provided by the average state (unweighted) versus that faced by the average recipient (weighted). Thus, unlike the AFDC/TANF papers of McKinnish, et al. and Ziliak, weighting is not important in this application to the FSP.

Figure 1: Real FSP Guarantees for 1-Person, 1983-2003

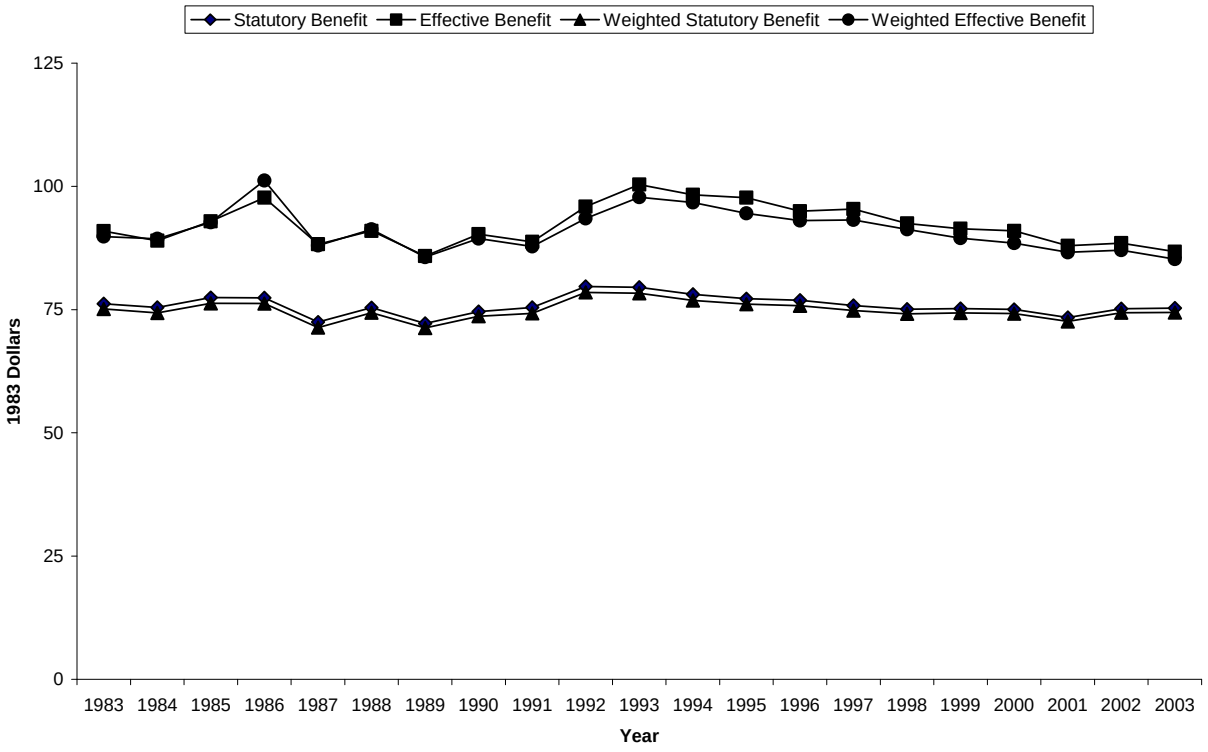


Figure 2: Real FSP Guarantees for 2 Persons, 1983-2003

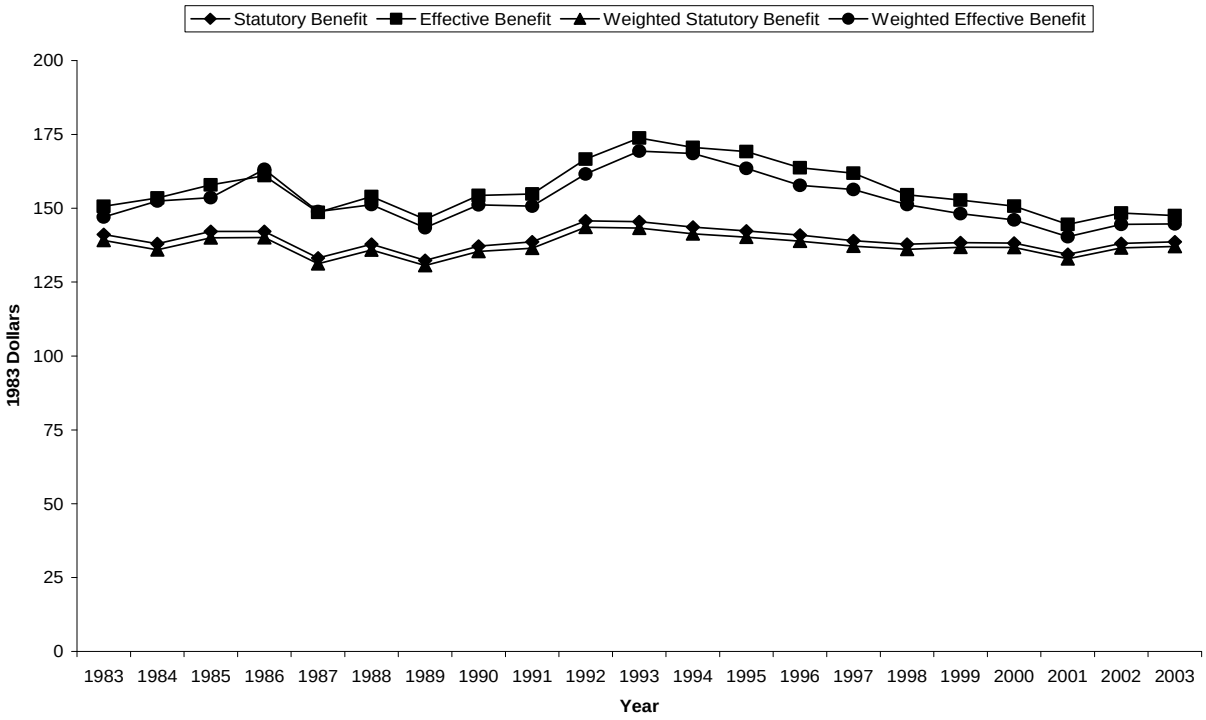


Figure 3: Real FSP Guarantees for 3 Persons, 1983-2003

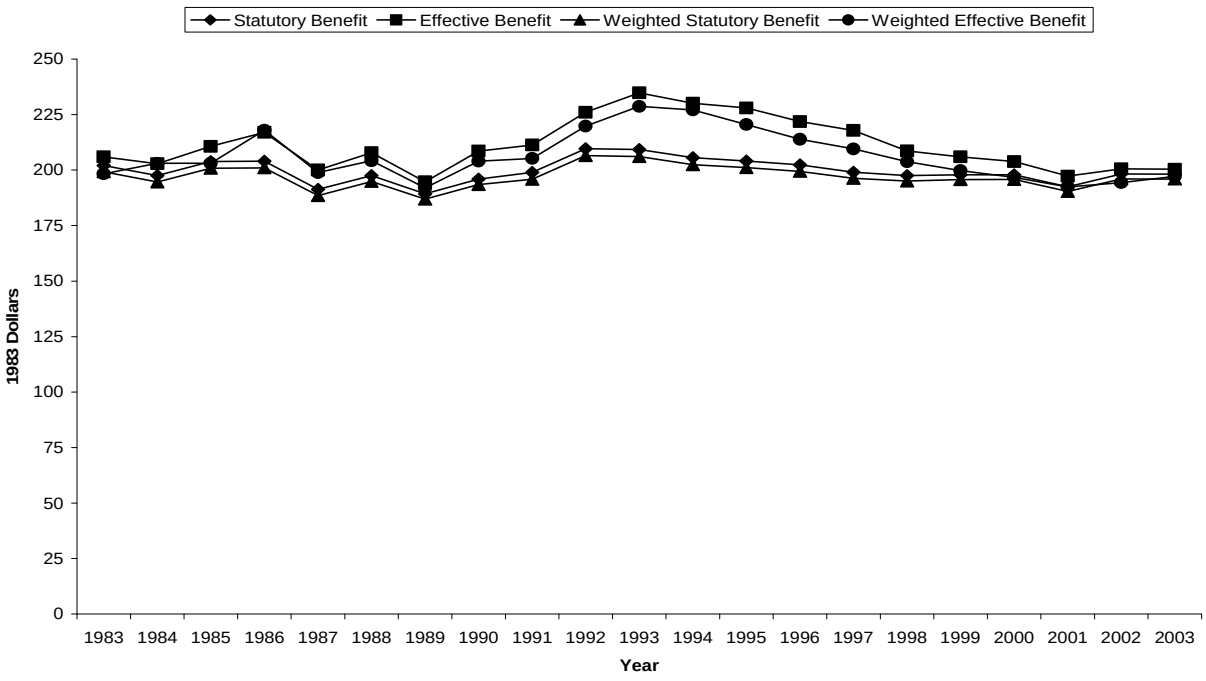
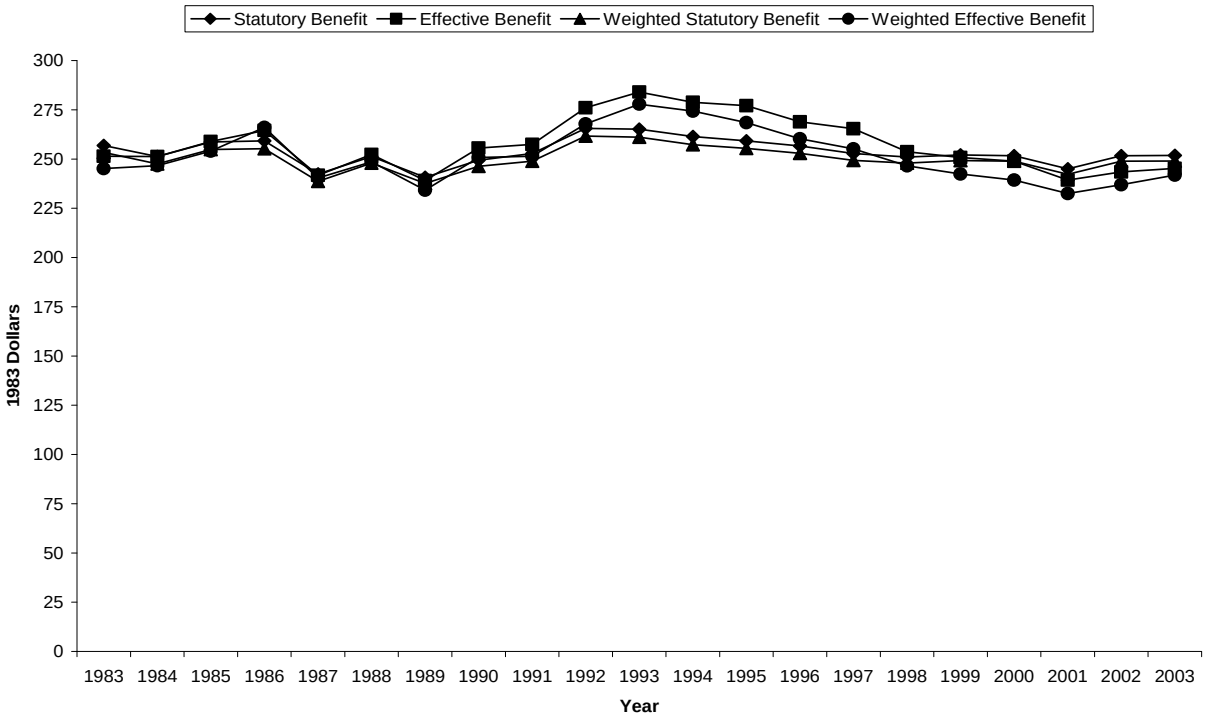


Figure 4: Real FSP Guarantees for 4 Persons, 1983-2003

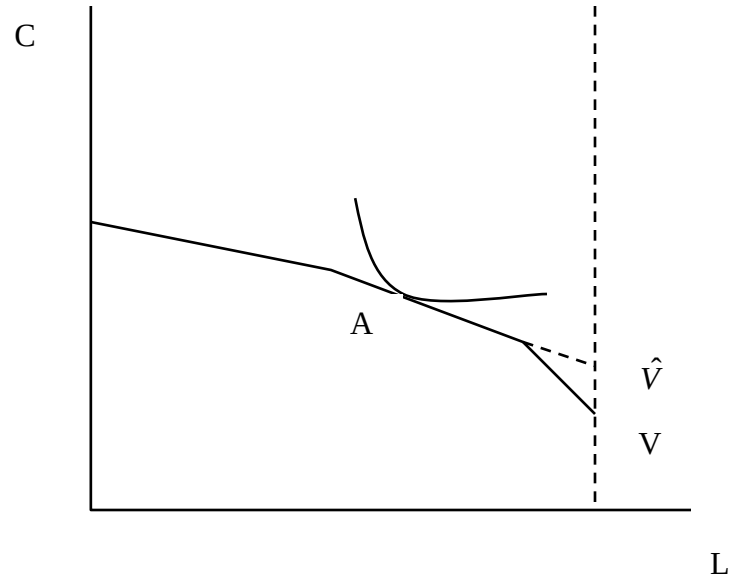


What is perhaps unexpected, especially in the case of 1- and 2-person FSP households in Figures 1 and 2, is that the effective maximum benefit guarantee is on average higher than the statutory average by upwards of 25 percent. On the surface this implies that the maximum effective guarantee at zero earned and unearned income exceeds that which is allowable by law at zero net income. Although caseworkers providing above-limit benefit levels in extreme hardship cases of families with no other (gross) income source cannot be ruled out, it is unlikely. Instead, this result is more likely a statistical artifact of the regression model and not actual practice. The regression model is fitting 255 intercepts (51 states for five household sizes) when there are only three true maximums—one for the 48 contiguous states and one for each of Alaska and Hawaii—for each family size. This is in contrast to the AFDC/TANF program where the statutory benefit is both state and family-size specific. The regression model extrapolates the intercepts off of the support of the data, but this extrapolation forces the intercept to be higher

than expected because of the nonlinearity of the budget set. The nonlinearity emanates from three sources: (1) the minimum guarantee of $10 for 1- and 2-person units; (2) the shelter deduction that raises the effective tax rates; and (3) the fact that 20 percent of earnings is automatically disregarded, as are a fraction of other work and child-care related expenses (Wilde 2001; Hanson and Andrews 2005).

An analogy to this artificial inflation of intercepts arises in applications of the effect of progressive income taxes on labor supply, as depicted in Figure 5. In the tax case it is common to linearize the budget constraint around the individual's chosen marginal tax rate and equilibrium consumption (C) and leisure (L) allocations as in point A. However, because the individual has deductions from income and may face lower tax rates on initial income amounts the researcher must provide a "virtual income" transfer (i.e. the addition to nonlabor income V to generate $\hat{V}$) to the individual so that they behave *as if* they faced the higher marginal tax rate on all income. In the current application, the food stamp intercepts are akin to virtual income in that they reflect the amount of the food stamp benefit needed to keep the individual as well off as if they faced a constant tax rate on all earned income and unearned income. I explore this in greater detail below.

Figure 5: Virtual Income and Nonlinear Budget Constraint

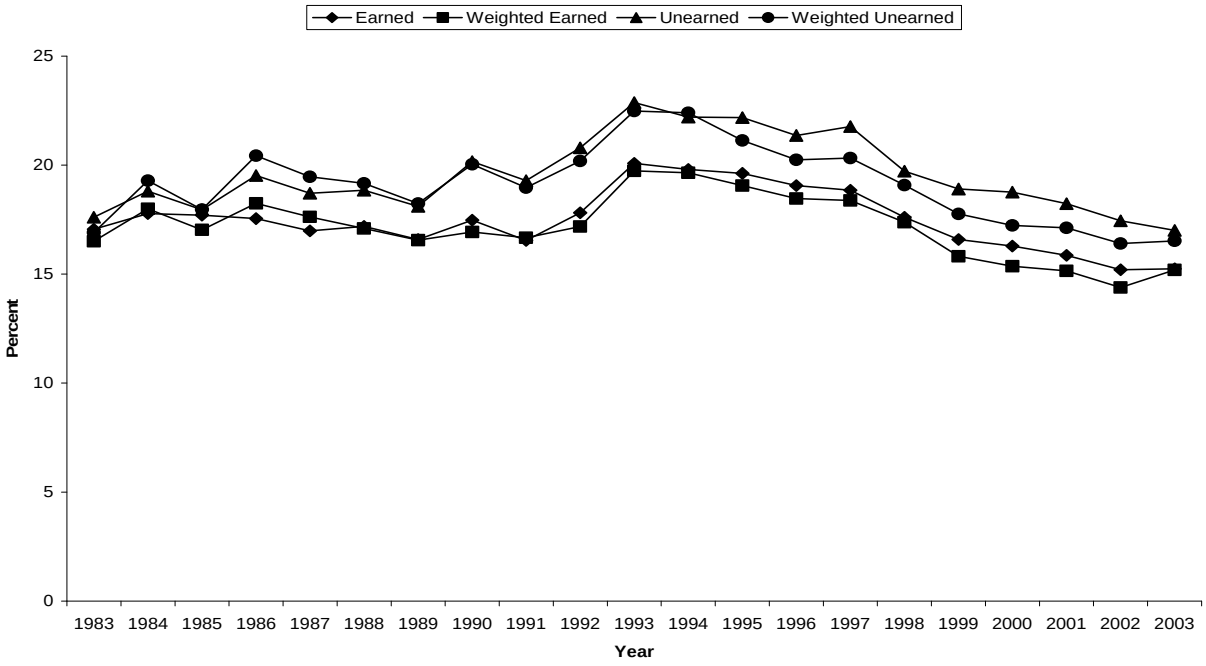


B. Effective Tax Rates

In Figure 6 I depict the effective tax rates on earned and unearned income, both unweighted and weighted by the number of food stamp recipients by state and year. Again, the weighted estimates are simple weighted means using the number of food stamp recipients in a given state-year as the weight. Recall that for most of the sample period the statutory tax rate (at zero or maximum shelter deduction) on earned income is 24 percent, while that on unearned income is 30 percent; however, the average effective tax rates over the 1983–2003 period are about 17 and 19 percent for earned and unearned income, respectively. From the mid-1980s until 1990 these rates were fairly stable on average, until they rose to a peak in 1993–1995 prior to a steady decline thereafter. By 2003 the average effective tax rates on both earned and unearned income fell nearly 25 percent from their mid-1990s peaks. Interestingly this pattern tracks the time series of food stamp caseloads—rising in the early 1990s then falling until the early 2000s. These trends could be the result of several factors or combination of factors

including an endogenous response by policymakers to tighten eligibility during the run-up in caseloads and then a loosening of eligibility (such as simplified reporting, categorical eligibility, and transitional benefits) during the caseload declines in order to foster transitions to work, changes in food stamp error rates (which follow a similar time series pattern), changes in the composition of the food stamp caseload, or changes in the composition of income among recipients. It is striking that the decline in food stamp effective rates coincided with the decline in effective tax rates in TANF as demonstrated in Ziliak (2007), implying that cumulative effective tax rates for those combining work, welfare, and food stamps fell substantively after welfare reform. Further research examining the multivariate causes of effective tax rates is clearly merited.

Figure 6: Effective FSP Tax Rates on Earned and Unearned Income, 1983-2003



In Table 2 I examine in more detail the distribution of declines in state-level effective earned and unearned income tax rates in the FSP over the decade 1993–2003. As seen in the table the changes are fairly symmetrically distributed with the medians near the means, and the

75th percentile (in absolute value) representing a decline of about 30 percent and the 25th percentile (in absolute value) representing a decline of about 18 percent. Interestingly, the distribution of declines across earned and unearned incomes are nearly identical.

Table 2
Distribution of Percent Changes in Effective Tax Rates in the FSP 1993–2003

Year	Effective Earned Income Tax Rate (%)	Effective Unearned Income Tax Rate (%)
Mean	–23.6	–24.8
25th Percentile	–29.6	–31.9
50th Percentile	–22.2	–23.6
75th Percentile	–18.0	–17.8

In Table 3 I document the coefficient of variation in (unweighted) earned and unearned effective tax rates for selected years using all available states. As seen in the table, between-state inequality in tax rates fell through the 1980s (perhaps driven in part from the smaller samples available for estimation), but then expanded throughout the 1990s, which is consistent with the results of Ziliak (2007) on the TANF program and suggests that the decentralization of welfare in the late 1990s may have contributed to the expanded cross-state variation in FSP tax policies. Although the level of cross-state variation in FSP tax rates is less than one obtains in

Table 3
Cross-State Inequality in Effective Tax Rates in the FSP

Year	Coefficient of Variation for Effective Earned Income Tax Rate	Coefficient of Variation for Effective Unearned Income Tax Rate
1983	0.357	0.466
1988	0.205	0.231
1993	0.102	0.137
1998	0.145	0.187
2002	0.168	0.202

AFDC/TANF benefits, there is considerable variation across states and over time such that the tax rates provided here may be of considerable value to researchers interested in the role of tax policy in behavioral models of the FSP.

C. State Welfare Reform Aggressiveness

With increased State flexibility in the administration of the FSP following passage of PRWORA and the 2002 Farm Security and Rural Investment Act, it is quite possible that deviations between statutory rates and effective rates have increased over time. If so, and if effective tax rates on earnings have fallen, which makes combining work *and* FSP participation relatively more attractive, this could help account for the recent growth in FSP participation. Indeed, it is possible that states that pursued a more aggressive reform agenda on their TANF program in terms of sanctions, time limits, effective tax rates and guarantees, and other policies may in turn have had a direct effect on FSP recipients in a number of ways, including the possibility of jointly sanctioned TANF and FSP benefits or mechanically lower FSP benefits in response to higher TANF benefits (in cases where effective tax rates on earned and unearned income fell in TANF). In an attempt to isolate whether changes in FSP parameters are related to a states degree of 'aggressiveness' of its TANF program I draw heavily from a method employed in my earlier application to the TANF program (Ziliak 2007). It is important to point out that this is purely a descriptive exercise (i.e. correlations) and no causal statements of aggressiveness on the FSP are possible with this analysis.

There is no generally agreed upon measure of aggressiveness in terms of welfare policy. Consequently, I consider five separate groupings of states as summarized in Table 4. The first

Table 4: Alternative Indicators of State Welfare Reform Aggressiveness

State	Ellwood	Meyer/Rosenbaum	Grogger/Karoly-1	Grogger/Karoly-2	Grogger/Karoly-3
Alabama	1	0	0	0	0
Alaska	0	0	0	0	0
Arizona	0	1	1	1	0
Arkansas	0	0	0	1	0
California	0	1	0	1	0
Colorado	1	0	0	0	0
Connecticutt	0	1	1	1	0
Delaware	1	1	0	0	0
District of Columbia	0	0	1	1	1
Florida	0	0	0	0	1
Goergia	1	0	0	1	0
Hawaii	1	0	0	0	0
Idaho	1	1	0	0	1
Illinois	1	1	1	1	0
Indiana	1	1	1	1	0
Iowa	0	1	1	1	0
Kansas	1	1	0	0	1
Kentucky	0	0	0	0	0
Louisiana	1	1	0	0	0
Maine	1	0	0	0	0
Maryland	0	0	1	1	0
Massachusetts	1	1	1	1	0
Michigan	0	1	1	1	0
Minnesota	0	0	0	0	0
Mississippi	1	0	0	1	1
Missouri	1	1	0	0	0
Montana	1	1	1	1	0
Nebraska	1	1	1	1	1
Neveda	0	0	0	0	0
New Hampshire	0	1	0	0	0
New Jersey	0	1	1	1	0
New Mexico	1	0	0	0	0
New York	0	0	0	0	0
North Carolina	0	1	1	1	0
North Dakota	1	0	0	0	0
Ohio	0	1	1	1	1
Oklahoma	0	0	0	0	1
Oregon	1	1	1	1	0
Pennsylvania	0	0	0	0	0
Rhode Island	0	0	0	0	0
South Carolina	0	0	0	0	1
South Dakota	1	1	0	1	0
Tennessee	1	1	1	1	1
Texas	0	1	1	1	0
Utah	0	0	0	1	0
Vermont	0	1	1	1	0
Virginia	0	1	1	1	1
Wahington	1	0	0	1	0
West Virginia	1	1	0	1	0
Wisconsin	1	1	1	1	1
Wyoming	0	0	0	0	1

Ellwood refers to David Ellwood's statistical estimates of state aggressiveness as found in his Appendix Table 2 in NTJ 53(4) pp. 1063-1105, 2000

Meyer/Rosenbaum refers to Ellwood's categorization of Meyer and Rosenbaum 2001 QJE programmatic listing of aggressiveness, consisting of 4 parts: (1) whether real AFDC benefit fell at least 25% between 1986 and 1997; (2) whether the state imposed a time limit waiver; (3) whether state imposed full family sanctions for failure to comply with JOBS requirements; and (4) whether any persons were terminated for failure to meet a requirement under aFDC waivers

Grogger/Karoly-11 refers to Grogger/Karoly (2005) Table 4.1 where a state is deemed aggressive if it has 3 or more waivers implemented between 1992-96

Grogger/Karoly-2 refers to Grogger/Karoly (2005) Table 4.1 where a state is deemed aggressive if it has 1 or more waivers implemented between 1992-96

Grogger/Karoly-3 refers to Grogger/Karoly (2005) Table 4.2 where a state is deemed aggressive if all 4 studies on state sanctions policies agree that the policy is stringent 1992-96

measure, labeled Ellwood, refers to a statistical approach of aggressiveness adopted by David Ellwood (1999) in his analysis of the effects of the EITC and welfare reform on various social and economic outcomes. Specifically, Ellwood argued that a plausible measure of aggressiveness is one that captures the changing odds that people of a given earnings level in a given state would receive public assistance. To construct the measure he used data from the Current Population Survey over the period 1984–1992 to estimate a probit model of AFDC participation among single parents in each state as a function of age, education, race, state unemployment, earnings, and a linear trend. Then he predicted the likelihood of receiving aid using the same demographic and state level variable but with data from the 1997 and 1998 CPS under the proviso that AFDC program rules were the same as in the base period of 1984–1992. The difference between the actual and predicted decline in AFDC participation between 1991–1992 and 1997–1998 is used as the metric of aggressiveness. For my purpose I denote with a '1' in Table 4 those states predicted to be most aggressive based on Ellwood's methodology; that is, those states with a greater than 10 percentage point difference between actual and predicted AFDC participation.

The second category is labeled Meyer/Rosenbaum, which refers to Ellwood's categorization of the programmatic listing of aggressiveness by Meyer and Rosenbaum (2001), and which consists of 4 parts: (1) whether the real AFDC benefit fell at least 25% between 1986 and 1997; (2) whether the state imposed a time limit waiver; (3) whether state imposed full family sanctions for failure to comply with JOBS requirements; and (4) whether any persons were terminated for failure to meet a requirement under AFDC waivers. For states that satisfied at least 3 of the 4 criteria Ellwood defined these states as most aggressive and I denote such states with a '1' in the second column of Table 4.

The last three columns labeled Grogger/Karoly–1, –2, and –3 refer to the three separate measures of aggressiveness as depicted in Grogger and Karoly (2005). More than half the states implemented waivers from federal AFDC rules during the early to mid 1990s such as expanded earnings disregards and asset limits, time limits on benefit receipt, and family caps. Thus, Grogger/Karoly–1 is derived from their Table 4.1 where a state is deemed aggressive if it had 3 or more waivers implemented between 1992 and 1996. Grogger/Karoly–2 is also derived from their Table 4.1 where a state is deemed aggressive if it had 1 or more waivers implemented between 1992 and 1996. Obviously, the latter is a much weaker criteria for aggressive as nearly three-fourths of states had such waivers. Grogger/Karoly–3 is perhaps the most extreme measure of aggressiveness as it is derived from their Table 4.2 where a state is deemed aggressive if all 4 studies on state sanctions policies summarized in the table agree that the state's sanction policy is stringent during the 1992 to 1996 period (where stringent typically means full family benefit sanction). Although none of these measure alone depict any concise notion of aggressiveness, taken together the five measures denote variation in the degree of reform ambition and collectively should shed some light on how states differed in their approach to tax rates and guarantees.

In Figures 7–9 I depict cross-state averages in effective guarantees and tax rates on earned and unearned income, respectively, for 3-person FSP units based on the five categories of aggressiveness delineated in Table 4. The estimates are for all states with non-missing data and are unweighted because the interest here is on the average state and not average recipient. As seen in Figure 7, there is no difference in estimated effective benefit guarantees based on aggressiveness of state welfare reform policies. Likewise, in Figures 8 and 9 little difference is revealed in effective tax rates based on welfare policy. The one possible exception is

Grogger/Karoly-3 where states with aggressive sanction policies consistently have effective tax rates about 2 percentage points higher than the average state. Moreover, this group of states

Figure 7: Real Effective FSP Guarantees for 3 Persons by State Welfare Reform Aggressiveness

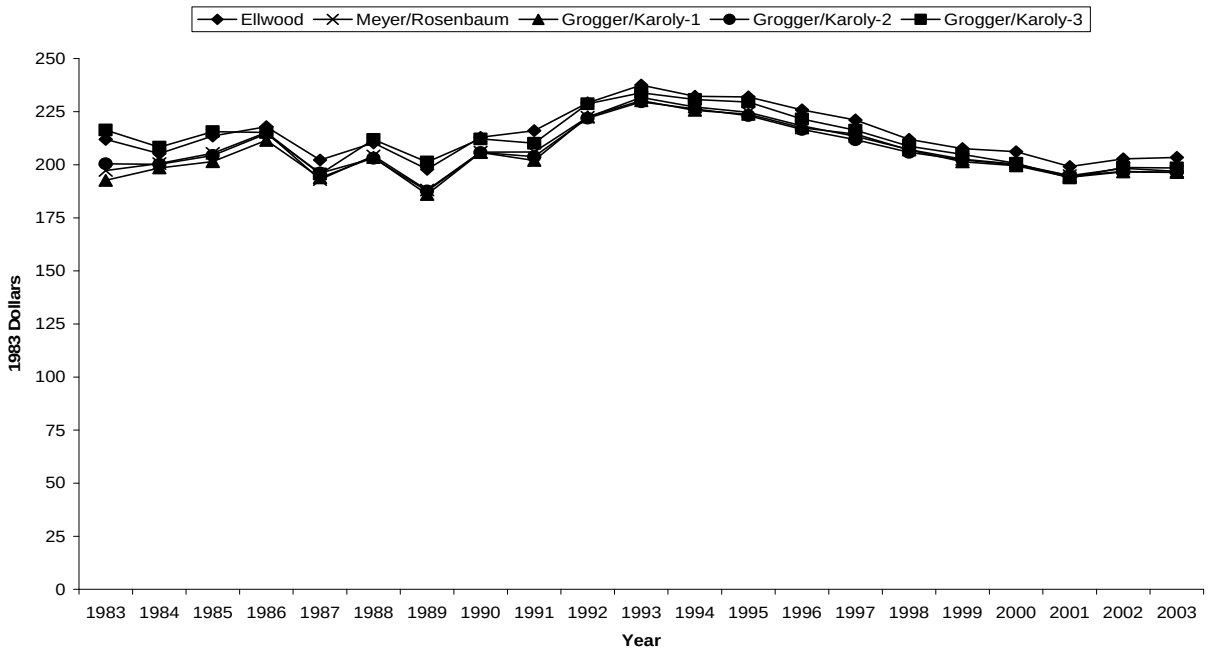


Figure 8: Effective Earned Income Taxes Rates by State Welfare Reform Aggressiveness

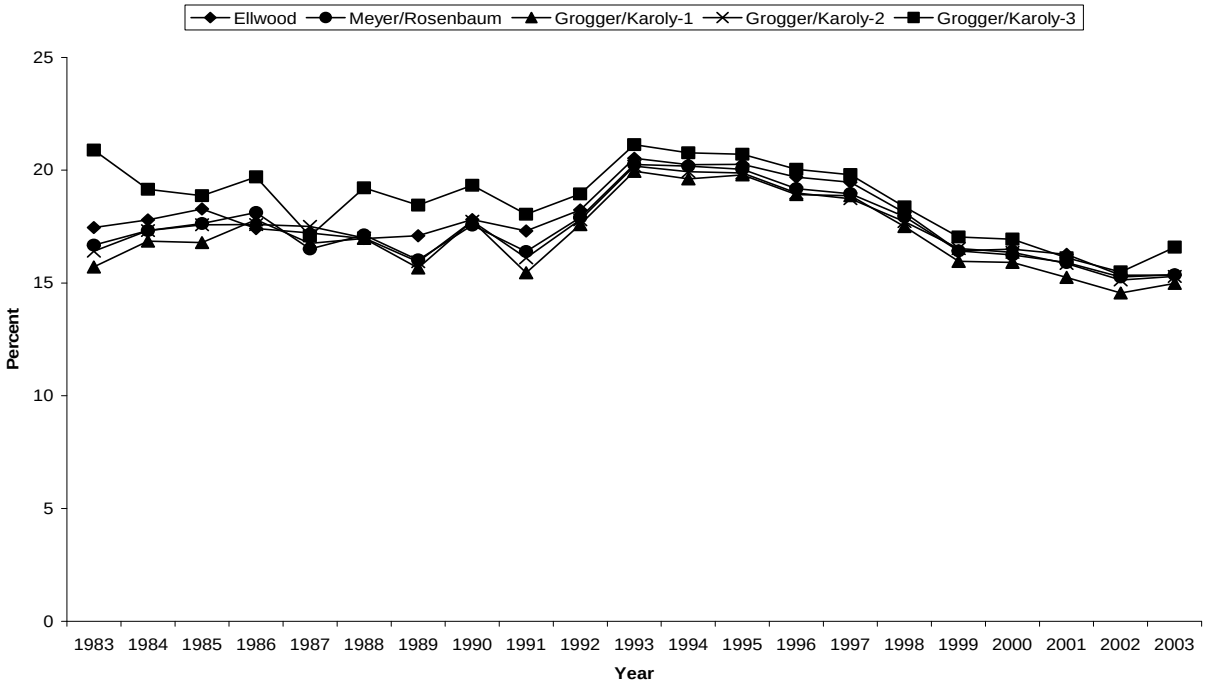
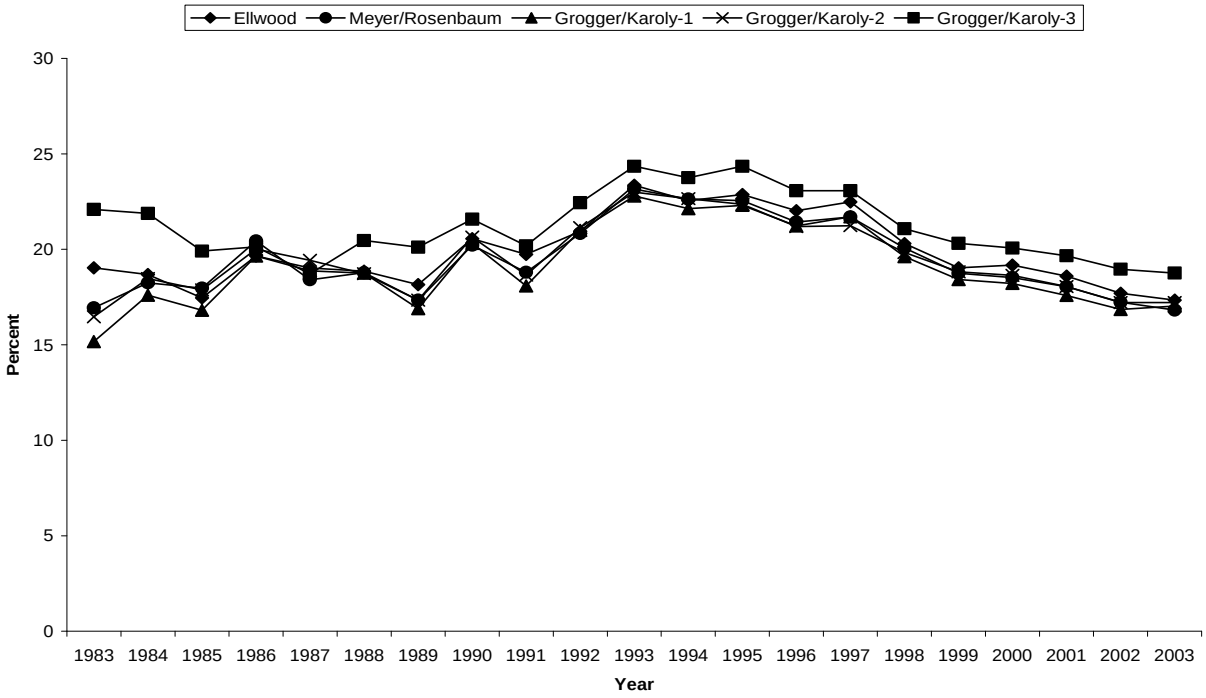


Figure 9: Effective Unearned Income Tax Rates by State Welfare Reform Aggressiveness



had smaller reductions in tax rates (about 20 percent rather than 25 percent) from 1993–2003. Ziliak (2007) found that this group of states with stringent sanctions policies had the least generous AFDC/TANF programs, but unlike their treatment of the FSP, were the most aggressive in reducing effective tax rates and benefits in AFDC/TANF in the welfare reform era. As an additional check I compared the effective tax rates from aggressive states to non-aggressive states based on each of the five definitions of aggressiveness. Tables 5 and 6 report the difference in cross-state mean tax rates on earned and unearned income for each year, respectively, along with the p-value from the unpaired t-test of the null hypothesis that the means in aggressive states are equal to the means from non-aggressive states. With the exception of the Grogger/Karoly-3 definition in the mid 1990s, most of the means are not economically or statistically significantly different. On net, there is not much heterogeneity in FSP guarantees and tax rates across groups of states based on aggressiveness of welfare reform policies.

Table 5: Difference between Effective Tax Rates on Earned Income in Aggressive States versus Non-Aggressive States

Year	Ellwood	Meyer/Rosenbaum	Grogger/Karoly-1	Grogger/Karoly-2	Grogger/Karoly-3
1983	2.652	-1.294	-3.151	-1.803	0.027
	(0.181)	(0.520)	(0.150)	(0.370)	(0.993)
1984	0.026	-0.962	-1.526	-1.010	1.850
	(0.985)	(0.493)	(0.307)	(0.466)	(0.194)
1985	1.085	-0.156	-1.503	-0.271	1.559
	(0.430)	(0.910)	(0.309)	(0.844)	(0.257)
1986	-0.252	1.221	0.422	0.090	2.890
	(0.843)	(0.367)	(0.713)	(0.949)	(0.069)
1987	0.429	-1.033	-0.377	1.154	0.131
	(0.718)	(0.390)	(0.755)	(0.332)	(0.929)
1988	-0.409	-0.123	-0.343	-0.418	2.717
	(0.684)	(0.901)	(0.726)	(0.677)	(0.004)
1989	0.957	-1.210	-1.525	-1.438	2.505
	(0.385)	(0.261)	(0.219)	(0.176)	(0.009)
1990	0.637	0.182	0.453	0.598	2.489
	(0.470)	(0.840)	(0.606)	(0.509)	(0.001)
1991	1.428	-0.320	-1.797	-0.979	2.013
	(0.155)	(0.753)	(0.109)	(0.326)	(0.137)
1992	0.816	0.184	-0.359	-0.023	1.522
	(0.317)	(0.824)	(0.678)	(0.977)	(0.136)
1993	0.835	0.345	-0.222	0.214	1.399
	(0.152)	(0.551)	(0.726)	(0.714)	(0.030)
1994	0.835	0.806	-0.311	0.302	1.295
	(0.201)	(0.230)	(0.651)	(0.654)	(0.133)
1995	1.204	0.888	0.279	0.571	1.452
	(0.033)	(0.115)	(0.632)	(0.321)	(0.020)
1996	1.193	0.249	-0.237	-0.159	1.307
	(0.051)	(0.683)	(0.711)	(0.793)	(0.039)
1997	1.152	0.222	0.023	-0.256	1.275
	(0.032)	(0.680)	(0.968)	(0.634)	(0.011)
1998	0.954	0.701	-0.172	0.263	1.033
	(0.183)	(0.345)	(0.798)	(0.731)	(0.174)
1999	-0.304	-0.366	-1.034	-0.141	0.606
	(0.700)	(0.644)	(0.158)	(0.862)	(0.531)
2000	0.403	-0.097	-0.622	0.150	0.878
	(0.652)	(0.913)	(0.481)	(0.868)	(0.396)
2001	0.760	0.091	-1.015	-0.001	0.342
	(0.344)	(0.910)	(0.180)	(0.999)	(0.737)
2002	0.269	0.140	-1.062	-0.143	0.386
	(0.715)	(0.849)	(0.118)	(0.846)	(0.665)
2003	0.193	0.252	-0.445	0.094	1.798
	(0.720)	(0.626)	(0.423)	(0.857)	(0.010)

NOTE: The difference in mean tax rates is reported with p-values from the unpaired t-test in parentheses

Table 6: Difference between Effective Tax Rates on Unearned Income in Aggressive States versus Non-Aggressive States

Year	Ellwood	Meyer/Rosenbaum	Grogger/Karoly-1	Grogger/Karoly-2	Grogger/Karoly-3
1983	4.773	-1.772	-4.700	-2.713	0.308
	(0.057)	(0.487)	(0.085)	(0.283)	(0.932)
1984	-0.236	-1.200	-1.990	-0.753	4.118
	(0.901)	(0.521)	(0.303)	(0.683)	(0.047)
1985	-0.940	0.024	-1.876	-0.187	2.624
	(0.652)	(0.991)	(0.334)	(0.930)	(0.175)
1986	0.226	1.943	0.207	1.074	0.812
	(0.840)	(0.075)	(0.859)	(0.337)	(0.524)
1987	0.593	-0.636	0.267	1.591	0.005
	(0.691)	(0.673)	(0.858)	(0.295)	(0.998)
1988	0.003	-0.147	-0.150	-0.286	2.158
	(0.998)	(0.901)	(0.907)	(0.812)	(0.060)
1989	0.068	-1.638	-2.006	-1.715	2.683
	(0.961)	(0.220)	(0.198)	(0.195)	(0.028)
1990	0.743	0.104	0.229	1.046	1.896
	(0.406)	(0.907)	(0.802)	(0.238)	(0.035)
1991	0.855	-1.029	-1.976	-1.404	1.206
	(0.451)	(0.371)	(0.095)	(0.219)	(0.412)
1992	0.278	0.070	0.320	0.743	2.210
	(0.768)	(0.941)	(0.734)	(0.432)	(0.022)
1993	0.903	0.602	-0.135	0.276	1.973
	(0.315)	(0.507)	(0.883)	(0.765)	(0.046)
1994	0.649	0.902	-0.124	0.986	2.074
	(0.497)	(0.350)	(0.900)	(0.305)	(0.075)
1995	1.290	0.781	0.203	0.381	2.910
	(0.157)	(0.396)	(0.820)	(0.684)	(0.001)
1996	1.253	0.133	-0.228	-0.380	2.292
	(0.192)	(0.890)	(0.816)	(0.687)	(0.026)
1997	1.340	-0.164	-0.118	-1.187	1.733
	(0.142)	(0.858)	(0.895)	(0.185)	(0.046)
1998	1.106	0.744	-0.162	0.241	1.819
	(0.290)	(0.482)	(0.868)	(0.820)	(0.095)
1999	0.244	-0.349	-0.806	-0.194	1.884
	(0.808)	(0.733)	(0.383)	(0.851)	(0.130)
2000	0.782	-0.512	-0.896	-0.267	1.744
	(0.463)	(0.633)	(0.372)	(0.805)	(0.168)
2001	0.685	-0.387	-1.063	-0.383	1.916
	(0.504)	(0.710)	(0.261)	(0.715)	(0.114)
2002	0.480	-0.460	-0.985	-0.544	2.023
	(0.635)	(0.649)	(0.270)	(0.588)	(0.082)
2003	0.622	-0.401	0.045	0.453	2.344
	(0.391)	(0.585)	(0.948)	(0.528)	(0.005)

NOTE: The difference in mean tax rates is reported with p-values from the unpaired t-test in parentheses

D. Nonlinearity in Effective Tax Rates

A puzzle arose in the base-case estimates of Figures 1–2 for one and two-person food stamp units where the estimated effective guarantees were on average $25 greater than the statutory benefit guarantee. Based on results from the AFDC/TANF literature of effective guarantees, one would expect the effective benefit to be less than or equal to the statutory benefit. Figures 1–4 reveal that these differences were most pronounced among one- and two-person households (effective rates were about one-third higher than statutory rates), although there was a period in the early to mid 1990s when the gap was quite sizable for three- and four-person households as well (though only about a 12 percent difference between effective and statutory rates). Coincidentally, Figure 6 demonstrates that during these same years effective tax rates on earned and unearned income were increasing. Notice that in Figure 5 if the tax rate on earned income increases, the budget constraint 'flattens out', and thus there is a corresponding increase in the linearized intercept $\hat{V}$. As discussed previously, one possibility is that that there might be some unmodeled nonlinearities in the budget constraint owing to the $10 minimum benefit for one- and two-person units, the interaction between the shelter deduction and the tax rate, and the 20 percent earnings disregards.

I consider two extensions to the base case model of equation (2) to address potential nonlinearities in tax rates, one a function of household size and one a smooth nonlinear approximation to the actual constraint. A key advantage of the model in equation (2) is that the linear specification allows researchers to easily predict food stamp benefits in any survey containing information on household size, labor-market earnings, unearned income, and state of

residence. Thus, the two extensions are designed to maintain the tractability of the basic linear prediction equation but to improve model fit.

The first extension is based on an observation made by Wilde (2001) where he showed that the statutory rules governing FSP benefits appeared to be biased in favor of small FSP units. Specifically, he showed that the standard deduction raises per person food stamp benefits much more for small households than for large households. The reason for this is that prior to FY2003 the standard deduction was constant across household size and thus its effect on per person benefits falls sharply with increases in household size. To accommodate possible nonlinearities in the tax rate based on household size I estimate the following model:

(3)

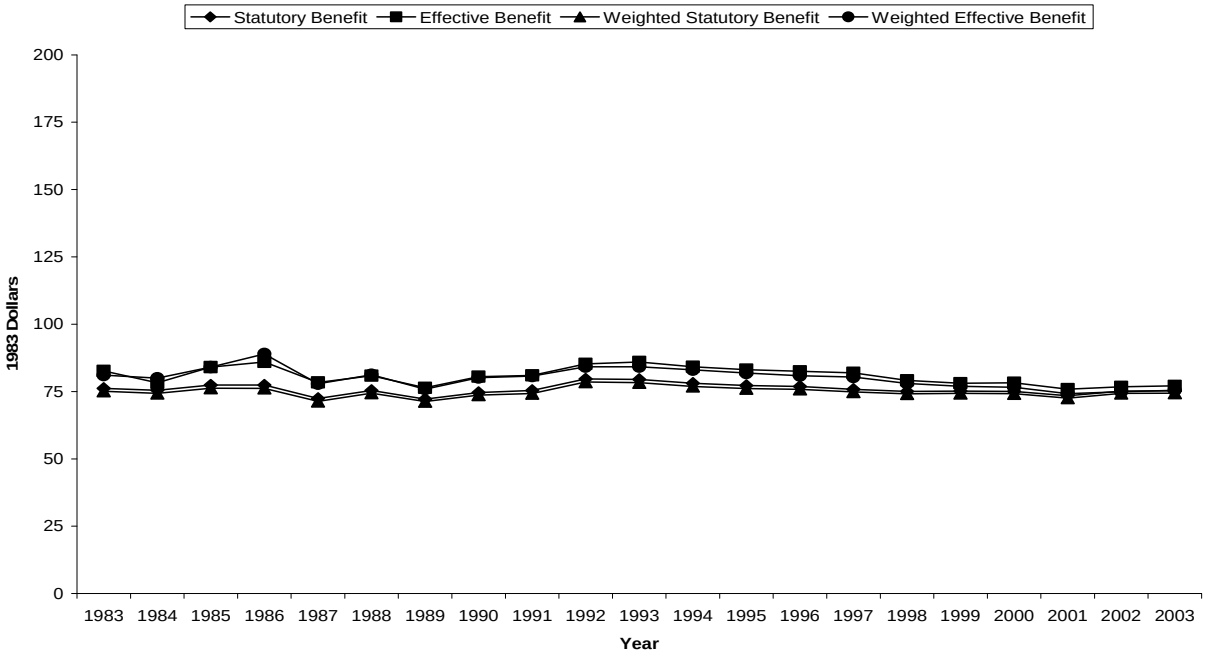
$$B_{ijt} = \alpha_{jt}^{0} + \alpha_{jt}^{1} F2_{ijt} + \alpha_{jt}^{2} F3_{ijt} + \alpha_{jt}^{3} F4_{ijt} + \alpha_{jt}^{4} F5_{ijt} - t_{jt}^{e} E_{ijt} - t_{jt}^{e'}(E_{ijt} * F3_{ijt}) - t_{jt}^{n} N_{ijt} - t_{jt}^{n'}(N_{ijt} * F3_{ijt}) + \varepsilon_{ijt},$$

where t_{jt}^{e}, t_{jt}^{n} reflect the effective tax rates on earned and unearned income for 1- and 2-person food stamp units, and $t_{jt}^{e} + t_{jt}^{e'}, t_{jt}^{n} + t_{jt}^{n'}$ reflect the effective tax rates on food stamp households with at least 3 persons. This simple extension permits differential tax rates based on family size.

In Figures 10–11 I present results on real statutory and effective guarantees for 1-person and 3-person FSP households, and in Figure 12 I present (unweighted) effective tax rates on earned and unearned income based on household size. In Figure 10 it appears that this change in specification improves the time-series fit between statutory and effective guarantees for 1-person units relative to the base case model in equation (2) as the gap between the two series is nearly zero compared to the previous $25, but in Figure 11 the fit deteriorates for 3-person units (and in results not presented, also in 4-person units) because the gap between effective and statutory rates actually expands relative to Figure 3. Figure 12 shows that there are marked differences in

effective tax rates based on family size. Indeed the tax rates for households of one or two persons are about 50 percent lower than those for households with 3 or more persons (the original results in Figure 6 lie in between these two series). This confirms that the statutory distinctions in standard deductions by household size highlighted by Wilde (2001) have a substantial impact on effective tax rates. [6] With the shift in caseload composition toward one-person food stamp units, the post 1993 decline in effective tax rates depicted in Figure 6 could simply mirror this compositional change. However, effective tax rates on earned and unearned income declined after the mid 1990s for both small- and large-size food stamp units, suggesting the overall decline reported earlier is not simply a shift from large to small food stamp households.

Figure 10: Real FSP Guarantees for 1 Person with Tax Rates Varying by Household Size



[6] A related factor may be a result of the fact that the maximum excess shelter cost deduction is constant across household size and thus may be biased against larger working families.

Figure 11: Real FSP Guarantees for 3 Persons with Tax Rates Varying by Household Size

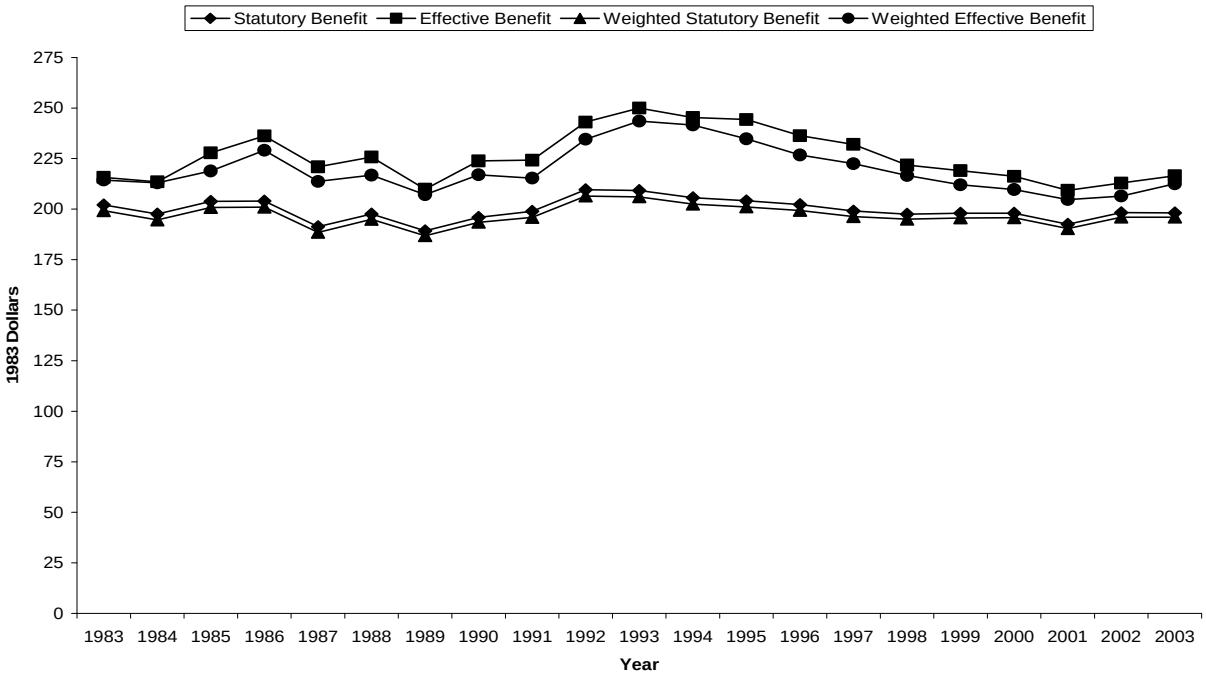
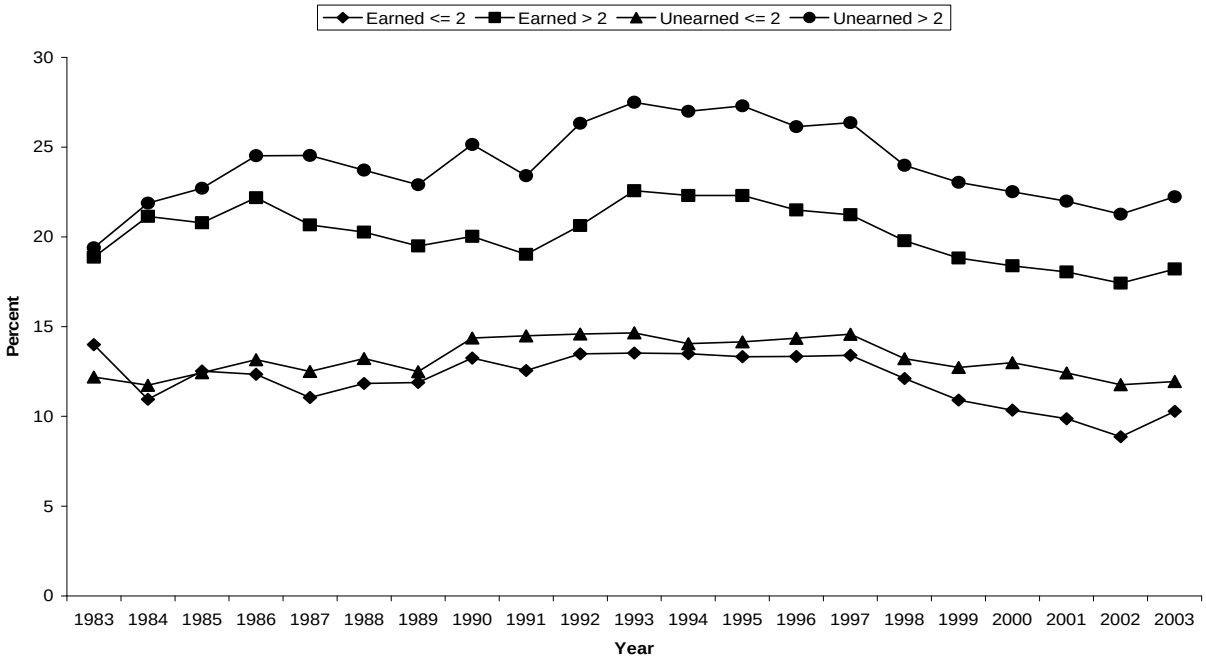


Figure 12: Unweighted Effective Tax Rates on Earned and Unearned Income Based on Household Size



Although the evidence suggests that effective tax rates vary by family size, it is not clear that this specification improves the predictive power of the food stamp benefit equation given the worsening fit in guarantees among large families. Because family size and income are positively correlated, it may be possible to simultaneously capture the nonlinearities due to treatment of household size and improve the fit of effective guarantees by using a flexible function of income. Specifically, I allow the tax rates to be a cubic function of earned and unearned income as:

(4)

$$B_{ijt} = \alpha^0_{jt} + \alpha^1_{jt} F2_{ijt} + \alpha^2_{jt} F3_{ijt} + \alpha^3_{jt} F4_{ijt} + \alpha^4_{jt} F5_{ijt} - t^e_{jt} E_{ijt} - t^{e^2}_{jt} E^2_{ijt} - t^{e^3}_{jt} E^3_{ijt} - t^n_{jt} N_{ijt} - t^{n^2}_{jt} N^2_{ijt} - t^{n^3}_{jt} N^3_{ijt} + \varepsilon_{ijt},$$

such that the effect of the earned-income tax rate on the FSP benefit is now $-t^e_{jt} - 2 * t^{e^2}_{jt} * E_{ijt} - 3 * t^{e^3}_{jt} * E^2_{ijt}$, which is a quadratic function of the earnings of individual *i* residing in state *j* in time period *t*. A similar function is obtained for unearned income but with *N* replacing *E*. The cubic polynomial was chosen because an analogous approach has been used in the context of behavioral models of labor supply in the presence of progressive income taxes whereby a cubic polynomial appears to be a good approximation to any arbitrary nonlinearities arising in tax budget constraint (MaCurdy, et al. 1990; Ziliak and Kniesner 1999).

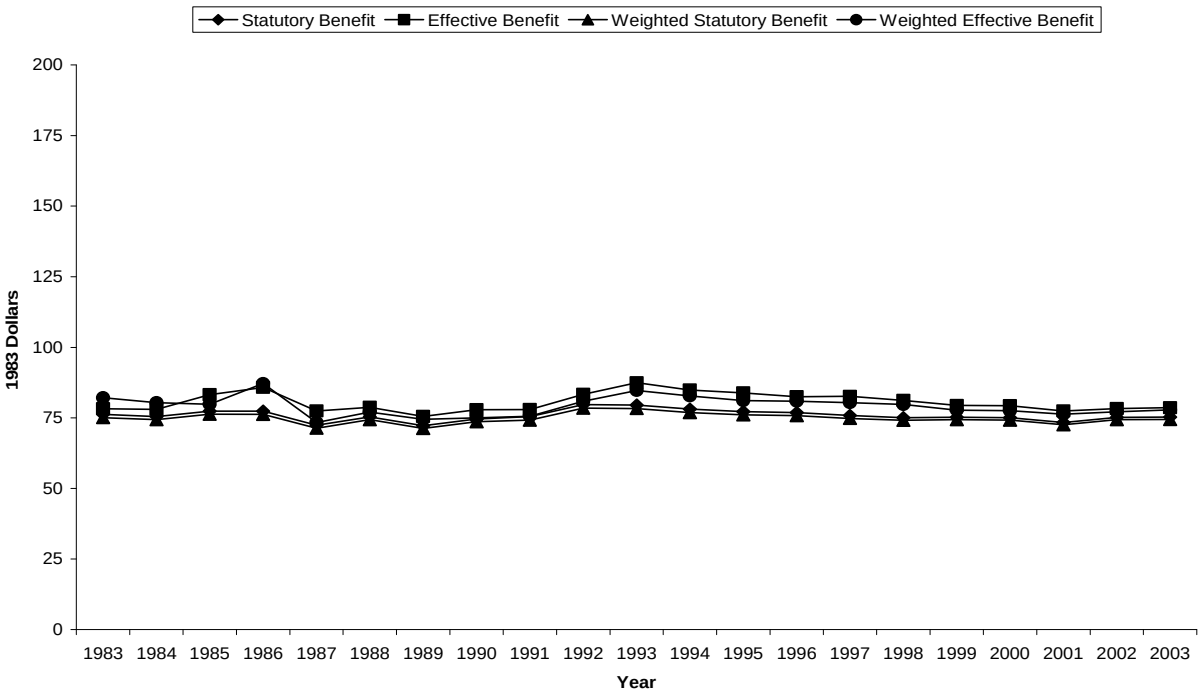
In Figures 13 and 14 I present the statutory and effective benefit guarantees for 1- and 3-person food stamp households under the cubic-in-income tax rate specification of equation (4). Recall that based on the AFDC/TANF literature we expect the effective guarantees to be less than or equal to the statutory guarantees, but Figures 1–3 under linear tax rates revealed the counterintuitive result that the effective guarantee exceeded the statutory guarantee. Figures 13–14 reveal a substantial improvement in fit for the 3-person household relative to the base case or the case where tax rates are a function of family size because the statutory and effective

guarantees are now nearly coincident as expected. It appears that the average fit in the case of 1-person households is similar to the previous case, and markedly improved relative to the base case.

In Figure 15 I present the time series of earned and unearned income tax rates for the cubic polynomial model. To construct the figure I calculate $|-\overline{t}_t^{\,e} - 2*\overline{t}_t^{\,e^2} * \overline{E}_t - 3*\overline{t}_t^{\,e^3} * \overline{E}_t^2|$ and $|-\overline{t}_t^{\,n} - 2*\overline{t}_t^{\,n^2} * \overline{N}_t - 3*\overline{t}_t^{\,n^3} * \overline{N}_t^2|$ which is the absolute value of the tax function evaluated at the state average tax rate and the state earned and unearned incomes using data from the FSP-QC. The income averages include those with no earnings or unearned income. This function is only an approximation because it reflects a nonlinear function evaluated at the means of the data rather than the mean of the nonlinear function evaluated at the individual-level data. In Figure 15 the time series of tax rates follows the basic pattern as in the base-case in Figure 6 (with the exception of 1983 and 1984 unearned tax rates that are driven by a few extreme outliers and should not be used in practice), though there is a less pronounced peak in the 1990s. The attenuated peak in Figure 15 is most likely due to the use of average earned and unearned income in calculating the series, which is more smooth than if I used averages of individual-level nonlinear tax rates. Also, the wedge between earned and unearned income in Figure 15 compared to Figure 6 is more pronounced, which likely is a result of the nonlinear features of the function better approximating the effective tax facing earnings. The convergence between earned and unearned tax rates in the late 1990s stems in part from the convergence in average earned and unearned income (see Table 1). Overall, the cubic approximation in equation (4)

dominates the linear specification of equation (2) for the calculation of effective tax rates and benefit guarantees in the Food Stamp Program.[7]

Figure 13: Real FSP Guarantees for 1 Person with Tax Rates as Cubic Polynomial in Income



[7] The null hypothesis that the higher order tax rates are jointly zero is strongly rejected with a p-value < 0.05.

Figure 14: Real FSP Guarantees for 3 Persons with Tax Rates as Cubic Polynomial in Income

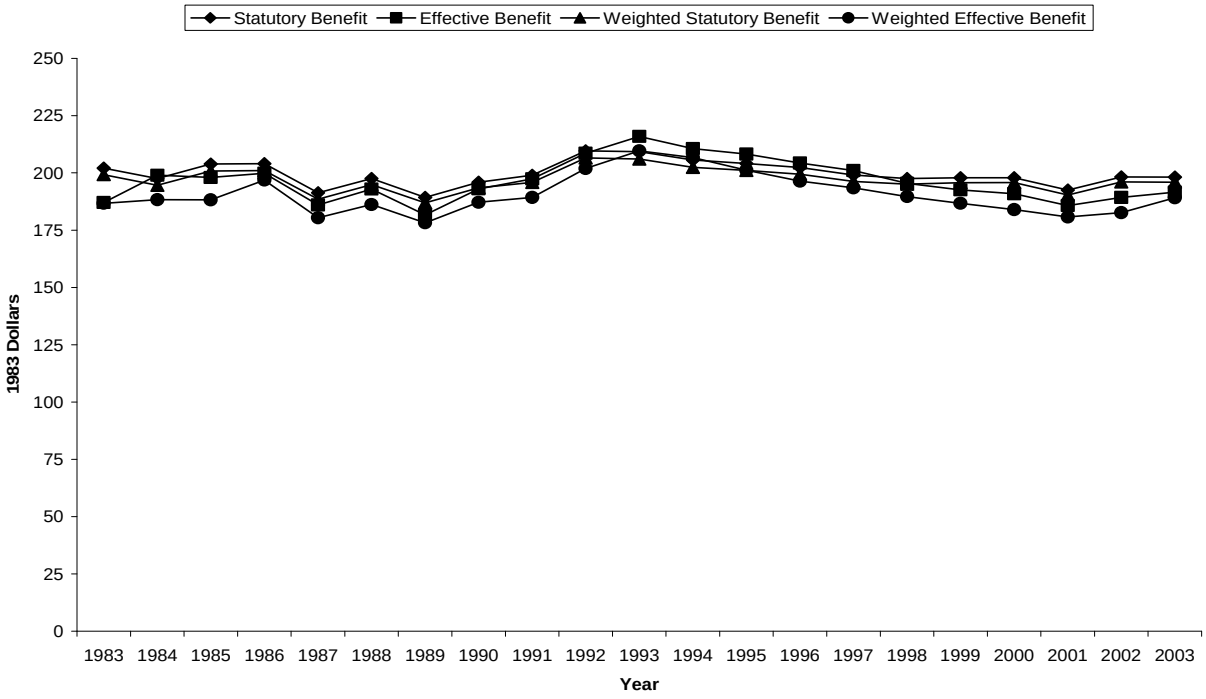
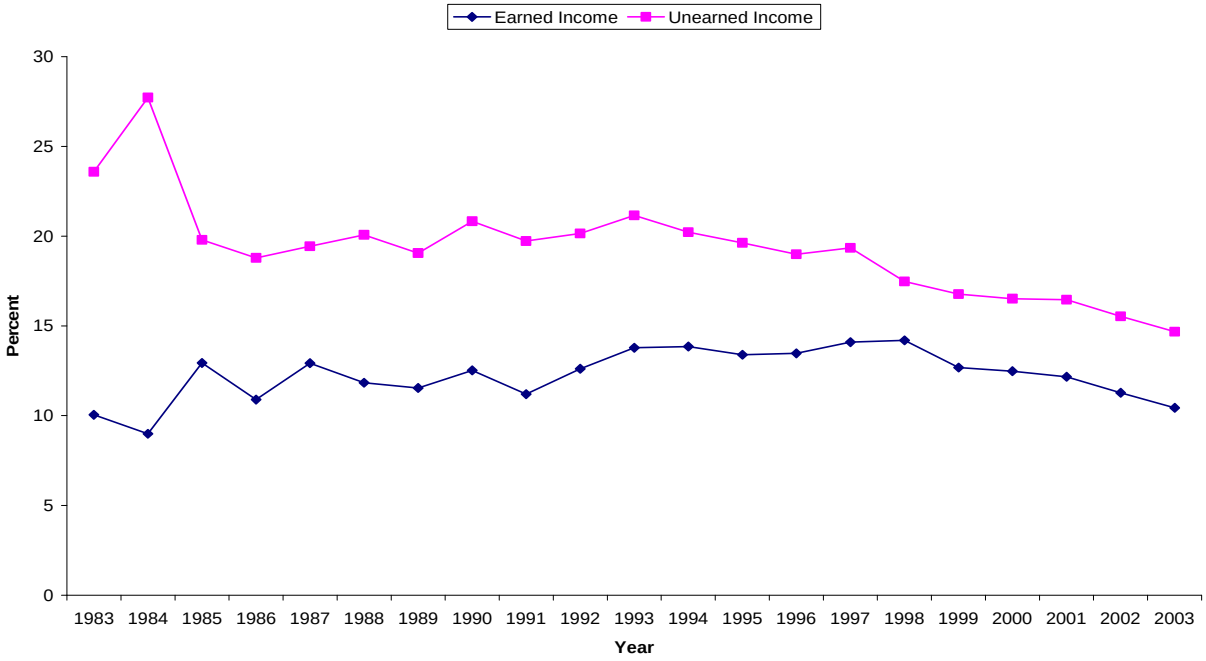


Figure 15: Unweighted Effective Earned and Unearned Income Tax Rates for Cubic Polynomial Model



VI. Conclusion

I used data from Food Stamp Program Quality Control system over the fiscal years 1983–2003 to estimate effective tax rates and benefit guarantees in the Food Stamp Program. These estimates are of interest both because they are useful in tracking cross-state over time changes in program administration and targeting, and because they can be used in reduced-form and structural models of labor supply and transfer program participation, among other outcomes. The latter should be especially useful to researchers interested in understanding the dramatic changes in work and welfare over the 1990s.

A number of conclusions emerge from the analysis. First, use of family-size specific statutory benefit guarantees instead of family-size and state-specific effective guarantees is unlikely to lead to any bias in predicting food stamp benefits in practice. Second, the basic linear specification for effective tax rates which has been widely employed in the AFDC literature is likely to provide fairly accurate predictions of food stamp benefits. However, the model that permits the effective tax rates to vary with a cubic polynomial in income improved overall model fit and is recommended for practice. A possible compromise for researchers employing the state-by-year coefficients in behavioral models is to estimate the models both with the base case linear predictions as well as the nonlinear benefit predictions.

Finally, there appears to be considerable cross-state and over time variation in effective tax rates on earned and unearned income in the FSP. The reasons for the rise in the early 1990s and subsequent decline in effective tax rates after the mid 1990s likely emanated from multiple channels, including changes in policy, caseload composition, income sources, and errors in benefit determination. I demonstrated that although there was a sizable shift towards more

single-recipient food stamp cases after the mid 1990s and that these units face markedly lower effective tax rates because of the standard deduction that is constant across family sizes, there was still a substantial decline in effective earned and unearned tax rates for food stamp households with three or more persons (as well as for one- and two-person cases). This suggests that changes in the tax rates reflect something beyond simple compositional changes related to household size and the treatment of the standard deduction, but whether the changes in tax rates reflect other caseload composition changes, changes in official policy, or changes in caseworker error remain unknown. Future research examining the causes of changes in effective tax rates should be a priority.

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