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THE RELATIONSHIP BETWEEN OVERPAYMENTS AND UNDERPAYMENTS IN THE FOOD STAMP PROGRAM

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EXECUTIVE SUMMARY

This study addresses the concern that federal emphasis on reducing overpayment error might serve to increase underpayment error in the Food Stamp Program. Since Fiscal Year 1983, States have been subject to fiscal liabilities if they exceed a target error rate for benefit issuances to ineligible cases and overissuances to eligible cases.[1] No penalty exists for underissuances to eligible cases, nor for erroneous denials or terminations of assistance. This imbalance in the treatment of overpayment and underpayment error raises the possibility that States, in seeking to control overpayment error and thereby avoid liabilities, may divert their attention from underpayments and allow such errors to rise. This analysis uses food stamp error rates by State from 1980 through 1986 to examine whether there is any empirical basis for this concern.

The experience of States in the Food Stamp Program during the 1980s indicates that lower overpayment error has not been accompanied by higher underpayment error. To the contrary, the evidence examined here suggests that lower overpayments have been associated with lower underpayments. This relationship is found when one examines either the cross-sectional variation in error among States or--more pertinently--the intertemporal variation in error for individual States. In addition, there is no evidence to suggest that those particular States previously needing to reduce overpayment error to avoid liabilities have systematically experienced increases in underpayment error. These findings are all based on a measure of underpayments that includes underissuances to eligible cases but does not include erroneous denials or terminations.

The analysis undertaken in this study has addressed two specific questions, with the following results:

Do error rate comparisons from State to State indicate that food stamp overpayments and underpayments are systematically related to each other, either positively or negatively? In cross-sectional variation, the error rates for overpayments and underpayments are positively related. Thus, States

[1] States have been subject to liabilities for excessive errors since 1981, but based initially on whether the State's error rate for total overpayment and underpayment errors exceeded the national average.

with relatively low error of one type tend also to have relatively low error of the other type. For instance, a State whose overpayment error rate is below the median in one period tends also to be below the median error rate for underpayments in the same period. The correlation coefficient between overpayment and underpayment error was found to be positive and statistically significant in each of the seven years under study. These findings must be interpreted with caution, however, for the relative performance of States may reflect the influence of such factors as caseload demographic characteristics and socioeconomic conditions, as well as administrative actions.

Are individual States able to reduce their food stamp overpayment error rate without increasing their underpayment error rate? This is the more relevant question in addressing concerns about the unbalanced liability for overpayment and underpayment error.

Several separate findings support the judgment that States are able to reduce overpayments with no worsening of their underpayment error rate.

- The correlation coefficient between dollar error rates for overpayments and underpayments, when computed separately by State for the seven-year interval of generally declining overpayments, was positive and statistically significant for fourteen States. For no State was the coefficient significantly negative.

- To the extent that significant correlations exist between the year-to-year changes in overpayments and underpayments observed among all States, these correlations were also positive.

- Year-to-year movement in the overpayment and underpayment error rates--if statistically significant--tended to be in the same direction for both types of error. About two-thirds of the observed error rate changes are not statistically significant at the 90 percent confidence level.

- In instances where States needed to reduce their overpayment error rate to avoid an impending liability, with no similar pressure to reduce underpayments, there was no evidence to suggest any corresponding upward movement in underpayment error.

- In a multiple regression model controlling for State-specific and year-specific effects on error, a lower

level of overpayments was significantly associated with a lower level of underpayments.

In summary, this analysis finds no empirical support for the hypothesis that federal emphasis on reducing overpayments may prompt increasing underpayments. However, the limitations of available data warrant caution in interpreting the evidence. Most importantly, the underpayment measure subject to analysis reflects neither the extent of erroneous denials or terminations nor the possibility of "caseload churning" among eligible households who reapply after being denied or terminated only for procedural reasons. Second, the seven-year historical period--while including all years during which liabilities have been in effect--allows only limited analysis of the intertemporal variation in error rates by State. Third, the data reflect some changes over time in the measurement of error rates. For example, changes occurred during the period in the adjustments made to reflect the findings of the federal subsample re-review and to account for State noncompletion of case reviews. Fourth, there is only limited information on the sampling error of the official error rates, restricting the extent to which one can assess the statistical significance of year-to-year changes in error rates.

The first issue above, the lack of comparable data on negative case action error, is the most serious data limitation. Unfortunately, there is no way to assess its implications. The other issues appear to be of relatively minor significance and arguably do not influence the findings in any important fashion.

A final caveat is that the factors influencing error rates are subject to varying degrees of State and local administrative control. Without an elaborate modelling approach and much more data, however, one cannot estimate separately the effects on error of these various factors. The nature of controllable variation is of most interest to this study. Greater attention is thereby focused here on the pattern of year-to-year changes in error rates by State, rather than the State-to-State comparison of error rate levels. The presumption is that the pattern of intertemporal variation reflects more the administrative changes within each State than it does the shifts in external conditions. However, the historical period under study saw major changes in the economy and program policy. Since the observed movement

of overpayment and underpayment error for each State reflected in part the influence of such factors, the findings are limited in what they suggest about the effects of State and local administrative actions on the resulting mix of error in the Food Stamp Program.

CHAPTER ONE

INTRODUCTION

Federal quality control policy in the Food Stamp Program seeks to promote payment accuracy by offering "enhanced funding" or "incentive payments" to low-error States and imposing fiscal "liabilities" or "sanctions" on high-error States. Enhanced funding is offered for low error rates on benefit issuances to ineligible cases, overissuances and underissuances to eligible cases, and erroneous denials and terminations. However, since 1983, fiscal liabilities have been based on State performance with respect only to overpayment error--that is, issuances to ineligible cases and overissuances to eligible cases.

It is the different treatment of overpayments and underpayments in quality control policy that gives rise to the present study. A persistent criticism of the prevailing policy is that, by establishing a stronger incentive for States to control overpayments than underpayments, the federal government may be prompting States to take actions that increase underpayments. In response to this concern, the Food and Nutrition Service (FNS) conducted a study in 1985 to examine whether the system of error rate liabilities in the Food Stamp Program has "caused an emphasis on overpayment errors to the detriment of improving all payment errors" and whether this emphasis has "resulted in administrative decisions that encourage judgments against clients."[1] The historical period under study included the eight semiannual quality control reporting periods during Fiscal Years 1980 to 1983. The major findings of the study were as follows (pp. i-ii):

- "...this analysis suggests that the error sanction system has not resulted in increased underpayment error rates."
- "Analysis also suggests that there is no statistically significant correlation of the national error rates; i.e., national overpayment error rate levels are not systematically associated with national underpayment error rate levels."

[1] See U.S. Department of Agriculture, Food and Nutrition Service, Office of Analysis and Evaluation, "The Relationship Between Overpayment and Underpayment Error Rates in the Food Stamp Program: A Preliminary Analysis," by Robert Dalrymple, November 1985.

- "...on an individual basis, only a few States had significant correlations, and these were mixed between positive and negative correlations."

- "The most consistent relationship found [on an individual State basis] is that States with high overpayment error rates also tend to have high underpayment error rates..."

The report noted the limitations posed by the small number of observations per State, the lack of variability in the underpayment error rate, and the exclusion from the underpayment measure of foregone benefits due to erroneous denials or terminations.

1.1 Statement of the Research Question

The present study has been undertaken to re-examine the relationship between overpayment and underpayment error, employing more recent data and different empirical methods than those in the 1985 FNS study. Specifically, the research question to be addressed is as follows:

> Based on the observed experience of States since 1980, are the food stamp error rates for overpayments and underpayments systematically related in such a way as to suggest that federal policy emphasis on the reduction of overpayment error tends to promote an increase in underpayment error?

As did the November 1985 FNS report, this study adopts the State as its unit of analysis. In any given period, each State is viewed as administering the Food Stamp Program under basic federal policy provisions that are common nationwide, but under State-specific circumstances regarding the demographic characteristics of the client population, the prevailing socioeconomic conditions, and--most importantly for this study--the administrative procedures employed in caseload management. Because of the substantial within-State variation that may exist along any of these latter dimensions, each State might be more appropriately viewed as a set of heterogeneous localities. This study, however, does not explicitly address such internal diversity and treats each State as effectively uniform within its boundaries.

The choice of administrative practices in each State is considered here to be responsive in some measure to the federal government's quality control policies, to the extent that such policies alter the financial (and

political) consequences of committing errors, through threatened fiscal liabilities and available incentive payments. The annually-determined error rates for overpayments and underpayments in each State, as sample measures of the degree of payment accuracy achieved during that period, reflect importantly (but not solely) the choice of administrative practices. The key issue under consideration here is whether this link between federal quality control policies and State administrative practices is such that the federal policy emphasis on the reduction of overpayments has prompted States to adopt administrative practices that, while serving to reduce overpayments, have also served to increase underpayments.

There are several arguments by which one would not expect rising underpayments as a consequence of efforts to control overpayments. First, both overpayments and underpayments should be reduced if the administrative response to threatened liabilities is to become more error-conscious in general and to take more care in collecting, verifying, and processing client information and in applying policy rules. Second, if the measures to reduce overpayments focus predominantly on such program elements as client assets, for which overpayment error is the only type of error that might result, the corrective actions should have little effect on underpayments. Third, if overpayments and underpayments are separate error phenomena, arising from different sources and responding independently to administrative actions, one expects to find no systematic relationship between them.

The countering arguments, that underpayments might increase in conjunction with efforts to reduce overpayments, focus on the role of uncertainty and discretion in deciding client eligibility and benefits.[2] If program managers, supervisors, and caseworkers respond to the threat of liabilities by shifting the "burden of proof" upon the client in situations of questionable case information or ambiguous program policy, there is arguably an increased risk of underpayments.

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[2]The corresponding literature addresses similar issues arising in the Aid to Families with Dependent Children program. For instance, see the following: Evelyn Z. Brodkin, "The Error of Their Ways: Reforming Welfare Administration through Quality Control," doctoral dissertation, Massachusetts Institute of Technology, 1983; Jerry L. Mashaw, "The Management Side of Due Process," Cornell Law Review, Vol. 59, 1974, pp. 772-837; and John Mendeloff, "Welfare Procedures and Error Rates: An Alternative Perspective," Policy Analysis, Vol. 3, 1977, pp. 357-374.

These scenarios are not mutually exclusive for any State, and one expects States to differ from each other in their response to liabilities. The empirical question is whether the observed experience of States is more supportive of one view or another.

Before any examination of the data, it is important to consider the differing inferences to be drawn by comparing error rates across States at different time periods versus comparing error rates over time for individual States. Previous analysis has shown that interstate variation in food stamp error rates is significantly affected by demographic or socioeconomic factors.[3] Thus, a cross-sectional finding that overpayment and underpayment error rates are positively correlated does not necessarily indicate that individual States acting to reduce one type of error have also typically experienced a reduction in the other type. The cross-sectional variation may simply indicate that the differences between States in the program's operating environment have enabled some to achieve lower levels of both error types, totally apart from the administrative practices in use. Indeed, the error patterns observed cross-sectionally can be considered relevant here only to the extent that States employing similar administrative practices could be expected to exhibit similar error rate levels.

In contrast, error rate changes from one time period to the next are more likely to reveal the effects on error of changes in administrative practices. While intertemporal variation in error rates may also reflect changes in external factors, such factors are arguably less subject to change from period to period for any State. For these reasons, this study will give greater importance to the findings derived from analysis of error rate changes, as opposed to error rate levels. Since error measures are subject to sampling variability, care has been taken to examine the statistical significance of year-to-year changes in error rates, where such changes are the focus of analysis.

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[3]See Michael J. Puma and David C. Hoaglin, "The Effect of Caseload and Socioeconomic Characteristics on Food Stamp Payment Error Rates," Abt Associates Inc., Cambridge, Massachusetts, April 10, 1987.

1.2 Organization of the Report

Chapter Two of this report discusses the data and empirical methods used in the analysis. The quality control measurement system is briefly reviewed, with attention to those aspects of measured error rates that complicate either the analysis itself or the interpretation of findings. Chapter Three then presents the analysis of cross-sectional variation in error rates, assessing whether States with lower rates of overpayment error also tend to achieve lower (or higher) rates of underpayment error. Chapter Four examines year-to-year changes in error rates to establish whether the observed movements in overpayment and underpayment error by State are systematically related. Finally, Chapter Five presents a more generalized, multivariate analysis of the relationship between overpayments and underpayments, accounting for the effects of State-specific and time-specific circumstances.

CHAPTER TWO:

DATA SOURCES AND STATISTICAL ISSUES

2.1 Error Rate Definitions and Measurement

The principal sources of data for this study are the annual (or previously semiannual) reports issued by the Food and Nutrition Service for each quality control reporting period.[1] These reports contain the error rate findings by State for both active cases and negative case actions, but only the active caseload data have been used here. The negative case action reviews, unlike the active case reviews, address principally the procedural correctness of case actions and not the substantive correctness of the eligibility and benefit determinations. Specifically, a negative case action is considered correct if existing information in the case record sufficiently justifies the denial or termination. Moreover, a reported negative action error does not necessarily mean that the household lost benefits, since the agency may simply have failed to document its decision on a household that was ineligible for assistance. No information is collected on the dollar amount of foregone or lost benefits among those clients considered to have been erroneously denied or terminated.

In contrast, the active case reviews include not only a review of the case record but also a full field investigation of the household's circumstances, in order to establish the benefit amount that the household was entitled to receive. Each State initially aggregates its findings for the reviewed sample cases and computes its "reported" error rates for "payment errors"--issuances to ineligible cases and overissuances to eligible cases--and for "underissuances" to eligible cases. (Eligible cases are considered correctly paid if the monthly benefit issuance is within $5 of the entitlement determined in the quality control review.) The estimated extent of errors in the State's active caseload is computed both in terms of "case error rates," cases in error as a percentage of total cases, and "dollar error rates," issuances in error as a percentage of total issuances.

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[1]For Fiscal Years 1983 through 1986, these reports are each entitled "Food Stamp Quality Control Annual Report." For Fiscal Years 1980 through 1982, the reports were issued semiannually for the October-March and April-September periods and are each entitled, "Semiannual Summary Report of Food Stamp Quality Control Reviews."

Since Fiscal Year 1981, each State's "official" dollar error rates have reflected two federal adjustments. The first, based on the findings of federal re-reviews for a subsample of the State's completed sample, accounts for possible reporting bias in the State's findings. This statistically-derived "regression" adjustment is made separately to the dollar error rates for both payment errors and underissuances. The second adjustment, based on the extent to which the State fails to complete its review of sampled cases, provides an incentive for States to draw their required sample size and review all sampled cases that are subject to review. From 1981 through 1985, this latter adjustment was made only to the dollar error rate for payment errors; beginning with 1986, it is now also made to the dollar error rate for underissuances.

These adjustments result in the "regressed dollar error rates" for payment errors and for underissuances, also termed the "official" error rates. The regressed dollar error rate for payment errors, or the "payment error rate," is the criterion measure for imposition of fiscal liabilities.

For the purposes of this study, the following terminology is adopted, unless otherwise specified:

- overpayments--issuances to ineligible cases and overissuances to eligible cases;
- underpayments--underissuances to eligible cases;

[redacted]

underpayments)--cases in error as a percentage of total cases, as reported by the State; and

- regressed dollar error rate (for either overpayments or underpayments)--issuances in error as a percentage of total issuances, reflecting the adjustments for federal re-review and sample noncompletion.

Exhibit 2.1 shows the national trend in the regressed dollar error rates for both overpayments and underpayments.

EXHIBIT 2.1

NATIONAL AVERAGE ERROR RATES FOR OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1986

	1980	1981	1982	1983	1984	1985	1986
	National average error rate (%)						
Overpayments	9.51	9.90	9.54	8.34	8.60	8.28	8.13
Underpayments	2.35	2.50	2.44	2.45	2.32	2.24	2.30

observations were available for regressed dollar error rates, representing Fiscal Years 1980 through 1986. For Puerto Rico, observations were available only for 1980 and 1981, prior to the conversion of the program to a block grant. For reported case error rates, the number of observations is one fewer due to unreported data for Montana in 1982. For analysis of year-to-year changes in error rates, this data set yielded 319 observations for changes in regressed dollar error rates and 317 observations for changes in reported dollar error rates, with Montana again responsible for the small difference.

At the outset of this study, consideration was given to two adjustments to the regressed dollar error rates. As explained below, one was to modify the error rates in a way that would remove the existing endogeneity of the error rate denominator. The second was to eliminate the effect of the federal adjustment for sample noncompletion. Since preliminary analysis showed that such corrections would be so trivial as to have no appreciable effect on the findings, neither was performed. Nevertheless, the issues are presented briefly here.

As to the nature of the error rate denominator, one might argue that the conventionally-computed error rates are ill-suited for analysis because the denominator, total issuances, is itself a function of the extent of error and is therefore endogenous. This could be corrected by dividing all dollar error rates by the corresponding value of 1-x+y, where x and y are the conventionally-measured dollar error rates for overpayments and underpayments respectively. It turns out that error rates are only superficially affected by such corrections, since the value of 1-x+y is typically so close to 1. The correlation coefficient between the conventional and corrected dollar error rates is .9974 for overpayments and .9970 for underpayments, when computed for the 373 annual State observations.

As to the federal adjustment for sample noncompletion, one could argue on technical grounds that this adjustment introduces an arbitrary upward bias to the error rates for the affected States. Here again, however, it turns out that "corrected" estimates are so highly correlated with the conventionally-reported statistics that the correction seems unwarranted. The simple correlation coefficient between the corrected and uncorrected dollar

error rates for overpayments is estimated at .9998, using the observations for which a corrected value can be readily computed.[2]

2.2 Sampling Variation and Statistical Significance

Because the quality control measurement system operates through the review of randomly-selected cases in each State, the computed error rates are subject to sampling error. The error rate estimated for each State in each reporting period can be viewed as drawn from a distribution that is centered about the "true" caseload-wide error rate, but is subject to variation depending importantly upon the size of the sample. The dispersion of this "sampling distribution" is indicated by its variance, which can be readily computed for case error rates estimated from a simple random sample. (In such instances, with a sample of n cases, the variance of the estimated error rate p is simply p(1-p)/n.) For dollar error rates, or in instances where the sampling scheme is something other than simple random selection, the computation of the variance is more complicated.

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[2]The corrected values for the regressed overpayment dollar error rates (x') were computed from their corresponding uncorrected (official) values (x) as follows:

for 1981 through 1983-- $x' = x - (s * (.95-r)/.95)$
for 1984 through 1986-- $x' = x - (2s * (1.00-r)/1.00)$

where, consistent with the federal formula, s is the standard error of the State-reported dollar error rate for overpayments, and r is the ratio of completed State reviews to sampled State cases (or to the federally-established minimum sample size, if this is larger). The specific calculation above was possible only for 24 State observations in 1983, using the standard errors computed for that year by the General Accounting Office. See U.S. General Accounting Office, "Quality Control Error Rates in the Food Stamp Program," GAO/RCED-85-98, April 12, 1985, p. 9. The correlation between the corrected and uncorrected values for these 24 observations was found to be .9998. An approximate calculation of the corrected error rate was computed for 212 observations from 1983 to 1986, using the standard error of the regressed overpayment dollar error rate as a proxy for the standard error of the reported overpayment dollar error rate. For 1983 to 1985, the standard errors were computed for selected states by Westat and reported in a recent study prepared for the Food and Nutrition Service. See Westat, Inc., " A Statistical Evaluation of Food Stamp Quality Control," by Morris H. Hansen and Benjamin J. Tepping, September 1987, Table A-1. For 1986, the standard errors were reported by the Food and Nutrition Service in "Food Stamp Quality Control Annual Report: Fiscal Year 1986," September 1987, p. 15. The correlation coefficient between the corrected and uncorrected values for these 212 observations was also found to be .9998.

Because this study focuses considerable attention on year-to-year changes in error rates for each State, the issue of sampling error becomes even more important. The variance of the change in the error rate is the sum of the variances of the separate annual rates, if one considers successive annual error rates in each State to be independent statistics.

For the regressed overpayment dollar error rates by State, the standard error (the square root of the variance) has been released by the Food and Nutrition Service only for Fiscal Year 1986. For 1983, 1984, and 1985, Westat, Inc. computed the standard errors for all States subject to a liability.[3] Unfortunately, standard errors are not available for the regressed underpayment dollar error rates in any period.

The approach taken in this study, when examining year-to-year changes in overpayments or underpayments, is to consider such changes to be significant only when different from zero at the 90 percent confidence level. Where the information does not exist to perform such a test on the change in regressed dollar error rates, the test is performed on the corresponding change in reported case error rates. In such instances, this places reliance on the State's reported case error rate as a reasonable proxy for its regressed dollar error rate. For the pooled set of State observations from 1980 through 1986, the correlation between these error rates is expectedly high, .801 for overpayments and .711 for underpayments. Where case error rates are used, the standard error is computed on the assumption of a simple random sample. This results in some imprecision for States that employed stratified sampling.

The need for attention to the sampling variability of the measured error rates is indicated by the finding that, of the year-to-year error rate changes observed from 1980 to 1986, more than two-thirds were not significantly different from zero at the 90 percent confidence level. This is true for the observed changes in regressed dollar error rates for overpayments and for changes in reported case error rates for overpayments and underpayments.

[3] See Westat (1987), table A-1.

CHAPTER THREE:

STATE-TO-STATE VARIATION IN ERROR RATES

3.1 Conceptual Approach

The issue addressed in this chapter is whether States with lower rates of overpayment error also systematically achieve lower (or higher) rates of underpayment error than other States in the same period. Any such systematic relationship would suggest, but only in a prima facie way, the direction of expected movement in the underpayment error rate for States that successfully lower their overpayment error rates.

This kind of inference, however, is weakened to the extent that States differ on dimensions other than their administrative procedures. The relative performance of States is seemingly affected by variation in circumstances such as caseload demographic characteristics and local socioeconomic conditions.[1] If interstate variation in the pattern of overpayment and underpayment error is indeed systematically related to variation in such factors, cross-sectional comparisons could be misleading as indications of expected error rate movements resulting from deliberate action in any particular State. Nonetheless, this cross-sectional analysis has merit as an initial exploratory step, to be contrasted later with the findings from examination of year-to-year error rate changes in each State.

The only prior published analysis of the cross-sectional relationship between overpayments and underpayments in the Food Stamp Program is contained in the 1985 FNS study. This earlier report found the correlation between regressed dollar error rates for overpayments and underpayments to be significantly positive in five of the eight semiannual review periods during Fiscal Years 1980 to 1983 (with values as high as .60), and not significantly different from zero in the remaining three periods (with values as low as .10).[2]

The approach taken here was first to examine whether States below the median error rate for overpayments also tend to be below the median error rate for underpayments in the same period. The next step was to compute for

[1] See Puma and Hoaglin (1987).
[2] See Food and Nutrition Service (1985), p. 25.

each year the correlation coefficent between State error rates for overpayments and underpayments.

3.2 Empirical Findings

In each year, one-half of States will be below the annual median error rate for overpayments, by definition. Separately, one-half will be below the median for underpayments. The first question addressed here is whether a State that is below the median for one type of error also tends to be concurrently below the median for the other type of error.

Based on the 373 available State observations for annual regressed dollar error, pooled over the seven-year historical period, States below the median error rate for overpayments are very likely to be at the same time below the median underpayment error rate (Exhibit 3.1). Specifically, 65 percent (119/184) of the State observations below the overpayment median were also below the corresponding underpayment median. Arranging these data in a two-by-two contingency table and performing the standard chi-square test of significance, one can reject with 99.9 percent confidence the hypothesis that a State's position relative to the overpayment median is independent of its position relative to the underpayment median.[3]

The standard approach for examining the degree of association between such error rate measures is to compute the correlation coefficient between them, as was done in the 1985 FNS study. Here, the correlation was computed for each of the seven annual reporting periods and also for the observations pooled over the entire seven-year interval (Exhibit 3.2). In all instances, the correlation coefficient was positive and significantly

[3]Contingency tables are typically used to organize data when observations correspond to categorical outcomes or discrete events. The chi-square test of significance is the standard procedure for testing the hypthesis that outcomes or events are independent of each other.

EXHIBIT 3.1

RELATIONSHIP OF STATES TO ANNUAL MEDIAN ERROR RATES FOR OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1986

	Relationship to annual median underpayment error rate		
	Below median	At or above median	Total
	Number of State observations		
Relationship to annual median overpayment error rate			
Below median	119	65	184
At or above median	64	125	189
Total	183	190	373

Chi-square test of significance:

Degrees of freedom	1
Value of chi-square	35.42
Probability*	0.000

*Significance level at which one can reject the hypothesis of independence.

EXHIBIT 3.2

CORRELATION BETWEEN OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1986

1980	1981	1982	1983	1984	1985	1986	Pooled total
Correlation coefficient							
.616***	.256*	.343**	.436***	.544***	.615***	.389***	.463***
Number of State observations[a]							
54	54	53	53	53	53	53	373

* Different from zero at the 90 percent confidence level.
** Different from zero at the 95 percent confidence level.
***Different from zero at the 99 percent confidence level.

Note: The 1981 estimate is different from the 1980 estimate at the 95 percent confidence level. All subsequent annual estimates are not different from their corresponding prior-year value, at the 90 percent confidence level.

[a]Error rate data for Puerto Rico are not available after Fiscal Year 1981, due to the subsequent conversion of the program to a block grant.

different from zero with at least 90 percent confidence. The values of the coefficient ranged from .256 in 1981 to .616 in 1980.[4]

These findings indicate that States with lower overpayment error than other States also tend to achieve lower underpayment error. However, for the reasons cited earlier, this evidence is only weakly supportive of the judgment that States reducing their overpayment error are also able to reduce their underpayment error.

[4]The change in the coefficient between these two particular periods was found to be significant at the 95 percent confidence level. (Recall that the 1980 data are unusual in not being subject to either the federal re-review or sampling adjustments. Also in 1980, sample completion requirements were relaxed to permit completion of 1979 reviews.) Subsequent year-to-year differences in coefficients were found not to be significant at the 90 percent level.

CHAPTER FOUR:

STATE-SPECIFIC VARIATION IN ERROR RATES

4.1 Conceptual Approach

As stated earlier, the policy concern that motivates this study is that federal emphasis on reducing overpayment error may prompt States into actions that cause higher underpayments. Without the appropriate experimental data, these relationships must be inferred indirectly from historically-observed variation in error rates, as affected not only by deliberate corrective actions, but also by caseload demographic characteristics and socieoconomic conditions. The empirical approach must seek to minimize the confounding effects on error of these other factors.

One strategy for doing this is to conduct separate analyses of error rates on a State-by-State basis, where one might assume the external factors to be unchanged. However, the seven-year historical period, while short enough as to limit the number of observations per State, is long enough as to call into question any such assumption of stable environmental conditions. A second strategy is to conduct the analysis on changes in error rates from one year to the next, during which time the non-administrative conditions in each State are again assumed to be relatively stable (though different from State to State). One can thereby justify a pooling of the observed year-to-year changes over all States and years. Both strategies have been employed here.

The 1985 FNS study also conducted both State-by-State analysis of error rate inter-relationships and pooled analysis of changes in error rates. Based on eight semi-annual observations of regressed dollar error rates per State, for 1980 through 1983, the correlation coefficient between overpayments and underpayments was found to be significantly positive for six States (ranging in value from .63 to .97) and significantly negative for one State (-.78). Based on the six review periods for 1981 to 1983, during which time a federal policy of error rate liabilities was in force, the correlation was found to be significantly positive for four States (from .74 to .97) and significantly negative for four States (from -.73 to -.78). The study interpreted these mixed results as evidence of no systematic inter-relationship between the two types of error.

In examining error rate changes, the FNS study first ranked States according to the percentage change in their overpayment error rate from the first half of 1980 to the second half of 1983. It then examined the direction of change in the State's underpayment error rate. The study reported that, of the fifteen States with the largest proportional decrease in overpayments, ten also experienced a decrease in underpayments. Meanwhile, of the fifteen States with the largest proportional increase in overpayments, thirteen also experienced an increase in underpayments. The study thereby cited the "tendency for those States that have done well in reducing their overpayment error rates to have also done well in reducing their underpayment error rates." (p. 12)

One of the issues not addressed by the FNS study is the statistical significance of observed period-to-period changes in sample-determined error rates. Whenever possible in the analysis conducted here, any year-to-year error changes that fail a test of statistical significance are regarded as not meaningful.

4.2 Empirical Findings

As a first step in examining State-specific error variation, the seven annual observations for each jurisdiction were used to compute a State-specific correlation coefficient between the regressed dollar error rates for overpayments and underpayments (Exhibit 4.1). Of the 53 States subject to analysis, 14 have correlations that are significantly positive, ranging from .671 to .896. (Within this group of States, the correlations are not significantly different from each other.) No State has a significant negative correlation.

The next step was to compute the correlation coefficient between the year-to-year change in overpayments and the corresponding change in underpayments (Exhibit 4.2). Changes were computed here as the absolute difference between the two annual error rates.[1] For the pooled set of 319 observations, the correlation was found to be .153, significantly different from zero. Among the six separate year-to-year intervals, the correlation was

[1]If each year-to-year change is instead expressed as a percentage of the prior year's error rate, the findings are largely unaffected.

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EXHIBIT 4.1

STATES WITH STATISTICALLY SIGNIFICANT CORRELATION BETWEEN OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1986

State	Correlation coefficient
1. Connecticut	.896***
2. Kentucky	.890***
3. Hawaii	.885***
4. South Dakota	.867**
5. Colorado	.864**
6. Michigan	.853**
7. Arkansas	.754*
8. Oregon	.754*
9. West Virginia	.743*
10. Wisconsin	.740*
11. Maryland	.732*
12. Idaho	.727*
13. Montana	.701*
14. Arizona	.671*
Number of annual observations per State	7
Total number of States subject to analysis	53

* Different from zero at the 90 percent confidence level.
** Different from zero at the 95 percent confidence level.
***Different from zero at the 99 percent confidence level.

EXHIBIT 4.2

CORRELATION BETWEEN YEAR-TO-YEAR CHANGES IN OVERPAYMENT AND UNDERPAYMENT REGRESSED DOLLAR ERROR, FISCAL YEARS 1980 TO 1986

1980 to 1981	1981 to 1982	1982 to 1983	1983 to 1984	1984 to 1985	1985 to 1986	Pooled total
Correlation coefficient						
.115	-.019	.101	.253*	.296**	.037	.153***
Number of State observations						
54	53	53	53	53	53	319

* Different from zero at the 90 percent confidence level.
** Different from zero at the 95 percent confidence level.
***Different from zero at the 99 percent confidence level.

found to be significantly positive only for 1983-to-1984 and 1984-to-1985. Such positive correlations indicate that both types of error were moving systematically in the same direction.

However, the correlations themselves do not indicate whether the movement in error rates was systematically upward or downward, even though the central interest here is on the change in underpayments accompanying a reduction in overpayments. In addition, the correlations are computed on the basis of year-to-year changes that reflect a substantial degree of sampling variation. For these reasons, contingency tables were constructed to indicate the directional pattern of significant changes in overpayments and underpayments. As discussed in Chapter Two, limited information on the standard errors of regressed dollar error rates required the use of reported case error rates, and the estimated standard error of each observed year-to-year change, to test the statistical significance of upward and downward error rate movements.

The data set provided 317 observed year-to-year changes in case error rates, for both overpayments and underpayments. Each of these changes was classified as either a significant increase, a significant decrease, or not significantly different from zero (at the 90 percent confidence level). The changes for overpayments and underpayments were then cross-tabulated to create a three-by-three contingency table (Exhibit 4.3). While more than one-half of the total number of observations (163 of 317) involved no significant change for both overpayments and underpayments, a systematic pattern is present. Using the conventional chi-square test, one can reject with 99.9 percent confidence the hypothesis that the direction of change in underpayments is independent of the direction of change in overpayments.

Perhaps of greatest interest are the 73 observations for which there was a statistically significant reduction in overpayments. In nearly two-thirds of these instances (47 of 73), there was no significant change in underpayment error. Where a significant change in underpayments occurred, decreases were nearly three times as likely as increases (19 versus 7). The tendency for the two error rates to move in similar directions also prevailed in the 40 instances where overpayments increased significantly. The corresponding shift in underpayments, if significant, was in each instance also an increase in error.

EXHIBIT 4.3

STATISTICAL SIGNIFICANCE OF YEAR-TO-YEAR CHANGES IN OVERPAYMENT AND UNDERPAYMENT REPORTED CASE ERROR, FISCAL YEARS 1980 TO 1986

Year-to-year change in reported overpayment case error rate	Year-to-year change in reported underpayment case error rate: Significant decrease*	No significant change	Significant increase*	Total
	Number of State observations			
Significant decrease*	19	47	7	73
No significant change	23	163	18	204
Significant increase*	0	33	7	40
Total	42	243	32	317

*Different from zero at the 90 percent confidence level.

Chi-square test of significance:

Degrees of freedom	4
Value of chi-square	19.31
Probability*	0.001

*Significance level at which one can reject the hypothesis of independence.

A similar contingency table was constructed using the available data on the standard errors of the regressed overpayment dollar error rates (Exhibit 4.4). This table displays the direction of change in the reported underpayment case error rate, by the corresponding change in the regressed overpayment dollar error rate, for year-to-year changes between 1983 and 1986. Here, with a smaller number of observations, one can not reject (at the 90 confidence level) the hypothesis that the two types of error are directionally independent.

A final contingency table was constructed to test more specifically the effect on underpayment error of federal quality control liabilities that focus only on overpayment error. Not until 1983 were States subject to such "unbalanced" incentives. At that time, States either had to meet a fixed national target rate for regressed dollar overpayments (9 percent in 1983, 7 percent in 1984, or 5 percent in 1985) or had to achieve a phased reduction in overpayments (for 1983 or 1984 only). Previously, liabilities were either not in effect or were based on an error rate measure that included both overpayments and underpayments. This shift in policies enables the pattern of year-to-year movements in underpayment error to be examined under both "balanced" and "unbalanced" liability systems.

If the contention is valid that underpayments tend to be higher in situations where liabilities are based on overpayments but not underpayments, we would expect to observe differences in the movement of underpayment error between the following situations:

- situations in which a State needed to reduce overpayments and underpayments combined, or neither, in order to avoid a liability (and could thus be considered "not subject to an unbalanced liability"); and

- situations in which a State needed to reduce overpayments (but not underpayments) in order to avoid a liability (and could thus be considered "subject to an unbalanced liability").

Assigned to the first category were the following year-to-year changes:

- those observations corresponding to years in which liabilities were based on a combined measure that included both overpayments and underpayments (i.e., all observations for 1980-to-1981 and 1981-to-1982); and

EXHIBIT 4.4

STATISTICAL SIGNIFICANCE OF YEAR-TO-YEAR CHANGES IN REGRESSED OVERPAYMENT DOLLAR ERROR AND REPORTED UNDERPAYMENT CASE ERROR, FISCAL YEARS 1983 TO 1986

	Year-to-year change in reported underpayment case error rate			
	Significant decrease*	No significant change	Significant increase*	Total
	Number of State observations[a]			
Year-to-year change in regressed overpayment dollar error rate				
Significant decrease*	6	14	1	21
No significant change	17	98	9	124
Significant increase*	0	5	1	6
Total	23	117	11	151

[a]Due to limited information on the standard errors of the regressed dollar error rates for overpayments, the number of observations for this tabulation of year-to-year changes in error rates is as follows: 49 for 1983 to 1984, 49 for 1984 to 1985, and 53 for 1985 to 1986.

*Different from zero at the 90 percent confidence level.

Chi-square test of significance	
Degrees of freedom	4
Value of chi-square	4.85
Probability*	0.303

*Significance level at which one can reject the hypothesis of independence.

- for years in which liabilities were based on overpayments only, those observations corresponding to States whose overpayment error rate in one year was less than their target error rate for the following year (e.g., those 1982-to-1983 observations for which the 1982 overpayment error rate was below 9 percent, those 1983-to-1984 observations for which the 1983 overpayment error rate was below 7 percent, and those 1984-to-1985 and 1985-to-1986 observations for which the overpayment error rate was below 5 percent in 1984 or 1985 respectively.[2])

All other observations were assigned to the second category. If the need to reduce overpayment error prompts States into actions that increase underpayment error, we would expect to see in this second category a higher frequency of increased underpayments, in comparison to the first category.[3]

Between these two categories, the observations of year-to-year changes in the reported case error rate for underpayments were divided almost equally, 154 versus 163 (Exhibit 4.5). A two-by-three contingency table was then constructed by subdividing the observations within each category according to the directional change in underpayments. The tendency of States to experience a significant increase in underpayments was somewhat lower for those subject to an unbalanced liability. Using a chi-square test, one can not reject (with 90 percent confidence) the hypothesis that the directional change in underpayments is independent of the State's status regarding error rate liabilities.

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[2]Also included in this category were the observations corresponding to States whose error rate in 1982 or 1983 was below its State-specific target for 1983 or 1984 respectively.

[3]This comparison admittedly abstracts from the reality that there are time lags in the reporting of error findings, in the administrative response of States to the need for error reduction, and in the effects of

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EXHIBIT 4.5

CHANGE IN REPORTED UNDERPAYMENT CASE ERROR BY WHETHER STATE WAS SUBJECT TO AN UNBALANCED LIABILITY[a], FISCAL YEARS 1980 TO 1986

	Year-to-year change in reported underpayment case error rate			
	Significant decrease*	No significant change	Significant increase*	Total
	Number of State observations			
State status regarding liability				
Not subject to an unbalanced liability	17	119	18	154
Subject to an unbalanced liability	25	124	14	163
Total	42	243	32	317

[a]See text for definition.

*Different from zero at the 90 percent confidence level.

Chi-square test of significance"

Degrees of freedom	2
Value of chi-square	1.873
Probability*	0.392

*Significance level at which one can reject the hypothesis of independence.

CHAPTER FIVE:

MULTIVARIATE ANALYSIS OF ERROR RATES

5.1 Conceptual Approach

The analysis reported thus far has proceeded largely in a bivariate framework, where overpayment and underpayment error rates are both treated as outcome variables, subject to some unknown degree of interassociation. The statistical relationships were measured without taking explicit account of other factors that might affect error.

This chapter introduces a more formal modelling framework, where the regressed dollar underpayment error rate observed in each State in each year is treated as the outcome variable, and where the corresponding overpayment error rate (its level and/or its change from the prior year) is treated as an explanatory variable amidst many other contributing effects. In particular, each State is assumed to exert an effect on underpayments that is different from other States, as a result of its distinctive combination of policy provisions, administrative practices, demographic characteristics, socio-economic conditions, and other circumstances influencing payment accuracy. This "State effect" is assumed to be constant for each State across all time periods.

Similarly, each time period is assumed to contribute an effect on underpayments, as a result of nation-wide factors that exert the same influence on all States in any given year. This "time effect" corresponds to such factors as federal program policies, quality control measurement procedures, or macroeconomic conditions.

In explaining the observed variation in underpayment error, the State effects, time effects, and overpayment effects are each assumed to contribute in a linear, additive fashion that can be estimated by ordinary least squares regression. The State effects and time effects are measured by the inclusion in the regression model of separate dummy variables for each State and year (with one State and one year designated as reference points for the purpose of estimating the model).

Because the underpayment error rate is a variable bounded by zero and one, it is ill-suited as a dependent variable for ordinary least squares

estimation. Consistent with accepted practice in such instances, the dependent variable is constructed here as the logistic (or logit) transform of the underpayment error rate, by taking the natural logarithm of the ratio between the error rate and its complement (one minus the error rate).

Given this general structure of the regression model, four separate equations were estimated, to test the possible effects of overpayment error on the underpayment error rate when controlling for the State effects and time effects. In Equation 1, only the State effects and time effects were entered. In Equation 2, the overpayment error rate was also entered. In Equation 3, the year-to-year change in the overpayment error rate was entered (but not its level). In Equation 4, both the level of overpayment error rate and its year-to-year change were entered. Each equation was estimated with a constant term.

Formally, the regression equations can thus be expressed as follows:

1. $$\ln\left|\frac{\bar{y}_{it}}{1-\bar{y}_{it}}\right| = k_1 + \sum_i a_{1i}S_i + \sum_t b_{1t}T_t + e_{it}$$

2. $$\ln\left|\frac{\bar{y}_{it}}{1-\bar{y}_{it}}\right| = k_2 + \sum_i a_{2i}S_i + \sum_t b_{2t}T_t + c_2x_{it} + f_{it}$$

3. $$\ln\left|\frac{\bar{y}_{it}}{1-\bar{y}_{it}}\right| = k_3 + \sum_i a_{3i}S_i + \sum_t b_{3t}T_t + d_3(x_{it} - x_{i,t-1}) + g_{it}$$

4. $$\ln\left|\frac{\bar{y}_{it}}{1-\bar{y}_{it}}\right| = k_4 + \sum_i a_{4i}S_i + \sum_t b_{4t}T_t + c_4x_{it} + d_4(x_{it} - x_{i,t-1}) + h_{it}$$

where x_{it} is the regressed overpayment dollar error rate for State i in year t, and y_{it} is the regressed underpayment dollar error rate for State i in year t, with both expressed in decimal terms. S_i is a dummy variable for each State i (excluding Alabama), T_t is a dummy variable for year t (excluding 1981). The constant terms are k_1, k_2, k_3, and k_4, and the random error terms are e_{it}, f_{it}, g_{it}, and h_{it}. All equations were estimated on the same set of 319 observations, which excluded 1980 observations due to lack of data on the 1979-to-1980 change in overpayment error.

5.2 Empirical Findings

For each equation, more than 60 percent of the variation in the dependent variable is explained by the included independent variables (Exhibit 5.1). The State effects are, as a joint set, statistically significant in each equation. The time effects (measured relative to 1981) are negative and statistically significant for 1984, 1985, and 1986, in each equation, with the year 1985 exhibiting the strongest negative effect.[1]

The estimated coefficients on the level of the overpayment error rate in Equations 2 and 4 are positive and statistically significant. This indicates, consistent with the previous findings, that lower overpayments are associated with lower underpayments. In contrast, the year-to-year change in overpayments is not a significant predictor of the underpayment error rate, whether or not the level of overpayments is included in the equation. The overpayment variables contribute only marginally to explaining the variation in the underpayment error rate, as the adjusted R-squared for Equation 1 is nearly as high as that for each of the other equations.

The parameter estimate for the coefficient on the overpayment error rate can be used to calculate the effect on the underpayment error rate of a one percentage point change in the overpayment error rate. This estimated effect is .05, when evaluated at the sample mean error rates using the parameter estimate from Equation 2.[2] This value implies that a decrease in the overpayment error rate of 1 percentage point (at the sample mean, from 8.63 to 7.63 percent) is associated with a decrease in the underpayment error rate of .05 percentage points (at the sample mean, from 2.21 to 2.16 percent). When expressed as an elasticity, evaluated again at the sample means, the estimated parameter implies that a proportional decrease of one percent in the overpayment error rate is associated with a proportional decrease of .20 percent in the underpayment error rate.

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[1] The estimated coefficients for these three years are not significantly different from each other.

[2] Under the notation introduced earlier, this effect can be derived as $c_2 y(1-y)$. Its value, estimated at the sample mean of y, is $(2.33)(.0221)(.9779) = .050$.

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EXHIBIT 5.1

REGRESSION ESTIMATES

Dependent variable: Regressed underpayment dollar error rate (logit transform)

Number of State observations: 319 (excluding those for 1980)

Explanatory variable	Equation 1	Equation 2	Equation 3	Equation 4
		Estimated coefficients		
Intercept	-3.85***	-4.11***	-3.87***	-4.11***
State effects	a***	a***	a***	a***
Time effects[b]				
1982	-.02	-.01	-.01	-.01
1983	-.06	-.03	-.04	-.03
1984	-.15***	-.11**	-.13***	-.11**
1985	-.22***	-.17***	-.21***	-.17***
1986	-.20***	-.14***	-.19***	-.14***
Regressed overpayment dollar error rate				
Level	----	2.33***	----	2.39**
Year-to-year change	----	----	1.19	-.08
		Summary statistics		
Degrees of freedom	260	259	259	258
Adjusted R-squared	.613	.624	.616	.623
F statistic	9.68***	9.95***	9.63***	9.75***

** Different from zero at the 95 percent confidence level.
***Different from zero at the 99 percent confidence level.

a. Statistical significance of the included set of dummy variables is computed jointly by an F test.
b. Effects computed relative to 1981.

These multivariate findings can be summarized as follows. One's expectation about a State's annual underpayment error rate is only slightly altered by information about the State's overpayment error rate--either about the overpayment error rate itself, its change from the previous year, or both. To the extent that the overpayment and underpayment error rates are systematically related, after controlling for State-specific and time-specific effects on error, it is that a lower overpayment error rate is associated with a lower underpayment error rate. These findings thus do not support the view that States tend to reduce overpayment error in ways that result in higher underpayment error.