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# Watching the Clocks

## The Role of Food Stamp Recertification and TANF Time Limits in Caseload Dynamics

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### ABSTRACT

*We use administrative data to examine how “clock” policies—program time limits and recurring deadlines for confirming eligibility—affected participation in South Carolina’s TANF and Food Stamp Programs from 1996-2003. South Carolina’s TANF program limits most families to two years of benefits in any ten-year period; so, recipients began exhausting their eligibility as early as 1998. The state’s Food Stamp Program sets regular recertification intervals that can be distinguished from other calendar effects and increased these intervals after October 2002. We find that the two-year time limit reduced TANF caseloads and that the longer recertification intervals increased food stamp caseloads.*

### I. Introduction

States and the federal government dramatically reformed public assistance programs in the 1990s, first through a series of demonstrations and waivers

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and ultimately through the enactment of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA). One way in which the PRWORA departed from past policy was the five-year lifetime limit that it placed on eligibility for federally subsidized welfare benefits. As a result of the federal limit and the stricter limits imposed by some states, welfare recipients must now consider the time that has run off their eligibility clocks. This can lead to anticipatory effects wherein clients “bank” their eligibility by leaving welfare before reaching a time limit and direct mechanical effects when clients lose their eligibility at the time limit (Gittleman 1999; Grogger 2002, 2003, 2004; Grogger and Michalopoulos 2003; Swann 2005).

Features of the Food Stamp Program also changed. Attention has focused on the strict provisions of the PRWORA, which eliminated eligibility for most noncitizens and established new work requirements for able-bodied adults without dependents (ABAWDs). However, subsequent legislation, especially the 2002 Farm Bill, relaxed some provisions. States also changed their administrative procedures, including their recertification policies.

Formally, food stamp eligibility is determined on a monthly basis, and recipients are supposed to report changes (or in states with simplified reporting, large changes) in their eligibility immediately. However, recipients have only weak incentives to do this. To overcome the reporting problems, states regularly require recipients to complete paperwork or interviews to “recertify” their eligibility. Recertifications are another clock that affect participation, both by identifying ineligible recipients and by increasing the compliance costs for recipients.

Welfare and food stamp caseloads plummeted during the late 1990s. The number of people receiving cash welfare dropped from a peak of 14 million in 1994 to six million in 2000. Despite the subsequent economic downturn, the welfare caseload fell by an additional 800,000 people by 2002 (Committee on Ways and Means 2004). Over the same time period, the food stamp caseload fell from 28 million people in 1994 to 17 million in 2000 before rebounding to 21 million in 2003 (U.S. Department of Agriculture 2004). There is considerable disagreement regarding the relative contributions of economic and policy changes to these trends.

In this study, we use program records from the postreform period in South Carolina to investigate how two specific “clock” policies—time limits and recertification intervals—affected transitions from and between food stamps and cash assistance. We also examine how other characteristics, including local economic conditions, affected these transitions.

At first glance, our strategy of using administrative data from a single state would seem to offer mostly disadvantages as it limits the variability that we can consider in economic conditions and policies, and restricts us to examining people who have been recipients of assistance. These limitations, however, need to be balanced against a number of strengths.

First and most important, the administrative data are extraordinarily detailed. They permit us to examine longitudinal behavior, including the timing of transitions and the duration of program spells. The data are not subject to the recall and nonresponse problems that are common to surveys. They also include a large number of cases and are very recent, covering the entire postreform period through the recent economic downturn.

Second, although the focus on a single state constrains the amount of economic and policy variation that we can consider, we are able to examine the available

variation carefully and exploit its advantages. Several features of the policy context in South Carolina make it an excellent candidate for study. For one thing, the state's Temporary Assistance for Needy Families (TANF) program has a short time limit that restricts most families from receiving benefits for more than two years out of any ten. Families in the state began reaching the time limits as early as 1998, which means that there are many cases and several years of followup data to study. Previous researchers have either extrapolated results from prereform data (Gittleman 1999; Moffitt and Pavetti 2000; Swann 2005) or concentrated on the anticipatory effects of policies (Grogger 2002, 2003, 2004; Grogger and Michalopoulos 2003). Our analyses confirm earlier findings of anticipatory effects and provide new evidence on mechanical effects.

Also, until October 2002, South Carolina required food stamp recipients with variable incomes to recertify their eligibility quarterly and recipients with fixed incomes to recertify annually. After October 2002, the interval for recipients with variable incomes increased to six months. Because recertification dates are tied to when cases begin, they can be distinguished from other calendar effects. We find that families are several times more likely to leave the Food Stamp Program at recertification dates than at other dates.

In the next section, we describe policies and trends in South Carolina's food stamp and TANF programs; we then summarize existing research on program behavior. A description of the administrative data comes next followed by descriptive and multivariate analyses of the data.

## II. Cash Assistance and Food Stamps in South Carolina

South Carolina's Family Independence (FI) Program, which was implemented in October 1996 as the state's TANF program, is one of the strictest and least generous welfare programs in the country. While most states have adopted the federal five-year time limit on assistance, South Carolina imposes an additional time limit of two years of participation in a ten-year period. Full family sanctions have been instituted, as have a family cap provision and strict work requirements. Over the period we are examining, benefits under the program were low; the maximum benefit for a family of three was \$205 per month. The earnings disregard and benefit reduction rate follow those of the old AFDC program.

The FI program included some ameliorative features, such as exemptions from the work requirements and time limits for disabled clients and people caring for disabled family members. South Carolina eliminated the eligibility requirements for two-parent households that had been associated with the earlier AFDC-Unemployed Parent program. The state also offers transitional Medicaid, childcare, and transportation assistance to ease the movement from welfare to work.

The Food Stamp Program in South Carolina is separate from the FI program. The Food Stamp Program has a higher maximum benefit than the FI program. In 2003, the maximum monthly benefit for a family of three was \$366. It also has higher eligibility limits and a lower benefit reduction rate than the FI program, so families, especially working families, can receive food stamps even if they are ineligible for

FI. In 2003, only 9 percent of food stamp households in South Carolina received TANF; the comparable national figure was 17 percent (USDA 2004).

There have been a number of changes, both restrictive and expansive, in food stamp policies since 1996. Restrictive changes came from the PRWORA, which imposed tough work requirements on able-bodied adults without dependents and eliminated food stamp eligibility for most noncitizens. Subsequent executive orders and legislation relaxed some of these rules.

In contrast to its policies toward cash assistance, South Carolina pursued an accommodating set of food stamp policies. These included applying for waivers that exempted ABAWDs in economically distressed areas from work requirements, adopting "categorical eligibility" rules that relaxed the treatment of assets, and conducting numerous outreach efforts.

South Carolina also relaxed its food stamp recertification policies. Until October 2002, the recertification period for households with earned incomes was three months, while the period for most households with fixed incomes was a year. Starting in October 2002, clients with fluctuating incomes were only required to recertify semiannually. There were also changes in the methods, with more recertification interviews being conducted over the phone and less stringent verification procedures being used.

South Carolina's monthly cash assistance caseload dropped by nearly two-thirds between 1996 and 2000, from just under 50,000 households to 17,000 households. The state's food stamp caseload also declined, from 143,000 household in 1996 to 120,000 in 2000. Since 2000, the caseloads have rebounded, though in very different fashions. While the welfare caseload grew modestly and peaked at 23,000 households in 2002, the food stamp caseload soared, reaching a historic high of over 200,000 families by the end of 2003.

Changes in economic circumstances undoubtedly account for some of the trends in caseloads. The state's unemployment rate fell from 6 percent at the end of 1996 to 3.5-4.5 percent in the late 1990s before rising again in the second half of 2000. By 2003, the unemployment rate had reached 6.5 percent. While the trends in caseloads and unemployment have generally moved in the same directions, the asymmetric sizes of the caseload changes before and after the economic turning points leave considerable room for other explanations.

Some direct evidence indicates that policy changes have been important. With respect to the FI program, the South Carolina Legislative Audit Council (1998) found that three-fifths of case closures between the middle of 1996 and end of 1997 resulted from compliance failures, sanctions, and voluntary withdrawals, rather than people working their way off of welfare. The mechanical effects of time limits have also played a role, as more than 6,000 families have exhausted their eligibility. For the Food Stamp Program, the decline in the caseload coincided with the initial implementation of the PRWORA restrictions, while the rise coincided with the increase in recertification intervals and the adoption of other relaxed policies.

### III. Previous Research

The advent of welfare reform and the tremendous declines in assistance caseloads have prompted a torrent of research on program behavior. Because

comprehensive reviews already exist (Blank 2002; Bloom *et al.* 2002; Grogger and Karoly 2005; Moffitt 2002), we only briefly summarize the general findings from the literature and devote more attention to research that has directly examined welfare time limits and food stamp recertifications.

### ***A. General Findings from Cash Assistance Research***

Studies of welfare participation have almost universally found that better employment opportunities reduce participation. The dispute centers more on the magnitude than the existence of the relationship. Estimates range from one-tenth to two-thirds of the caseload decline being attributable to economic improvements.

Studies have also consistently found that reductions in benefits discourage welfare participation, with most estimates of the elasticity of participation with respect to changes in benefits falling between 0.2 and 0.5. From 1994–2003, South Carolina failed to adjust its welfare benefits for inflation, which meant that the real values declined by about one-sixth. Based on the elasticity estimates from the literature, this reduction alone would have contributed to a 3–8 percent decline in the state's welfare caseload.

Other welfare policies also appear to have played a role in the caseload declines, though the findings regarding specific policies have been equivocal. The strongest evidence comes from the numerous experimental evaluations that were conducted of waiver policies. Synthesizing results from more than two-dozen evaluations, Grogger and Karoly (2005) concluded that the demonstrations of policies similar to South Carolina's that required recipients to engage in work-related activities or that set time limits generally reduced participation.

### ***B. Welfare Time Limits***

Gittleman (1999) and Moffitt and Pavetti (2000) examined prereform data and calculated the percentage of welfare spells that would have run longer than five years. Their extrapolations indicated that 23–41 percent of welfare recipients might reach the time limit. Swann (2005) also used prereform data but estimated a dynamic structural model that incorporated forward-looking behavior. Simulations based on his model indicated that a five-year lifetime limit on welfare would reduce participation by 60 percent.

Newer observational studies have investigated people's actual experiences with time limits and controlled for other welfare reforms. Studies by the Council of Economic Advisors (1997, 1999) and Gittleman (2001) used simple dummy variables for whether a state adopted a time limit. These studies did not consider differences in the length or applicability of time limits and obtained results that were inconclusive. In contrast, Grogger and Michalopoulos (2003) and Grogger (2002, 2003, 2004) employed a clever strategy to address the applicability issue and generated stronger findings. Their insight was that, regardless of any time limit, families lose their eligibility for welfare once their youngest child reaches age 18. Thus, time limits initially are only binding on families with young children. Comparisons based on this quasi-experiment indicated that exposure to time limits reduced participation. Because the policies had only been in place for a few years, the evidence was interpreted as an anticipatory effect.

### *C. General Findings from Food Stamp Research*

As with the research on cash assistance, studies of food assistance have generally found that food stamp receipt falls as economic circumstances improve. These include aggregate studies of statewide caseloads and economic conditions by Danielson and Klerman (2005), Kabbani and Wilde (2003), Kornfeld (2002), Wallace and Blank (1999), Ziliak, Gundersen and Figlio (2003), and microstudies of participation decisions and household earnings and employment by Farrell et al. (2003), Gleason, Schochet, and Moffitt (1998), McKernan and Ratcliffe (2003), and Mills et al. (2001).

It has been more difficult to examine the impact of food stamp benefits because the annual benefit formula is identical across all states except Alaska and Hawaii. This means that nearly all of the cross-section variation in benefits is due to other state-assistance policies or personal characteristics. Fraker and Moffitt (1988) and Keane and Moffitt (1998) estimated structural econometric models that accounted for self-selection from employment and other program participation decisions and found that higher benefits encouraged food stamp use.

Only a few economic studies have examined other food stamp policies. Ziliak, Gundersen, and Figlio (2003) examined the cross-state differences in the proportion of ABAWDs who were exempt from the PRWORA work requirements and found that the exemptions modestly increased program participation. Danielson and Klerman (2006), Kabbani and Wilde (2003), and Kornfeld (2002) investigated the implementation of Electronic Benefit Transfer (EBT) systems and found that these innovations also encouraged participation. Currie and Grogger (2001), however, found that EBT systems increased participation for some groups but decreased it for others, while McKernan and Ratcliffe (2003) reported only weak negative impacts from these systems. Bartlett et al. (2004) conducted a more comprehensive survey of administrative policies, such as outreach efforts and operating hours, and administrator and staff attitudes across food stamp offices in different localities, and found that these administrative characteristics influenced participation behavior.

### *D. Recertification Intervals*

The U.S. General Accounting Office (1999) surveyed state Food Stamp Program directors regarding the reasons for the decline in food stamp caseloads following the enactment of the PRWORA. Most of the directors cited economic improvements, changes in eligibility associated with the PRWORA, and changes in state policies as important factors. None of them, however, felt that changes in recertification policies played a major role.

Direct analysis of program behavior, however, leads to the opposite conclusion. Kabbani and Wilde (2003) estimated that decreases in recertification intervals across states in the late 1990s could explain as much as 10 percent of the food stamp caseload decline. Currie and Grogger (2001) likewise found that food stamp participation among several subgroups of households was positively associated with average recertification intervals. McKernan and Ratcliffe (2003) found similar evidence for working households. Staveley, Stevens, and Wilde (2002) examined the duration of food stamp spells and found that spells were more likely to end in months that coincided with probable recertification dates than in other months.

#### IV. Analysis Data

The data for the empirical analyses come from case management records for South Carolina's food stamp and FI programs. From these records, we draw a 1-in-11 sample of cases with unmarried heads and children younger than age 18 that began a spell of food stamp or FI receipt between October 1996 and December 2003. In our descriptive analyses, we consider simple spells of food stamp and FI receipt. In the multivariate analyses, we look at more complex spells involving the receipt of food stamps alone, the receipt of FI benefits alone, and the receipt of both types of benefits together. Households may experience multiple spells.

The case records include right- and left-censored spells. In this study, spells are right-censored if they continued past December 2003 or at the first instance where information on time-varying explanatory measures was missing. We use hazard techniques to address the loss of information associated with right-censoring. Left-censored spells—spells that were ongoing as of October 1, 1996—are dropped from the analysis. This leads to a sample that is representative of new spells of benefit receipt but that may not be representative of all spells.

For the remaining spells, we observe the exact start dates and either the specific ending or censoring dates, making the durations nearly continuous in principle. A closer examination of the data revealed, however, that nearly all of the spells were coded to end on the last day of the month. Also, South Carolina usually only issues benefits once a month. In light of these features, we measure the spells in discrete monthly increments, starting with the first month in which benefits are paid.

The administrative records include many short breaks and short spells. For the analysis files, we smooth the information by combining spells of program participation that are separated by a month or less and ignoring spells of participation that last a month or less. This kind of smoothing is commonly applied in studies of caseload dynamics and can be interpreted as reflecting reasonably strong attachment or detachment from a program. This treatment is also consistent with policies in South Carolina, which consider program receipt spells that resume within one month of a previous spell to be a continuation of the earlier spell.

The case records designate one person who is responsible for the household's financial decisions and in a position to provide information on its members as the "primary informant." Our analyses include data on the primary informant's age, gender, race, educational attainment, and marital status as explanatory variables. From the information available about the household, we also include measures of the number of children in the age groups 0–2, 3–5, 6–11, 12–14, and 15–17-years-old. We use information on the county of residence to link the case records to local contextual measures. In particular, we use a three-month moving average of the per capita employment rate and the three-month trend in this rate as indicators of economic conditions. We use the population density to capture the degree of urbanization and development.

Because we are studying both the Food Stamp and FI programs, we limit the analysis to households with unmarried heads that were ever observed with a child younger than 18. In 2003, 45 percent of the households on food stamps in South

Carolina were single-adult household with children (USDA 2004).<sup>1</sup> To reduce the number of cases that we examine, we randomly select one out of every 11 households who ever met the selection criteria. We further exclude cases with (a) inconsistent spell information, (b) missing demographic or geographic data, (c) primary informants who changed over time, (d) primary informants who were younger than 18 or older than 85 years of age, and (e) child-only FI benefits. These exclusions reduce the sample by about 10 percent. The final analysis extract contains information for 14,056 households and includes 22,759 spells (304,835 months) of food stamp receipt and 6,287 spells (47,390 months) of FI receipt. Within these spells are 5,835 spells (41,387 months) of combined food stamp and FI receipt. Appendix 1 lists the means of the variables in the analysis.

## V. Descriptive Analysis of Hazard Rates

Figure 1 displays nonparametric Kaplan-Meier estimates of the hazard functions for the food stamp participation spells from the administrative data. Separate estimates are calculated for cohorts of households that began their spells at different times. The most striking features of the graphs are the pronounced spikes at three-, six-, and 12-month intervals. The spikes coincide with the dates when the households would have been required to recertify their eligibility and indicate that households were several times more likely to leave the Food Stamp Program in these months than in other months.

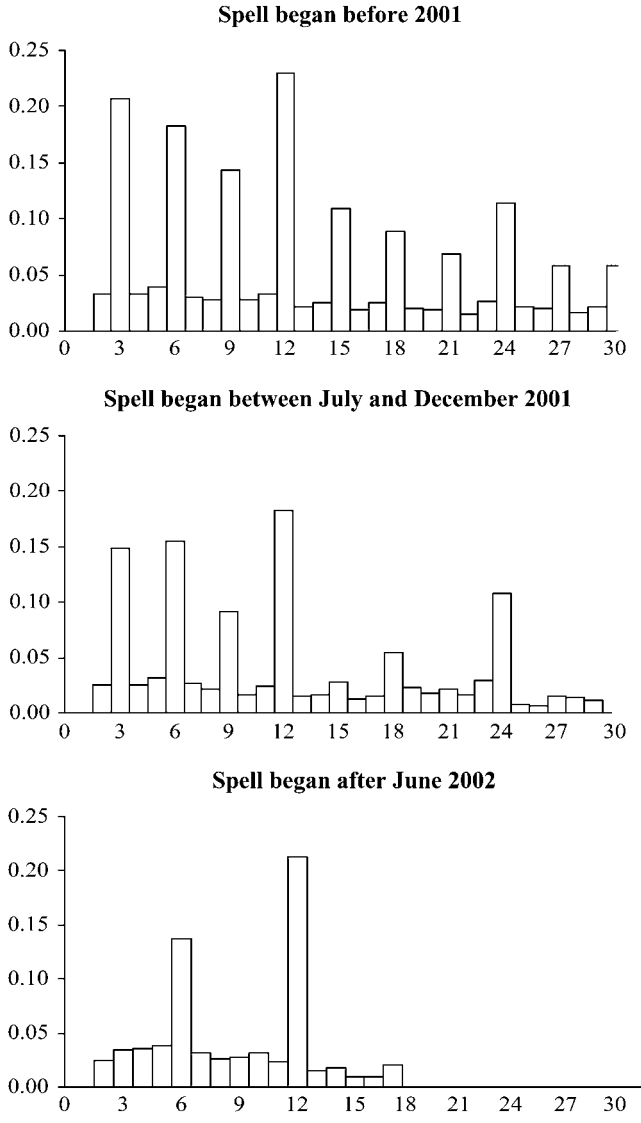
A close examination of different cohorts shows the association with recertification policy. The hazard function in the top panel corresponds to food stamp spells that began before 2001 when nearly all of the households were subject to quarterly or annual recertification. The middle panel shows hazard estimates for spells that began in the second half of 2001. This cohort of households was subject to quarterly and annual recertification for their first 12 months and semiannual and annual recertification thereafter. The bottom panel shows estimates for spells that began in the second half of 2002 when the households were subject to semiannual and annual recertification throughout their durations. In all three graphs, the spikes in the hazard rates line up exactly with the relevant recertification schedules.<sup>2</sup>

Figure 2 further disaggregates the spells by whether the case records indicated that the households initially had fluctuating or fixed incomes and were therefore subject to short or long recertification intervals. Because the administrative data do not record the relevant income status before July 2001, we only report estimates for the last two cohorts from Figure 1. Figure 2 provides further evidence that the patterns in hazard functions represent the effects of recertification and not something else. The hazard functions for households that initially had fluctuating incomes have

1. A separate analysis (Ribar, Edelhoach, and Liu 2006b) examines food stamp use and employment among childless households.

2. We do not display results for food stamp spells that began in the first halves of 2001 and 2002. However, the spikes in the hazard functions for these spells also line up with the relevant recertification intervals.

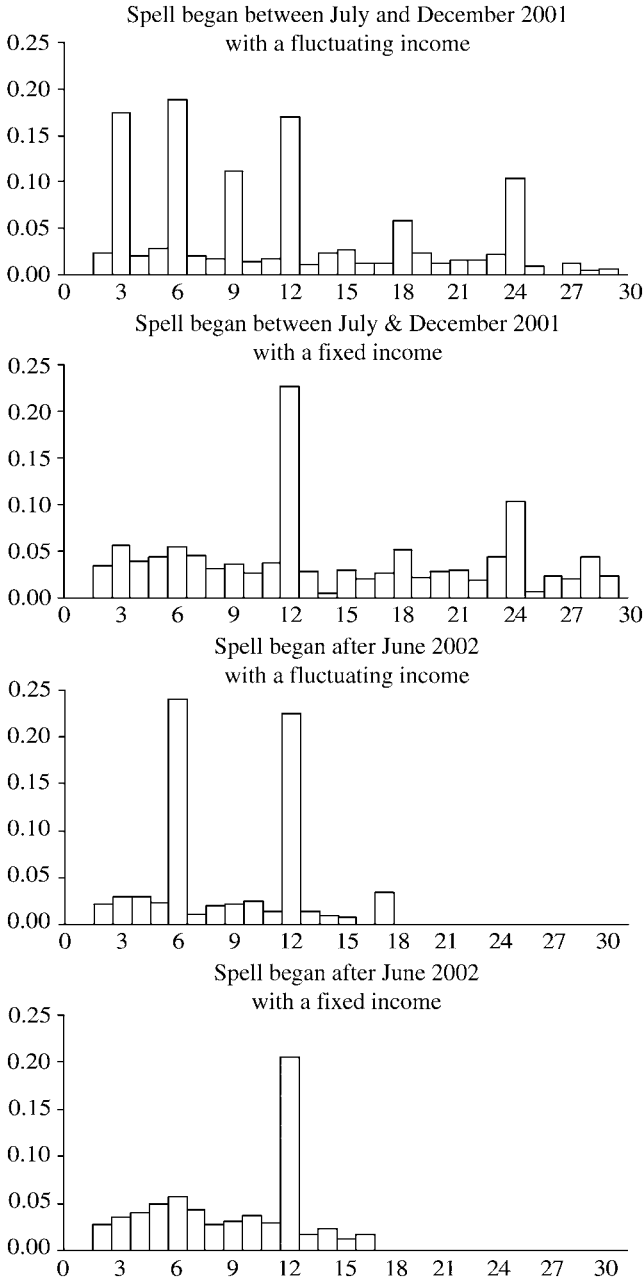




**Figure 1**  
*Nonparametric Hazard Estimates of Food Stamp Program Exits for Different Entry Cohorts of Single-headed Families with Children*

Note: Figures are Kaplan-Meier hazard functions, calculated using monthly administrative data from the South Carolina Department of Social Services.

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**Figure 2**  
*Nonparametric Hazards of Food Stamp Program Exits for Different Entry Cohorts of Single-headed Families with Children Conditional on Initial Income Status*

Note: Figures are Kaplan-Meier hazards, calculated using monthly administrative data from the South Carolina Department of Social Services.

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quarterly or semiannual spikes in the first year, while the hazard functions for households with fixed incomes only have an annual spike in the first year.

Beyond the strong evidence tying recertification to the timing of food stamp exits, there is also evidence that the change in recertification policy may have led to longer spells. Survival functions (not shown) indicate that spell lengths increased across successive cohorts of recipients. The median spell length for the first cohort was just under nine months, while the median durations for the latter two cohorts were closer to 12 months. Only a quarter of the spells that began before 2001 lasted 18 months or more, while nearly half of spells that started after June 2002 reached this duration.

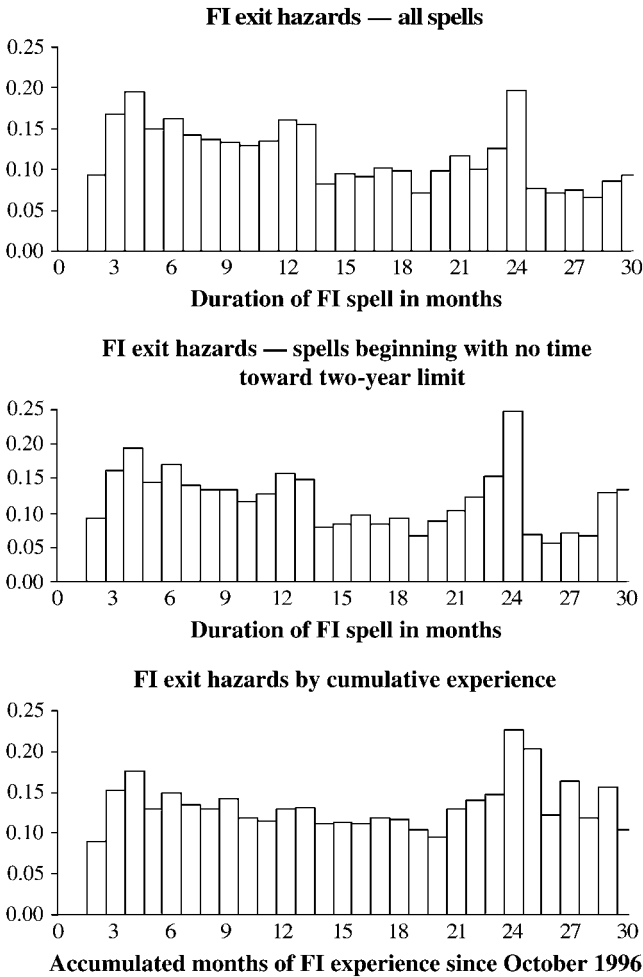
Turning to welfare exits, Figure 3 displays nonparametric hazard estimates for FI spells. The top panel shows the estimates for all of the spells from our analysis sample. On average, the monthly FI hazards are higher than the food stamp hazards, leading to much shorter spells. The median FI spell length is five months, and less than 10 percent of cases extend past 18 months. There is a noticeable spike in the 24th month of a spell, which is consistent with nonexempt households reaching the two-year time limit.

The estimates in the top panel include households that were returning to the FI program and starting their spells with time already elapsed from the two-year clock. The association between spell lengths and the time limit is clearer in the middle panel of Figure 3, which restricts the sample to spells with no prior FI experience. The shape of this hazard function is similar to that of the general sample, but the hazard estimates in the first 23 months for the restricted sample are slightly lower on average, while the spike at the 24th month is 25 percent higher.

Another way to examine the association with the time limit is to array the monthly hazard estimates by the accumulated amount of FI experience. We do this in the bottom panel of Figure 3 and again see that the hazard rate jumps in the 24th month. While the various analyses show that the hazard rates at the time limit are high, it is important to note that relatively few households actually reach this point. Of the 4,510 households in our sample that ever received FI, only 611 (14 percent) accumulated two years of experience.

## VI. Econometric Specification

Our multivariate models use more detailed definitions of program participation and nonparticipation than do the descriptive analyses. Specifically, we consider the four possible combinations of receipt and nonreceipt among South Carolina's Food Stamp and FI programs: receiving only food stamps ( $k = 1$ ), receiving only FI benefits ( $k = 2$ ), receiving both types of assistance ( $k = 3$ ), and receiving neither type of assistance ( $k = 4$ ). For each combination involving benefit receipt ( $k = 1, 3$ ), we model transitions to other types of receipt or nonreceipt, using a discrete-time, competing risk framework (Allison 1982). This modeling strategy allows us to examine program linkages. The distribution of transitions is shown in Table 1.

**Figure 3**

*Nonparametric Hazard Estimates of FI Program Exits for Single-headed Families with Different Prior Program Histories*

Note: Figures are discrete-time hazard functions, calculated using monthly administrative data from the South Carolina Department of Social Services.

We adopt multinomial logit specifications to model the different types of transitions. Let  $T_1(t)$  represent a vector of duration variables; let  $X_1(t)$  represent a vector of other observed explanatory variables, and let  $\mu$  and  $\eta$  be unobserved time-invariant variables. For the spells involving the receipt of food stamps alone, the hazard models for transitioning to combined food stamp and FI receipt,  $h_{13}(t)$ , and no receipt,  $h_{14}(t)$ , are

**Table 1**  
*Monthly Transitions among Program Categories*

Origin category	Destination category					Total monthly observations
	Food stamps only ( <i>k</i> = 1)	FI only ( <i>k</i> = 2)	Food stamps & FI ( <i>k</i> = 3)	Neither program ( <i>k</i> = 4)		
Food stamps only ( <i>k</i> = 1)	245,911 <i>93.3%</i>	11 <i>0.0%</i>	2,761 <i>1.0%</i>	14,765 <i>5.6%</i>	263,448 <i>100%</i>	
FI only ( <i>k</i> = 2)	46 <i>0.8%</i>	4,826 <i>80.4%</i>	397 <i>6.6%</i>	734 <i>12.2%</i>	6,003 <i>100%</i>	
Food stamps & FI ( <i>k</i> = 3)	3,604 <i>8.7%</i>	424 <i>1.0%</i>	36,152 <i>87.4%</i>	1,207 <i>2.2%</i>	41,387 <i>100%</i>	

Note: Estimates computed using monthly administrative data from the South Carolina Department of Social Services. Figures in *italics* are percentages of transitions from within a given program category (row percentages).

$$(1) \quad h_{13}(t) = \frac{\exp(A'_{13}T_1(t) + B'_{13}X_1(t) + \gamma_{13}\mu + \lambda_{13}\eta)}{1 + \sum_{k=3}^4 \exp(A'_{1k}T_1(t) + B'_{1k}X_1(t) + \gamma_{1k}\mu + \lambda_{1k}\eta)}$$

$$(2) \quad h_{14}(t) = \frac{\exp(A'_{14}T_1(t) + B'_{14}X_1(t) + \gamma_{14}\mu + \lambda_{14}\eta)}{1 + \sum_{k=3}^4 \exp(A'_{1k}T_1(t) + B'_{1k}X_1(t) + \gamma_{1k}\mu + \lambda_{1k}\eta)}$$

where  $A_{1k}$ ,  $B_{1k}$ ,  $\gamma_{1k}$ , and  $\lambda_{1k}$  denote coefficients. We do not model the 11 transitions from spells of simple food stamp receipt to FI alone and instead treat these spells as being right-censored.

We use similar specifications to model the transitions from the receipt of FI alone to the combined receipt of food stamps and FI,  $h_{23}(t)$ , and no receipt,  $h_{24}(t)$ , (the 46 transitions to the receipt of food stamps alone are treated as censoring events) and to model the transitions from combined receipt to simple food stamp receipt,  $h_{31}(t)$ , simple FI receipt,  $h_{32}(t)$ , and no receipt,  $h_{34}(t)$ .

The random variables,  $\mu$  and  $\eta$ , which appear throughout the specifications, are included to address problems that are common to hazard models and multiple-event processes. One of these problems is spurious duration dependence that arises when unobserved heterogeneity is present. Accurate estimates of duration effects are especially important in this analysis because the recertification and time limit policies are duration-related. Another problem involves associations among the series of spells that we observe for a given household. Each of our hazard models includes the time spent in previous spells, such as the total consecutive months of food stamp receipt and the cumulative months of FI experience, as explanatory variables. The terms  $\mu$  and  $\eta$  account for unmeasured characteristics of households that could lead to earlier program participation behavior being correlated with current behavior. For each of the heterogeneity terms, we follow a finite mixture approach (Heckman and Singer 1984) and specify discrete distributions, estimating all of the points of support and associated probabilities.

The system of models, consisting of the three possibly repeating discrete-time competing-risk hazard specifications (seven transition outcomes) interlaced with the two sources of unobserved heterogeneity, is estimated using maximum likelihood with the aML software package (Lillard and Panis 2003).

## VII. Multivariate Estimation Results

### A. General Specification Issues

An initial step in estimating the transition models is to specify the functional forms of the baseline hazards. All of the models use piecewise-linear functions, or linear splines, to control for general spell duration effects. The splines for the baseline hazards in the models of transitions out of spells of receiving only food stamps ( $h_{13}(t)$  and  $h_{14}(t)$ ) each have 14 segments: 12 three-month segments covering the first three years of a spell, a 12-month segment covering the fourth year, and a final segment thereafter.<sup>3</sup> The splines in the models of transitions from receiving only FI benefits

3. The specific elements of the duration vectors in the food stamp only transition models are  $T_{0,3}(t) = \min(t, 3)$ ,  $T_{4,6}(t) = \max[0, \min(t-3, 3)]$ , ...  $T_{34,36}(t) = \max[0, \min(t-33, 3)]$ ,  $T_{37,48}(t) = \max[0, \min(t-36, 12)]$ , and  $T_{49+}(t) = \max(0, t-48)$ .

( $h_{23}(t)$  and  $h_{24}(t)$ ) have eight quarterly segments followed by a final segment, while the splines in the models of transitions from combined receipt ( $h_{31}(t)$ ,  $h_{32}(t)$  and  $h_{34}(t)$ ) have eight quarterly segments followed by two six-month segments and a final segment. The number of segments and locations of the connecting points were selected after some initial experimentation and specification testing.

All of the models also include linear splines to account for time-trend effects. The specifications are identical across the models with 12-month segments that correspond to each fiscal year through 2002 and a final segment covering all of fiscal and calendar year 2003.

In addition to the linear splines for duration dependence and calendar effects, the transition models include other controls for program effects that evolve with the spell duration. In the transition models from spells of food stamp receipt, four dummy-variable controls correspond to potential recertification months—indicators for every third and 12th month of a food stamp spell that occurs before October 2002 and indicators for every sixth and 12th month of a spell that occurs after that.<sup>4</sup> The dummy controls are defined relative to the start of the current spell of food stamp receipt—regardless of FI status—and are included to account for discrete jumps in the transitions in recertification months. Each of the food stamp transition models also includes a linear control for the total consecutive months of food stamp receipt, again defined regardless of FI status.

The transition models also include measures of the household's cumulative experience with the FI program to examine effects associated with the household's progression toward the two-year time limit. These measures include linear splines with three segments for the first 23 months of program experience (with the splines connecting at the end of the sixth and 12th months) and dummy indicators for 24–25 months of experience and for 26 or more months of experience. The latter two dummy measures are included to indicate households that have reached or passed the two-year limit. The model for transitions from spells of only receiving food stamps include an additional indicator for any FI experience whatsoever. In the models for spells involving FI receipt, the experience measures evolve with the duration of the spell. Separate duration and experience effects in these models are identified by returning households (we would never observe any differences in the two clocks if there was no reentry or if we only considered initial participation spells). In the models involving spells of only receiving food stamps, the experience effects are constant across the duration of the spell.

A second general specification issue involves the inclusion and distribution of the unobserved heterogeneity terms,  $\mu$  and  $\eta$ , and the normalization of the coefficients on these terms. We report detailed results from models with the two unobserved terms but have also estimated models with only one term and with no terms (the results are available upon request). Specification tests support the inclusion of two terms. However, there are few substantive differences in the results when more restrictive models are estimated—the differences being mostly confined to the baseline duration controls. We report results from models with three points of support for each

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4. We also estimated food stamp models that included three- and six-month dummy variables before and after October 2002. The coefficients on the six-month indicators before October 2002 and the three-month indicators afterward were jointly insignificant and usually close to zero.

of the heterogeneity terms; models with additional points of support failed to converge. The first term,  $\mu$ , is included in all of the transition models and normalized in terms of the transition with the most observations, the transition from simple food stamp receipt to no program receipt (for  $h_{14}(t)$ , we set  $\gamma_{14} = 1$ ). Identification of the second heterogeneity term requires that it be excluded from at least one transition. Here again we use the transition from food stamps only to no program receipt (set  $\lambda_{14} = 0$ ). We normalize  $\eta$  in terms of the transition from simple FI receipt to no program receipt (for  $h_{24}(t)$ , we set  $\lambda_{24} = 1$ ).

### ***B. Estimation Results***

Coefficient estimates and average marginal effects for the policy and economic measures from the transition models are reported in Table 2. The remaining coefficient estimates for these models, including the coefficients for the measured household characteristics, time trends, baseline hazard patterns, and unobserved heterogeneity terms, appear in Appendix 2. In both the table and appendix the first two columns list results for the models of transitions out of simple food stamp receipt; the next two columns list results for the models of transitions out of simple FI receipt, while the final three columns list results for transitions out of combined receipt.

The estimates from Table 2 indicate that the food stamp and FI program policy variables are statistically and substantively important, even after other characteristics are controlled for. The single-parent households in our sample were much more likely to leave the Food Stamp Program in recertification months—at quarterly and annual intervals prior to October 2002 and at half-yearly and annual intervals subsequently—than in other months. For example, the estimated marginal effect of 0.116 for the quarterly recertification measure in the model of transitions from simple food stamp receipt to no receipt is calculated as the difference of the probability of transitioning at the three-month interval (0.147) and the probability of transitioning in another month (0.031). Thus, the probability of making this type of transition was nearly five times higher in potential quarterly recertification months than in other months, with the difference rising to nearly six times in potential annual recertification months.

The spikes in transition behavior during potential recertification months were largest for the transitions from food stamps only to no benefits. However, there were increases in other types of transitions as well. For the transitions from combined receipt to no receipt, there is a large (55 percent increase), statistically significant coefficient for the quarterly indicator as well as two other large but imprecisely estimated coefficients for the semiannual and annual indicators after October 2002. A more intriguing result is that transitions from combined receipt to simple FI receipt also rose, with the two short-interval indicators being large and statistically significant and the additional long-interval indicator for the period after October 2002 also being significant.

The model estimates also provide evidence of both anticipatory and mechanical effects from the two-year time limit. For households that were only receiving FI benefits, the risk of transitioning to no receipt rose, and the risk of transitioning to



**Table 2**  
*Selected Coefficient Estimates and Marginal Effects from Transition Model*

Transition:	Food Stamps Only to		FI Only to		Food Stamps and FI to		
	Food Stamps and FI $h_{13}(t)$	No Receipt $h_{14}(t)$	Food Stamps and FI $h_{23}(t)$	No Receipt $h_{24}(t)$	Food Stamps Only $h_{31}(t)$	FI Only $h_{32}(t)$	No Receipt $h_{34}(t)$
<b>Recertification Months</b>							
3 Month (< Oct. 2002)	0.0942* (0.0570)	1.8012*** (0.0239)			-0.0543 (0.0479)	1.6639*** (0.1436)	0.4910*** (0.0746)
	-0.0005	0.1161			-0.0078	0.0193	0.0135
12 Month (< Oct. 2002)	0.2272* (0.1207)	0.4533*** (0.0496)			0.1668 (0.1041)	-0.0822 (0.2529)	0.1670 (0.1900)
	0.0024	0.0262			0.0133	-0.0010	0.0042
6 Month ( $\geq$ Oct. 2002)	-0.0108 (0.1633)	1.6399*** (0.0532)			0.0069 (0.1316)	1.2073*** (0.4613)	0.3645 (0.2220)
	-0.0019	0.1346			-0.0028	0.0187	0.0101
12 Month ( $\geq$ Oct. 2002)	0.1493 (0.2404)	0.6381*** (0.0732)			-0.0099 (0.1975)	1.1964** (0.5474)	0.4924 (0.3313)
	0.0012	0.0397			-0.0046	0.0185	0.0150
<b>Cumulative FI experience</b>							
Any FI experience	0.2921** (0.1249)	0.0144 (0.0625)					
	0.0027	0.0006					
Spline: 0-6 Months	0.0788*** (0.0265)	-0.0175 (0.0145)	-0.1279** (0.0540)	0.3857*** (0.0785)	0.0567** (0.0249)	-0.0167 (0.0735)	0.0130 (0.0414)
	0.0010	-0.0010	-0.0123	0.0189	0.0037	-0.0003	0.0002

Spline: 7–12 Months	0.0357** (0.0167)	-0.0097 (0.0117)	0.0283 (0.0523)	-0.0221 (0.0463)	-0.0361** (0.0145)	-0.0288 (0.0428)	-0.1052*** (0.0260)
Spline: 13–23 Months	0.0006 (0.0114)	-0.0005 (0.0086)	0.0014 (0.0408)	-0.0029 (0.0377)	-0.0024 (0.0097)	-0.0002 (0.0343)	-0.0032 (0.0187)
Spline: 24–25 Months	-0.0126 (0.0002)	-0.0222*** (0.0010)	0.0667 (0.0033)	0.0190 (0.0015)	0.0324*** (0.0022)	-0.0281 (0.0003)	0.0429** (0.0008)
26+ Months	-0.0127 (0.1881)	-0.0080 (0.1110)	-0.0480 (0.9832)	0.2367 (0.5768)	0.0808 (0.1121)	-0.0014 (0.7776)	-0.0018 (0.2749)
County economic and population characteristics	-1.2006*** (0.1881)	-0.1291 (0.1105)	-0.2281 (0.8264)	0.7751 (0.7462)	-0.0404 (0.1003)	0.2521 (0.4617)	-0.4865* (0.2504)
Employment rate	-0.0132 (0.0125**)	-0.0042 (0.0162***)	-0.0304 (0.0201)	0.1116 (0.0244)	-0.0023 (0.0174***)	0.0022 (0.0017)	-0.0111 (0.0265***)
Employment trend	0.0001 (0.0419)	0.0008 (0.0174)	0.0010 (0.1312)	0.0022 (0.1034)	0.0013 (0.0368)	0.0000 (0.1024)	0.0007 (0.0610)
Population density	-0.0733* (0.0008)	0.0624*** (0.0033)	0.0076 (0.0010)	0.1492 (0.0147)	0.1269*** (0.0101)	0.0213 (0.0000)	0.0833 (0.0019)
	-0.4760** (0.2014)	0.0211 (0.0993)	0.4990 (0.7017)	1.3676* (0.7494)	-0.0387 (0.2003)	0.1503 (0.6882)	0.0694 (0.3140)
	-0.0053 (0.0168)	0.0014 (0.1272)	0.0168 (0.0015)	0.1272 (0.0015)	-0.0034 (0.0015)	0.0015 (0.0015)	0.0019 (0.0019)

Note: Estimates computed using monthly administrative data from the South Carolina Department of Social Services. The full set of estimation results are reported in Appendix 2. Asymptotic standard errors for the coefficients appear in parentheses. Average marginal effects appear in *italics*.

\* Significant at 0.10 level.  
 \*\* Significant at 0.05 level.  
 \*\*\* Significant at 0.01 level.

combined receipt fell with the first six months of FI experience. The risk of transitioning to no receipt remained elevated over the seventh-23rd months and then spiked in the 24th month, while the risk of transitioning to combined receipt remained depressed over this same interval. For households in combined receipt spells a different picture appears. These households were generally at an increased risk of transitioning to simple food stamp receipt over the first 23 months of FI experience and then at a substantially higher risk in the 24th month. Starting from the seventh month of program experience, combined-receipt households had a decreased risk of transitioning to no receipt. There was no strong association between program experience and combined-receipt households transitioning to simple food stamp receipt.

For households that were only receiving food stamps, the risk of transitioning to combined receipt—that is, of entering FI—increased with the first 12 months of FI experience, remained elevated through the next 11 months, then dropped sharply once the households reached 24 months. In contrast, the probability of food-stamp-only households transitioning to no receipt more consistently fell with FI experience. One implication of these two patterns is that households that reached the FI time limit were substantially more likely than other households to remain dependent on food stamps.

The economic results near the bottom of the table are in the anticipated directions. Higher employment rates were associated with more transitions from both simple and combined food stamp receipt to no receipt. Higher employment rates were also associated with transitions from combined receipt to simple food stamp receipt. Economic growth was positively associated with transitions from simple food stamp receipt to no receipt and from combined receipt to simple food stamp receipt and negatively associated with transitions from simple food stamp receipt to combined receipt. While there were several statistically significant associations between the economic variables and the transition outcomes, the sizes of the associations were very modest. Consider a relatively large hypothetical change in employment that increased both the average rate and the growth rate by a full percentage point. Such a change would have contributed to less than a half a percent increase in the transition rate from simple food stamp receipt to no receipt, a quarter of a percent increase in the transition rate from combined receipt to no receipt, and just over a 1 percent increase in the transition rate from combined receipt to simple food stamp receipt.

The results for the other observed controls, as reported in Appendix 2, are mostly consistent with expectations. Female- and black-headed households were less likely than other households to make transitions from program receipt to no receipt. The youngest household heads were the least likely to transition out of simple FI receipt or to transition from combined receipt to no receipt; however, they were the most likely to transition out of simple food stamp receipt. The number of children was negatively associated with the probability of transitioning from simple or combined food stamp receipt to no receipt and positively associated with the probability of transitioning from simple FI receipt to combined receipt. Among households that were only receiving food stamps, those with more adults, more educated heads, and formerly married heads were more likely to transition to no receipt.

The coefficients for our common unobserved factor,  $\mu$ , were significant and positive in all but one of the models. Thus, households that were likely to make one type

of transition were also likely to make others or put another way, could be broadly categorized as “movers” or “stayers.” The coefficients for the second unmeasured characteristic,  $\eta$ , are less uniform and only significant for three types of transitions. The results indicate that households that had a high risk of transitioning from simple FI receipt to no receipt also had higher risks of transitioning from combined receipt to FI receipt and no receipt.

### C. Simulation Results

The estimates from the transition models indicate that recertification intervals in the Food Stamp Program, the two-year time limit in the FI program, and economic conditions each affected the timing of different types of program transitions. The magnitudes of these associations with participation outcomes are harder to determine because of the cumulative nature of the transition processes and our consideration of simple and combined program spells. To give a better sense of the magnitudes, we use the estimated coefficients and the observed characteristics of our sample to conduct a partial simulation of caseload outcomes.

The simulation is partial because our models only examine some of the relevant processes that make up the caseload. In particular, we have not modeled initial program entry or reentry behavior. For our simulations, we take the initial entry as given in the data. For each household that then appears, we simulate possible program transitions under different conditions. When a household completely transitions out of assistance, we use year-specific averages of the observed monthly reentry rates from no receipt to each of our program outcomes to account for movements back onto the programs. Thus, our procedure treats the observed entry and reentry behavior as being fixed and only considers changes in the caseload that are associated with transitions between and exits from the programs. The simulations also do not account for spells that were ongoing as of October 1996. Results for the simulations are reported in Table 3.

The top rows in Table 3 show the simulated average monthly caseloads in each calendar year from 1998 through 2003 using the actual data from our sample and the procedures described above. This baseline simulation reproduces the caseload statistics for our sample, with each year’s simulated food stamp caseload estimate being within  $-0.7$  to  $2.4$  percent of the sample averages and the simulated FI caseloads being within  $0.8$  to  $7.2$  percent of the sample averages.

We examine the implications of recertification by comparing outcomes from the baseline simulation, which includes the October 2002 change in recertification intervals, with outcomes under the assumption that there was no change. The simulations indicate that the higher exit rates associated with the extra recertifications would have reduced the “new-spell” portion of the 2003 caseload by  $7.9$  percent.

In the next set of figures, we consider what would have happened if there were no FI experience effects in the models. For these simulations, we allow the spell duration clocks to run but do not allow the experience clocks to run after the first month. The simulations indicate that FI caseloads would have risen by about a fifth in each year and the food stamp caseloads would have been little affected.

The fourth set of figures simulates how caseloads would have evolved after July 2000 if there had been no recession and employment rates had stayed at their July

**Table 3**  
*Simulated Caseload Changes Under Different Conditions*

	Simulated Monthly Number of Households Receiving				Simulated Percent Change in Households Receiving				
	Food Stamps Only	FI Only	Food Stamps and FI	Any Food Stamps	Food Stamps Only	FI Only	Food Stamps and FI	Any Food Stamps	Any FI
<b>Baseline simulation</b>									
1998	23,752	692	5,177	28,929					
1999	29,422	700	4,656	34,078					
2000	31,444	637	4,927	36,371					
2001	37,987	806	6,469	44,456					
2002	46,956	961	7,574	54,530					
2003	57,854	818	7,642	65,496					
<b>Quarterly recertification intervals maintained after October 2002</b>									
2002	46,752	966	7,573	54,325	-0.4	0.5	0.0	-0.4	0.0
2003	52,833	850	7,514	60,347	-8.7	3.9	-1.7	-7.9	-1.1
<b>Two-year FI time limit eliminated</b>									
1998	23,380	973	5,547	28,927	-1.6	40.6	7.1	0.0	11.1
1999	28,811	1,137	5,323	34,134	-2.1	62.4	14.3	0.2	20.6
2000	30,759	1,003	5,756	36,515	-2.2	57.5	16.8	0.4	21.5
2001	37,104	1,204	7,461	44,565	-2.3	49.4	15.3	0.2	19.1
2002	45,777	1,489	8,873	54,650	-2.5	54.9	17.2	0.2	21.4
2003	56,446	1,340	9,131	65,577	-2.4	63.8	19.5	0.1	23.8

No recession, employment conditions fixed at July 2000 levels										
2000	31,418	634	4,909	36,327	5,543	-0.1	-0.5	-0.4	-0.1	-0.4
2001	37,708	783	6,304	44,012	7,087	-0.7	-2.9	-2.6	-1.0	-2.6
2002	46,178	919	7,398	53,576	8,317	-1.7	-4.4	-2.3	-1.7	-2.6
2003	56,893	795	7,469	64,362	8,264	-1.7	-2.8	-2.3	-1.7	-2.3
No time-trend effects after FY 2000										
2000	31,448	640	4,907	36,355	5,547	0.0	0.5	-0.4	0.0	-0.3
2001	36,455	753	6,020	42,475	6,773	-4.0	-6.6	-6.9	-4.5	-6.9
2002	41,239	778	6,632	47,871	7,410	-12.2	-19.0	-12.4	-12.2	-13.2
2003	48,423	716	6,911	55,334	7,627	-16.3	-12.5	-9.6	-15.5	-9.8

Note: Simulations obtained by applying transition model coefficients to monthly administrative data from the South Carolina Department of Social Services. The calculations use the actual entry behavior and average yearly reentry rates from the administrative data. Therefore, the simulations only reflect changes that arise from changes in exit rates and between-program transitions—entry and reentry behavior are effectively held constant.

2000 values. The results indicate that the “new spell” food stamp and FI caseloads would have only been slightly lower. Finally, the last set of figures examines the contribution of the time-trend variables, which account for other unmeasured policy and economic changes. As with the employment rate simulation, we freeze the time-trend controls at their July 2000 values. The time trends (unexplained factors) account for nearly two-thirds of the food stamp caseload growth by 2003 as well as most of the FI caseload growth.

### VIII. Conclusion

Our descriptive and multivariate analyses of household-level program data from South Carolina indicate that food stamp recertification intervals and TANF time-limit policies strongly affect the timing of exits, the length of assistance spells and ultimately caseloads in the relevant programs. Nonparametric estimates of the timing of food stamp exits show that exits were much more likely to occur during months when households were required to recertify their eligibility than in other months. The estimated sizes of the effects are very large. In the multivariate analyses, the transition rates out of the Food Stamp Program were five to six times higher in recertification months than other months. Median spell lengths for food stamp participation increased by nearly three months after South Carolina increased its recertification intervals for households with earnings, and we estimate that the portion of the caseload that we were able to examine rose by 8 percent.

Analyses of FI participation spells indicate that there is a marked increase in the hazard of leaving the program at the second anniversary, which is consistent with families exhausting their time limits. Our multivariate analysis revealed that a family’s probability of leaving the FI program generally increased with its accumulated experience on the program and spiked when its experience reached two years. The results buttress earlier findings by Grogger and Michalopoulos of anticipatory, or banking, effects of time-limit policies and provide new evidence of mechanical, or eligibility-exhaustion, effects. The estimated associations are also large; we calculate that the two-year time limit decreased the portion of the caseload that we could observe by roughly one-fifth.

Consistent with other studies, we find that changing economic conditions were associated with caseload movements. Our estimates, however, are in the lower range of what has been previously reported. Policy changes appear to have played a much bigger role in South Carolina.

As food stamp caseloads continue to swell and as more families either are diverted from or exhaust their eligibility for TANF, the Food Stamp Program is becoming a more important part of the safety net. Issues associated with the administration of food stamps are also becoming more prominent. We have shown that recertification is a significant “bump in the road” for food stamp recipients. Further research is needed to determine whether (for whom, and under what conditions) recertification is a useful screen that removes ineligible families from the program, an obstacle that keeps some eligible families from renewing their participation, or some combination of the two.

**Table A1**  
*Means of Analysis Variables*

	All Months	Months of Only Food Stamp Receipt	Months of Only FI Receipt	Months of Combined FS and FI Receipt
Primary informant and household characteristics				
Female	0.97	0.97	0.99	0.97
Black	0.72	0.73	0.75	0.70
Age	31.69	32.32	22.08	29.11
Completed some high school	0.30	0.29	0.44	0.32
Completed high school	0.53	0.54	0.44	0.50
Completed some college	0.13	0.13	0.07	0.13
Formerly married	0.36	0.37	0.11	0.32
Number of children aged 0–2	0.45	0.43	0.88	0.54
Number of children aged 3–5	0.39	0.39	0.23	0.43
Number of children aged 6–11	0.68	0.71	0.16	0.60
Number of children aged 12–14	0.25	0.26	0.07	0.20
Number of children aged 15–17	0.18	0.19	0.03	0.14
Number of other adults	0.15	0.16	0.10	0.09
County characteristics				
Employment rate	44.94	44.96	43.89	44.97
Employment trend	−0.03	−0.03	−0.03	−0.04
Population per square mile (000s)	0.20	0.20	0.17	0.20
Number of monthly observations	310,838	263,448	6,003	41,387
Number of spells	30,049	22,982	1,232	5,835

Note: Estimates computed using monthly administrative data from the South Carolina Department of Social Services.



**Table A2**  
*Complete Estimation Results from Transition Model*

	Food Stamps Only to		FI Only to		Food Stamps and FI to		
	Food Stamps and FI $h_{1,3}(t)$	No Receipt $h_{1,4}(t)$	Food Stamps and FI $h_{2,3}(t)$	No Receipt $h_{2,4}(t)$	Food Stamps Only $h_{3,1}(t)$	FI Only $h_{3,2}(t)$	No Receipt $h_{3,4}(t)$
<b>Recertification Months</b>							
3 Month (< Oct. 2002)	0.0942* (0.0570)	1.8012*** (0.0239)			-0.0543 (0.0479)	1.6639*** (0.1436)	0.4910*** (0.0746)
12 Month (< Oct. 2002)	0.2272* (0.1207)	0.4533*** (0.0496)			0.1668 (0.1041)	-0.0822 (0.2529)	0.1670 (0.1900)
6 Month ( $\geq$ Oct. 2002)	-0.0108 (0.1633)	1.6399*** (0.0532)			0.0069 (0.1316)	1.2073*** (0.4613)	0.3645 (0.2220)
12 Month ( $\geq$ Oct. 2002)	0.1493 (0.2404)	0.6381*** (0.0732)			-0.0099 (0.1975)	1.1964** (0.5474)	0.4924 (0.3313)
<b>Cumulative FI experience</b>							
Any FI experience	0.2921** (0.1249)	0.0144 (0.0625)					
Spline: 0-6 Months	0.0788*** (0.0265)	-0.0175 (0.0145)	-0.1279** (0.0540)	0.3857*** (0.0785)	0.0567** (0.0249)	-0.0167 (0.0735)	0.0130 (0.0414)
Spline: 7-12 Months	0.0357** (0.0167)	-0.0097 (0.0117)	0.0283 (0.0523)	-0.0221 (0.0463)	-0.0361** (0.0145)	-0.0288 (0.0428)	-0.1052*** (0.0260)

Spline: 13–23 Months	-0.0126 (0.0114)	-0.0222*** (0.0086)	0.0667 (0.0408)	0.0190 (0.0377)	0.0324*** (0.0097)	-0.0281 (0.0343)	0.0429*** (0.0187)
24–25 Months	-1.1214*** (0.1944)	-0.2386** (0.1110)	-0.2873 (0.9832)	1.5043*** (0.5768)	0.7011*** (0.1121)	-0.0969 (0.7776)	0.0627 (0.2749)
26+ Months	-1.2006*** (0.1881)	-0.1291 (0.1105)	-0.2281 (0.8264)	0.7751 (0.7462)	-0.0404 (0.1003)	0.2521 (0.4617)	-0.4865* (0.2504)
County economic and population characteristics							
Employment rate	0.0125** (0.0060)	0.0162*** (0.0030)	0.0201 (0.0197)	0.0244 (0.0203)	0.0174*** (0.0061)	0.0017 (0.0188)	0.0265*** (0.0097)
Employment trend	-0.0733* (0.0419)	0.0624*** (0.0174)	0.0076 (0.1312)	0.1492 (0.1034)	0.1269*** (0.0368)	0.0213 (0.1024)	0.0833 (0.0610)
Population density	-0.4760** (0.2014)	0.0211 (0.0993)	0.4990 (0.7017)	1.3676* (0.7494)	-0.0387 (0.2003)	0.1503 (0.6882)	0.0694 (0.3140)
Personal and household characteristics							
Black	0.1413*** (0.0507)	-0.3616*** (0.0245)	0.2445 (0.1639)	-0.5288*** (0.1638)	-0.0337 (0.0469)	-0.5409*** (0.1508)	-0.3913*** (0.0729)
Female	0.1125 (0.1628)	-0.1954*** (0.0519)	0.4752 (0.5257)	-0.9201* (0.5570)	0.0359 (0.1409)	0.3619 (0.5825)	-0.3265* (0.1683)
Spline for age 18–25	-0.0887*** (0.0139)	-0.0103 (0.0081)	0.2331*** (0.0418)	0.1433*** (0.0460)	0.0149 (0.0136)	-0.0125 (0.0409)	0.0506** (0.0213)
Spline for age 25–50	-0.0200*** (0.0046)	-0.0133*** (0.0021)	-0.0153 (0.0218)	0.0085 (0.0261)	-0.0189*** (0.0048)	-0.0163 (0.0161)	-0.0064 (0.0071)
Spline for age 50 and older	-0.0557*** (0.0211)	-0.0346*** (0.0067)	0.0661 (0.3752)	-0.7643 (0.8691)	-0.0493 (0.0444)	-0.1038 (0.2556)	0.0117 (0.0646)
Children ages 0–2	0.0464 (0.0371)	-0.1585*** (0.0206)	0.2477* (0.1320)	0.2659*** (0.1337)	0.0017 (0.0378)	0.0862 (0.1156)	-0.1454** (0.0620)

(continued)

**Table A2** (continued)

Transition:	Food Stamps only to		FI Only to		Food Stamps and FI to		
	Food Stamps and FI	No Receipt	Food Stamps and FI	No Receipt	Food Stamps Only	FI Only	No Receipt
	$h_{13}(t)$	$h_{14}(t)$	$h_{23}(t)$	$h_{24}(t)$	$h_{31}(t)$	$h_{32}(t)$	$h_{34}(t)$
Children ages 3–5	-0.0799** (0.0378)	-0.1654*** (0.0205)	0.3817*** (0.1134)	0.1167 (0.1484)	-0.0007 (0.0367)	-0.1749 (0.1305)	-0.2004*** (0.0643)
Children ages 6–11	-0.0647** (0.0281)	-0.1147*** (0.0144)	0.2385* (0.1263)	-0.0272 (0.1820)	-0.0158 (0.0282)	-0.0941 (0.1064)	-0.1292*** (0.0481)
Children ages 12–14	-0.0305 (0.0478)	-0.0634*** (0.0213)	0.1094 (0.2304)	0.3230 (0.2884)	-0.0506 (0.0474)	-0.1370 (0.1704)	-0.1682** (0.0814)
Children ages 15–17	-0.1743*** (0.0592)	0.0324 (0.0250)	0.4104 (0.2883)	-0.5865 (0.3903)	0.1074* (0.0570)	-0.2934 (0.2148)	0.0377 (0.0901)
Other adults	-0.0519 (0.0561)	0.1621*** (0.0242)	-0.1369 (0.1696)	-0.1348 (0.1850)	0.0135 (0.0642)	0.7265*** (0.1444)	0.0390 (0.0996)
Formerly married	0.0809 (0.0524)	0.1214*** (0.0261)	0.2535 (0.2058)	0.0974 (0.2547)	-0.0052 (0.0513)	0.2020 (0.1772)	-0.0286 (0.0812)
Some high school	-0.1013 (0.1097)	-0.0540 (0.0560)	-0.1517 (0.3148)	-0.6160* (0.3400)	0.0546 (0.1186)	0.3970 (0.3568)	-0.2229 (0.1471)
Completed high school	-0.1094 (0.1084)	0.1313** (0.0549)	-0.0262 (0.3180)	-0.2874 (0.3377)	0.1243 (0.1160)	0.3054 (0.3617)	-0.1575 (0.1437)
Completed some college	-0.1493 (0.1214)	0.3164*** (0.0604)	0.0678 (0.3870)	-0.1007 (0.4011)	0.1294 (0.1251)	0.5077 (0.3960)	-0.1202 (0.1606)

Time trend									
FY 1996–97	0.0080	-0.0047	-0.0198	-0.0835	-0.0039	0.2376**	0.0084		
	(0.0205)	(0.0117)	(0.0483)	(0.0841)	(0.0272)	(0.1048)	(0.0278)		
FY 1997–98	-0.0406***	0.0024	-0.0224	0.1064***	0.0563***	0.0719**	-0.0408***		
	(0.0110)	(0.0051)	(0.0301)	(0.0296)	(0.0110)	(0.0339)	(0.0151)		
FY 1998–99	-0.0061	0.0038	0.0097	-0.0599**	-0.0090	0.0056	0.0383***		
	(0.0101)	(0.0043)	(0.0310)	(0.0268)	(0.0090)	(0.0263)	(0.0148)		
FY 1999–2000	0.0265***	0.0055	0.0426	0.0247	0.0002	-0.0052	-0.0138		
	(0.0089)	(0.0041)	(0.0298)	(0.0285)	(0.0089)	(0.0258)	(0.0151)		
FY 2000–2001	-0.0120	-0.0298***	-0.0549*	-0.0464	-0.0265***	-0.0285	-0.0185		
	(0.0084)	(0.0041)	(0.0287)	(0.0286)	(0.0085)	(0.0255)	(0.0151)		
FY 2001–2002	0.0016	-0.0123***	-0.0123	0.0006	0.0064	-0.0381	0.0199		
	(0.0081)	(0.0043)	(0.0292)	(0.0270)	(0.0080)	(0.0280)	(0.0137)		
FY 2002–	-0.0366***	-0.0010	0.0377	-0.0025	-0.0052	-0.0255	-0.0178		
	(0.0079)	(0.0041)	(0.0270)	(0.0243)	(0.0071)	(0.0327)	(0.0136)		
Spell duration and other controls									
Intercept	-5.3694***	-9.3177***	-12.1131***	-11.5415***	-9.6664***	-14.4247***	-11.2415***		
	(1.2502)	(1.7635)	(3.0041)	(3.0717)	(1.3256)	(2.7469)	(1.7307)		
Spline: 0–3 Months	-0.1950***	0.5610***	-0.7266***	0.8209***	1.1161***	0.9281***	1.3742***		
	(0.0387)	(0.0296)	(0.1152)	(0.1702)	(0.0608)	(0.1625)	(0.1162)		
Spline: 4–6 Months	-0.1067***	-0.0265**	0.2594**	-0.1308	-0.1049***	0.0838	-0.0508		
	(0.0311)	(0.0106)	(0.1091)	(0.0895)	(0.0270)	(0.0746)	(0.0440)		
Spline: 7–9 Months	0.0081	-0.0848***	0.0465	-0.0850	-0.0188	-0.0680	0.0214		
	(0.0378)	(0.0131)	(0.1317)	(0.0912)	(0.0306)	(0.0856)	(0.0516)		
Spline: 10–12 Months	-0.0268	0.1199***	0.0977	0.3029***	0.0550	0.2175**	0.1281*		
	(0.0479)	(0.0190)	(0.1641)	(0.1173)	(0.0395)	(0.1058)	(0.0740)		

(continued)

**Table A2** (continued)

	Food Stamps only to		FI Only to		Food Stamps and FI to		
	Food Stamps and FI $h_{13}(t)$	No Receipt $h_{14}(t)$	Food Stamps and FI $h_{23}(t)$	No Receipt $h_{24}(t)$	Food Stamps Only $h_{31}(t)$	FI Only $h_{32}(t)$	No Receipt $h_{34}(t)$
Spline: 13–15 Months	-0.1142** (0.0570)	-0.1886*** (0.0237)	-0.3090 (0.2191)	-0.1288 (0.1592)	-0.2077*** (0.0541)	-0.1465 (0.1592)	-0.1161 (0.1090)
Spline: 16–18 Months	0.1262** (0.0625)	0.0022 (0.0251)	0.4069 (0.2665)	-0.0301 (0.2120)	0.0447 (0.0701)	-0.2970 (0.3150)	-0.1959 (0.1592)
Spline: 19–21 Months	-0.1478** (0.0689)	-0.0175 (0.0300)	-0.7143 (0.4659)	0.2253 (0.2278)	-0.0033 (0.0813)	0.5012 (0.3299)	-0.1467 (0.2400)
Spline: 22–24 Months	0.1061 (0.0813)	0.0674** (0.0325)	0.5339 (0.8928)	0.0835 (0.3022)	-0.0828 (0.0943)	-0.2664 (0.4396)	0.5618** (0.2502)
Spline: segment 9a	-0.1709* (0.0969)	-0.0357 (0.0373)	-0.1269 (0.5473)	-0.4209 (0.3407)	-0.0255 (0.0635)	0.0214 (0.2787)	-0.0064 (0.1171)
Spline: segment 10a	-0.1096 (0.1281)	0.0069 (0.0424)			-0.1337 (0.0872)	0.1713 (0.2713)	0.0502 (0.1413)
Spline: segment 11a	0.2215 (0.1373)	-0.1683*** (0.0571)			0.0500 (0.0344)	0.0518 (0.0600)	0.0528 (0.0615)
Spline: segment 12a	-0.1134 (0.1095)	0.1367** (0.0564)					
Spline: segment 13a	-0.0013 (0.0288)	-0.0088 (0.0126)					
Spline: segment 14a	-0.0499** (0.0249)	0.0048 (0.0111)					

Food stamp spell duration	0.0159*** (0.0031)	-0.0040 (0.0025)		0.0040* (0.0022)	-0.0278** (0.0118)	-0.0451*** (0.0065)
Unobserved heterogeneity parameters						
$\gamma$	0.6863*** (0.1136)	1.0000	1.0913*** (0.3771)	0.9617** (0.4106)	0.2529 (0.2343)	0.6797*** (0.1956)
$\lambda$	-0.0839 (0.0811)		0.1206 (0.1315)	1.0000	0.5955*** (0.1030)	0.0754* (0.0396)
Points	$\mu_1$ -0.6064	$\mu_2$ 4.3610** (1.7240)	$\mu_3$ 5.2416*** (1.7354)	$\eta_1$ -1.1066	$\eta_2$ 0.2454 (0.3951)	$\eta_3$ 3.8817*** (0.6621)
Probabilities	0.01	0.63	0.36	0.51	0.42	0.07

Note: Estimates computed using monthly administrative data from the South Carolina Department of Social Services. Asymptotic standard errors appear in parentheses.

\* Significant at 0.10 level.

\*\* Significant at 0.05 level.

\*\*\* Significant at 0.01 level.

a. Definitions of duration spline segments vary across models and are described in text.

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