Trend and Deviation in Crime Rates: A Comparison of UCR and NCS Data

Alfred Blumstein

Jacqueline Cohen
Carnegie Mellon University

Richard Rosenfeld
University of Missouri-St. Louis

July 1989

The research reported in this paper was supported by National Institute of Justice Grant 86-IJ-CX-0083. Points of view expressed herein are those of the authors and do not necessarily represent the official position of the National Institute of Justice.

ABSTRACT

Trends and year-to-year deviations in UCR and NCS data on burglary and robbery are examined for the period 1973 to 1985. We find strong correspondence between year-to-year deviations in UCR crime rates and NCS victimization rates for both crime types. The difference between the two data series is located primarily in their contrasting trends, although there is some evidence that trends in UCR and NCS crime rates have been converging in recent years. Ex post forecasts reveal that the UCR/NCS relationships estimated from the 1973-85 data continued through 1986 and 1987. While the UCR rates in 1986 were somewhat influenced by unusual increases in the proportion of crimes reported to the police that year, changes in crime reporting for the period as a whole have had little effect on UCR burglary and robbery rates. We conclude that, within the two serious crime types examined in this study, there is strong consistency between the alternative data sources on variations in crime rates over time.

Criminal justice researchers and policy analysts are fortunate in having two independent data series to test theory, develop and evaluate policy, and inform the public about changes in levels of serious crime over time. For over fifty years the Federal Bureau of Investigation, through the Uniform Crime Reporting Program, has generated national and local level offense and arrest data, based on police records. In recent years these data have been supplemented by information collected from crime victims through the National Crime Survey (see Bureau of Justice Statistics 1989, pp. 2-3, for a summary of NCS history and objectives).

An important stimulus for the development of victimization surveys was the recurring criticism that offense data based on police records omit a "dark figure" of crimes that victims do not report to the police (Biderman and Reiss 1967; Ennis 1967). However, the availability of victimization data does not seem to have allayed concerns about the accuracy of estimates of serious crime in the United States. Since the inception of the National Crime Survey nearly twenty years ago, the relative quality, comparability, and correspondence of the UCR and NCS crime data have been questioned and debated in the research literature (see Gove, Hughes, and Geerken 1985 and O'Brien 1985 for comprehensive reviews).

Concerns about the relative merits of the two data sources in reflecting the pattern of year-to-year changes in crime have also received widespread media attention. For example, when contrasting the 6% increase in UCR rates for serious crimes in 1986 with NCS victimization rates for the same year that, according to Justice Department officials, "remained essentially unchanged from the year

earlier," news articles attributed the UCR rise to increased reporting by the public to the police (New York Times 1987, p. 20; Washington Post 1987, p. 16; U. S. Department of Justice 1987a). Such accounts serve to reinforce the impression of noncomparability and divergence in UCR and NCS data, not only on the part of the general public, but also in the criminal justice community. The apparent conflict between UCR and NCS crime estimates for 1986 prompted at least one state criminal justice agency to ask: "Did crime go up in 1986?" (Illinois Criminal Justice Information Authority 1987, p. 4).

The correspondence between UCR and NCS crime estimates, and in particular the influence of crime reporting by the public on possible divergence between the two data series over time, are research issues with clear policy relevance. A fundamental goal of the National Crime Survey was to "launch a time series tracing changes in the incidence of crime...intended to complement information available from the FBI's Uniform Crime Reports (UCR) by collecting data on crimes not reported to the police..." (Bureau of Justice Statistics 1989, p. 2).

This paper examines the relationship between UCR and NCS data as indicators of serious crime in light of that objective. Specifically, we address the following research questions: (1) To what degree do UCR crime rates and NCS victimization rates correspond over time, either in their trends or in year-to-year fluctuations, for particular crime types? (2) To what degree have changes in reporting to the police influenced annual UCR crime rates and thereby contributed to divergence between the two crime data series? (3) Is the recent upturn in UCR crime rates primarily

attributable to increases in crime reporting or to underlying levels of criminal victimization? None of these issues has been adequately addressed in previous research.

PREVIOUS RESEARCH

Cross-sectional studies based on a sample of 26 cities surveyed in the early 1970s have generally found weak or even inverse relationships between the UCR and NCS data for several crime types (Booth, Johnson, and Choldin 1977; Cohen and Lichbach 1982; Decker 1977; Menard and Covey 1988; Messner 1984; O'Brien 1985, pp. 87-91; O'Brien, Shichor, and Decker 1980; for an exception, see Cohen and Land 1984). Such findings have prompted many researchers to urge caution in the use and interpretation of one or the other data source (usually the UCR data) and/or to conclude that the two sources are noncomparable because they "appear to have been measuring two different phenomena" (Menard and Covey 1988, p. 371).

Research on the relationship between UCR and NCS data over time is more limited, undoubtedly due in part to the small number of data points available for analysis. However, when viewed in relation to the NCS objective of revealing the "dark figure" of crime, the conclusions of existing longitudinal research on the comparability and correspondence of UCR and NCS data have not been promising. Longitudinal studies of the two crime data series have reached conclusions similar to those from the cross-sectional research: crime classifications used often differ enough that UCR and NCS data measure different domains of events, or when the crime events are comparable, the measures resulting from the two data sources are not significantly related (Menard and Covey 1988; Messner 1984; O'Brien 1985). A common interpretation of the apparent lack of association

between the two series is that the UCR rates vary substantially over time, while the NCS data exhibit less year-to-year and longer term change (Menard 1987, p. 462; Messner 1984, p. 440; O'Brien 1985, pp. 96-97).

An important exception is a study by Biderman, Lynch and Peterson (1983), which finds strong correspondence between UCR and NCS data over time. This study is also noteworthy because of its meticulous examination of the conceptual and procedural differences between the two data sources, and its use of systematic adjustments of the data to increase their comparability. Biderman et al. (1983) is one of the few studies to systematically examine (and adjust for) the influence of reporting rates of crimes to the police on the relationship between the two series. Interestingly, this study was prompted in part by media accounts, similar to those described above, of conflict between the two data sources in the early 1980s which "had the unfortunate consequence of reviving old and usually ill-informed arguments about which is the 'better' measure of 'trends in crime'" (Biderman et al. 1983, p. 1).

Limitations of Existing Longitudinal Research

In spite of its strengths, Biderman et al. (1983) shares significant limitations with other studies of the relationship between UCR and NCS data over time. The most obvious problem with existing longitudinal analyses is their reliance on very brief time series. Biderman et al. (1983) compares UCR and NCS data for the period 1973 (the first year of the NCS series) to 1979, while Messner (1984) and O'Brien (1985) examine the period 1973 to 1981. This was a necessary limitation of earlier studies that was acknowledged as such by some researchers (e.g., O'Brien 1985, pp.

97-98). Even more recent investigations, however, use less than the full range of data available for temporal comparisons. For example, the temporal analysis in Menard and Covey's study, published in 1988, is restricted to the period 1973 to 1982.

Use of such brief time spans limits the efficiency of regression estimates of the strength of the association between the two time series, as well as the degrees of freedom available for multivariate analysis, including analysis of the effects of crime reporting on changes in UCR crime rates. Obviously, the development of models to predict future changes in one variable based on past changes in the other is limited for the same reasons.

While previous studies usually include the standard caveats about generalizing from small samples, a related and more fundamental conceptual issue has been largely overlooked. Examinations of temporal changes in the UCR and NCS data have focused almost exclusively on "trends" in crime (or in crime reporting).[1] Such studies neglect the important difference between consistent, unidirectional change in a variable manifested in trend, on the one hand, and year-to-year fluctuation or deviation from trend (i.e., the detrended variation in the data over time), on the other. Conflating the two types of change can result in misleading or erroneous conclusions about the relationship between two time series. For example, a measure of association such as the correlation coefficient may show little or no relationship between two variables even if--or precisely because--they are positively correlated in their deviations, but negatively correlated in their trends (or vice versa). As we show below, failure to adequately distinguish between trend and deviation has led to just such errors

of interpretation in existing research on the relationship between UCR and NCS data over time.

Biderman et al. (1983) do distinguish between trend and deviation in the UCR and NCS data in their conclusion that, when adjusted for comparability, "the two series display the same directional changes, both with regard to trend over the seven years and fluctuations from year to year" (p. vii). However, this conclusion is based largely on visual inspection of changes in the two variables over an extremely limited time span of only seven years, and the authors make no attempt to assess the relative contribution of each type of change to the total variation in each of the crime measures. Nor do they systematically isolate trend from deviation in crime reporting, even though they assume, based on suggestive but very limited evidence, that "over time, a larger proportion of all crimes falling within the NCS became crimes known to the police" (p. vii).

Menard (1987) provides more precise estimates of trends in the two data series by regressing UCR and NCS crime rates on a time variable for the period 1973 to 1982. Finding nonsignificant or contrasting trends for most of the crime types examined, the study concludes that "the two measures--UCR and NCS--present very different pictures of the changes in crime rates and the risk of being victimized" (p. 463). However, because he dismisses changes not captured by linear trend as "random fluctuations" in the data (p. 470), Menard ignores the possibility that UCR and NCS crime rates may be meaningfully related in their <u>detrended</u> variation.

The present study tries to overcome each of these limitations of previous longitudinal research on UCR and NCS crime rates.

First, we base our analysis on a longer time period (1973-1985), thereby improving the efficiency of regression estimates of the relationship between the the UCR and NCS data. Second, we perform multivariate analyses to identify more precisely the structure of the relationship between the two data series, specifically, the relative influence on UCR rates of trends and of year-to-year fluctuations in both NCS crime rates and reporting rates to the police. Finally, we test the predictive accuracy of our models by comparing actual 1986 and 1987 UCR rates with ex post forecasts based on the 1973-1985 NCS data. This also permits a detailed assessment of the influence of changes in reporting on recent increases in the UCR crime rates.

Because of important differences in the classifications of some of the crime categories, we do not apply our analysis to all of the crime types available for comparison. Nor do we think it is advisable to compare single "indexes" that combine dissimilar crime types, especially given the uncertainty over the comparability of UCR and NCS measures for some crime types. We have therefore confined our attention to the two serious--and perhaps more consistently defined--crimes of robbery and burglary. While conclusions drawn from this study cannot be generalized to other crime types without testing them directly, our methods can be applied to appropriate comparisons in other offense categories.

DATA AND METHODS

The basic data used in our analysis, displayed in Table 1, consist of UCR and NCS robbery and burglary rates and the respective NCS reporting rates to the police for the period 1973 to 1985. Data for 1986 and 1987 are reserved for evaluating forecasting models

introduced later in the analysis. We constructed the NCS crime rates reported in Table 1 (ROBN and BURN) by dividing the number of robbery and burglary victimizations published each year by the Bureau of Justice Statistics (reproduced in Flanagan and Jamieson 1988, p. 240, Table 3.34) by the total U. S. resident population for each corresponding year (Bureau of the Census 1982, 1986) and multiplying the result by 100,000. The UCR rates (ROBU and BURU) were similarly constructed by dividing the number of robberies and burglaries "known to the police" (Federal Bureau of Investigation, annual, 1974-1988) by the same annual population bases (x 100,000). The robbery and burglary reporting rates (RREP and BREP) represent the fraction of crime victimizations that NCS respondents say were reported to the police each year (Bureau of Justice Statistics 1988, p. 5, Table 6).

[Table 1 about here]

Our NCS crime rates differ from those published by the Bureau of Justice Statistics, which are based only on the population of persons age 12 and over for personal crimes such as robbery, or on the total number of households in the case of household crimes such as burglary, and are expressed as rates per 1,000. We use the total resident population and a multiplier of 100,000 to construct our NCS rates in order to establish minimal comparability with the corresponding UCR measures. We might just as well have chosen the more "risk specific" population bases (and the same multiplier) used by NCS, since temporal comparisons of the two data series are not affected by the choice of denominators, as long as the same denominators are used in each case.

Standardizing the denominators of the two series is the only

adjustment we make in the data, even though UCR and NCS crime rates differ in their numerators as well as their denominators (Biderman et al. 1983, pp. 39-54; Bureau of Justice Statistics 1981; O'Brien 1985, pp. 18-24, 45-49). The major difference between the UCR and NCS crime counts is the inclusion in the NCS data of crimes not reported to the police. Rather than adjusting the data to eliminate this difference, we compare models which contain reporting rates with those which do not in order to determine the influence of crime reporting on divergence between the two series.

Another important difference between the UCR and NCS measures of robbery and burglary is the exclusion of commercial crimes from the NCS incidence counts. Commercial crimes represent a significant proportion of all robberies and burglaries, but this proportion has remained roughly constant in recent years.[2] Therefore, while the exclusion of commercial crimes from the NCS counts deflates the magnitude of NCS rates relative to the UCR rates, it should not have a substantial effect on the degree of association between the two crime series, which is the central focus of this study.[3]

In sum, our analysis isolates the influence of crime reporting on the relationship between population-standardized UCR and NCS crime rates. We leave the possible significance of other differences in the definitions and procedures of the two crime series as topics for further research..

We begin the analysis by comparing the magnitude and direction of change in the two crime data series between 1973 and 1985. We then detrend the data by regressing the rates on a time variable to determine the significance of linear trend and of year-to-year fluctuation around trend in accounting for the total variation in

each of the crime and reporting rates. The fitted values and residuals from the trend regressions are used to create NCS crime and reporting "trend" and "deviation" variables, and these are incorporated in alternative multivariate estimations of annual UCR crime rates. As a test of the robustness of the results, we interchange the independent and dependent variables in the final round equations. If the two crime series do in fact reflect the same underlying processes over time, then models containing UCR crime data should provide good estimates of year-to-year change in NCS crime rates, as well as vice versa. Finally, we test the stability of our models by comparing the actual UCR rates for 1986 and 1987 with predicted rates based on the relationship estimated from 1973-1985 data. To assess the influence of crime reporting on recent increases in the UCR rates, alternative ex post forecasts of crime reporting rates are used in the equations for UCR crime rates derived from 1973-1985 data.

RESULTS

In exploring the extent to which changes in UCR crime rates reflect corresponding changes in victimization rates, on the one hand, and in crime reporting rates, on the other, it is instructive to first examine the overall variability in each of the crime and reporting measures. Inspection of the coefficients of variation at the bottom of Table 1 reveals that, for the crime types of robbery and burglary that are considered in this study, the conclusion from previous research of greater variability in the UCR crime rates is incorrect. The two crime series show essentially the same magnitude of variation, with standard deviations that are about ten percent of the means. The reporting rates, by contrast, exhibit much less

variability over the 13-year period.

The two crime data sources have always differed in scale--with UCR robbery and burglary rates being about one-half NCS rates, reflecting the unreported crimes included in the NCS series (see Figure 1). However, the two series have been highly consistent in characterizing yearly fluctuations in crime rates. As indicated in Figure 2, for example, a simple adjustment by a factor of two (which corresponds to a 50% reporting rate) in plotting the UCR rates reveals strong correspondence between the two series regarding yearly upturns and downturns in U. S. robbery and burglary rates, and this correspondence holds regardless of any changes in reporting rates by the public. Even the highly publicized decline in NCS rates during the early 1980s cited earlier is mirrored by a similar pattern in UCR rates.

[Figures 1 and 2 about here]

Bivariate correlations have been used in previous research to assess the strength of the relationship between the alternative crime data sources. For our data, the correlation between the NCS and UCR measures is $r = .561$ for robbery and .595 for burglary. While both are statistically significant ($p \leq .05$), the magnitude of these relationships indicates that the variation in annual NCS rates alone leaves considerable unexplained variance remaining in the annual UCR rates for the same crime type (the correlation coefficients correspond to R^2s that are below .3 in each case). Other researchers have concluded from this modest linear relationship between UCR and NCS crime rates that the two series do not reflect the same underlying changes in crime over time (e.g., Menard and Covey 1988). However, such a conclusion remains

premature until separate comparisons are made between the longer term trends and the year-to-year fluctuations of the UCR and NCS data. These comparisons reveal that the differences between the two series are located primarily in their contrasting trends.

Trends in the Crime and Reporting Rates

We estimated the trend component of each series by regressing the crime and reporting rates on a time trend variable (trend = 1, 2,...13). Table 2 displays the slope coefficient (b) and the proportion of variance explained by trend (the unadjusted R^2) for the crime and reporting variables. The results in Table 2 indicate:

- no trend in UCR burglary rates, but a significant decrease in NCS burglary rates over the period 1973 to 1985;
- opposite trends for UCR and NCS robbery rates (while not statistically significant--because of the high year-to-year fluctuation in robbery rates--trends of about 1% change per year are estimated);
- a significant positive trend in burglary reporting rates and a positive but nonsignificant trend in robbery reporting rates.

In general, these results indicate that, with the exception of the NCS burglary rate (the only case where R^2 exceeds .5), most of the variation in the crime and reporting series over time is attributable to their deviation components and not to their trend components.[4]

[Table 2 about here]

Nonetheless, the data also show a tendency toward opposite trends between the two crime series. These differences (i.e., declining NCS crime trends that are not matched by similar UCR trends) are not fully accounted for by increases in the rates of

victims reporting crimes to the police. The significant increasing trend in the rate of reporting burglaries to the police found in the NCS data (BREP) is not sufficient to offset the declines in NCS burglary rates; even the fraction of NCS burglary victimizations that are reported to the police (BURNREP) declines over time. While not significant, a similar pattern is observed for robbery.

Another factor that might account for the opposite trends in NCS and UCR rates is early measurement problems during the starting years of the NCS surveys. Any problems that might have contributed to over-counts of crimes in the NCS surveys (e.g., crime classifications that were too broadly defined, respondents telescoping earlier crimes into the reference period) would inflate the NCS rates in earlier years. As the survey was refined and improved, over-counts would be reduced, resulting in declines in NCS rates over time.[5]

If this explanation is correct, we should expect trend differences between the two crime series to diminish over time. We tested this expectation by dividing the full period into half-periods (1973-1978 and 1979-1985) and performing separate regressions on the half-period time trends. The results suggest that the trends in the two series have in fact been converging. The NCS and the UCR data show negative trends of similar magnitude for both crime types between 1979 and 1985 (decreasing by 2 to 3% per year for robbery, and by 4 to 5% per year for burglary). During the 1970s, by contrast, the UCR robbery rate displayed virtually no trend, while the NCS robbery rate showed a strong negative trend. The trends in the two burglary series were more modest, but in the opposite directions.[6] Although these results must be treated with

caution due to the small number of cases on which they are based, they provide limited support for the hypothesis that, for the two crime types under consideration, NCS and UCR data exhibit increasing correspondence in their trends.

Models of the UCR-NCS Relationship

To examine the relationship between the UCR crime rates and the trend and year-to-year fluctuation in the NCS crime and crime reporting rates, we created "trend" and "deviation" variables from the results of the trend regressions reported in Table 2. The trend variables are the fitted values from the time trend regressions, and the deviation variables are the resulting residuals. Since the fitted values and the residuals sum to the actual values of the original variables, they effectively partition each data series into a trend and a deviation component, which can then be separately entered into alternative models of the structure of the relationship between the UCR and NCS data.

The results of our multivariate analyses are summarized in Table 3. The first model contrasts the NCS and UCR crime rates directly (column 1). The significant coefficient for the NCS rates (BURN and ROBN) confirms the modest correlation between UCR and NCS rates noted previously. Comparing model 1 with model 2, however, shows the extent to which the bivariate correlation suppresses the strong relationship between year-to-year fluctuations in UCR and NCS crime rates by conflating the trend and deviation components of the two series. In model 2 the fit between annual UCR rates and NCS crime data improves substantially (adj R^2 = .807 for burglary and .557 for robbery) by relying exclusively on the yearly deviations from trend (BURN(D) and ROBN(D)) in the NCS rates. Similar improvement

is not observed when only the deviations in NCS reporting rates are used (model 3). When the deviation components are used for both the NCS crime rate and reporting rate (model 4), the annual UCR rates are again related primarily to the NCS crime rate variable. Little or no improvement in R^2 is observed by adding the reporting rate variables (model 4 versus model 2), and the reporting rate variables are not significant for either crime type.[7]

[Table 3 about here]

The final model 5 in Table 3 assesses the contribution of time trends in accounting for UCR crime rates. Because the various trend variables are perfectly collinear, the separate effects on the UCR crime rates of trends in the NCS victimization rate and in the reporting rate to the police cannot be simultaneously estimated. We have therefore combined the victimization and reporting trends in a single "reported victimization" trend variable (i.e., the trend component of the product of the NCS victimization rate and reporting rate for each of the crime types). Differences in the trend components of the UCR and NCS data do not emerge as a concern for burglary. The estimated effect of trend in the reported victimization variable BURNREP(T) is negligible. In addition, no significant trend effects emerge when the trend components of the burglary victimization and reporting variables are estimated in separate equations otherwise identical to model 5 (results not shown); these are hardly surprising results in light of the fact that there is no trend in the UCR burglary rate to explain (see Table 2).

Time trends, however, are a factor in robbery rates. The negative trend coefficient in model 5 highlights the opposite

directions of trend between UCR rates and NCS reported victimization rates. This trend coefficient is significant and results in an increase of .197 in R^2 (model 5 versus model 4).[8]

It appears that the trend effect on the UCR robbery rates is attributable primarily to the victimization rate, which accounts for a much greater proportion of the variance in the "reported victimization" rate (ROBNREP) than does the robbery reporting rate.[9] In addition, when the reported victimization trend in model 5, ROBNREP(T), is replaced with the victimization trend ROBN(T) or the reporting trend RREP(T) in separate equations, the victimization trend is significant while the reporting trend is not, and the equation containing the victimization trend yields a higher R^2 (results not shown). However, contrary to these indications, it should be recalled that the reporting trend RREP(T) is in the same positive direction as the trend in the UCR robbery rate ROBU(T), whereas the trend in the NCS robbery rate, ROBN(T), is negative.

Based on these analyses, the relationship between UCR and NCS crime rates for burglary and robbery can be summarized as follows: (1) Most of the annual variation in UCR crime rates is accounted for by variation in NCS crime rates (model 2); variations in NCS reporting rates have little or no effect on UCR crime rates (model 3). (2) Most of the annual variation in UCR crime rates is due to yearly <u>deviations</u> from trend as opposed to <u>trend</u> in NCS crime rates; trend makes no difference at all for burglary, but has a modest effect for robbery (model 5). Trend differences between the two data series appear to be declining over time.[10]

Over time, the two data series tell virtually the same story about variations--especially year-to-year fluctuations--in crime

rates. Indeed, if the UCR and NCS crime rates measure essentially the same underlying domain of events, then substituting one measure for the other in our final round estimation of their relationship should produce few major changes in results. The findings reported in equations (i) and (ii) support this expectation. The crime/reporting trends in these equations (BURUREP(T) and ROBUREP(T)) adjust the data for trends in under-reporting of crimes to the police by dividing the UCR crime rate by the appropriate NCS reporting rate, and regressing the result on a time trend variable (*$p \leq .05$; **$p \leq .01$; ***$p \leq .001$).

(i) BURN = -10597.653 + 1.311 BURU(D)*** - 994.797 BREP(D)
(t= 4.775) (t= -0.330)

+ 4.638 BURUREP(T)***
(t= 8.741)

adj R^2 = .906

(ii) ROBN = 992.972 + 2.022 ROBU(D)** - 53.765 RREP(D)
(t= 4.257) (t= -0.098)

- 1.235 ROBUREP(T)*
(t= -2.252)

adj R^2 = .692

Comparing these results with those for final model 5 in Table 3, it seems to make little difference whether the NCS victimization and reporting data are used to estimate the UCR crime rates or UCR crime data (adjusted with NCS reporting rates) are used to estimate the NCS crime rates. For both crime types, variation in one crime indicator is significantly influenced by deviations from trend in the other crime indicator, but not by similar deviations in reporting rates. For robbery, the alternative specifications both show significant negative trend effects, reflecting the opposite trends in the two series. For burglary, a highly significant

positive trend effect appears in the estimation of the NCS rate, while no trend effect was found in the estimation of the UCR rate. The difference reflects the fact that adjusting the UCR burglary rate for nonreporting induces a negative trend in BURUREP, which varies positively with the highly negative trend component in the NCS burglary data. Perhaps because of the significant trend effect, the explanatory capacity of the NCS burglary model (equation i) is slightly greater than that of the UCR burglary model 5 in Table 3 (adj R^2 = .91 and .83, respectively). The alternative robbery models both explain approximately 70% of the variance in robbery rates between 1973 and 1985.

Predicting Recent Changes in Crime Rates

We have also examined the appropriateness of continuing to apply the past UCR/NCS relationships to data for the two series in subsequent years. The relationships between the UCR and NCS rates estimated from 1973-85 data, as reflected in the coefficients for final model 5 reported in Table 3, were applied to NCS data observed for 1986 and 1987. The resulting predicted UCR rates are the rates that would be expected if the relationship between UCR and NCS that prevailed through 1985 were to continue into 1986 and 1987 (NCS data for 1986 and 1987 are from Bureau of Justice Statistics 1988; UCR and population data are from Federal Bureau of Investigation 1988).

Table 4 and Figure 3 compare the predicted UCR rates which take into account changes in reporting during 1986 and 1987 (items 1b and 2b of Table 4) with the observed UCR rates (items 1a and 2a of Table 4). The difference between the observed rates and the predicted rates based on actual reporting changes is small: the error is under 5% in all cases. These results suggest that no major

structural changes occurred after 1985 in the relationship between the UCR and NCS crime series. The model estimated from 1973-85 data continues to be a reliable basis for estimating UCR crime rates from NCS data.

[Table 4 about here]

[Figure 3 about here]

Much of the recent controversy over differences between UCR and NCS crime rates has focused on the 1986 rates. One explanation offered for the apparent divergence between UCR and NCS rates in 1986 is a large increase in reporting crimes to the police, especially for robbery. Preliminary NCS estimates--which were widely reported in the media--put the robbery reporting rate at .61 in 1986, the highest level ever recorded since the NCS began in 1973 (U. S. Department of Justice 1987b). While the final estimate of the robbery reporting rate was somewhat lower at .58, it was still the largest ever recorded by the NCS and represented a substantial increase over the 1985 rate of .54. The burglary reporting rate for 1986 was also an all-time high at .52 (up from .50 in 1985). Bureau of Justice Statistics officials attributed the upswings in reporting rates to neighborhood watch programs and to "a less tolerant attitude toward crime generally" (New York Times 1987, p. 20).

Table 4 examines the role of reporting changes in UCR crime rates for 1986 and 1987 by extending the 1973 to 1985 trends in reporting rates to police out to 1987 in items b and c for each crime type. Deviations from the reporting trend in 1986 and 1987 are calculated as the difference between the observed value each year and the extended trend line. The first prediction in items 1b and 2b applies final model 5 from Table 3 to the deviations and

trends obtained from the NCS rates actually observed after 1985 for all variables. Any unusual changes in the reporting rate are reflected in the deviation variables BREP(D) and RREP(D). The final prediction in items 1c and 2c ignores unusual changes in reporting rates for 1986 and 1987; the predicted reporting rate is assumed to be determined solely by extending the 1973-85 trend with no deviations from this trend for 1986 and 1987.

The results in Table 4 are mixed. The change in reporting in 1986 appears to be an important factor in the UCR crime rates that year. The error rate increases by 50 to 60% for burglary and robbery when the unusual increases in reporting rates for 1986 are ignored. For 1987, however, ignoring the deviations from trend in the reporting rate results in smaller errors for both crime types.

The reason for the better predictions in 1987 is that the reporting increases observed in 1986 did not continue through the following year. The reporting rate for burglary remained unchanged at .52, and the rate for robbery fell to .56, a level of reporting reached or exceeded on several occasions in the past (see Table 1). Meanwhile, NCS burglary and robbery crime rates increased slightly in 1987 (the increase in robbery rates had begun the previous year), while the UCR rates declined (see Figure 3). This is why the error associated with our UCR predictions for 1987, albeit very small, is positive.[11]

In any case, these findings suggest that claims about the role of changes in reporting to the police in UCR crime rates--or the factors responsible for these changes--should be based on more than a single year's observation. When viewed in terms of the stability in the underlying relationships over the entire period for which

data are available, the results for 1986 and 1987 do not alter the conclusion that year-to-year changes in UCR crime rates reflect actual changes in criminal victimization and are not simply an artifact of variations in the rate at which victims report crimes to the police.

CONCLUSION

This study provides several issues for further research. An immediate task is to extend the analysis to other crime types, including those presumed to be less comparable (e.g., assault), or particularly vulnerable to reporting variations (e.g., rape). The sources of trend differences between the two series and the possibility of convergence in trends over time also require further exploration within different crime types and extended time series.

In addition to examining the influence of crime reporting on UCR crime rates, the factors affecting crime reporting rates also merit attention. The probability that crimes will be reported to the police is a function of the characteristics of crimes (e.g., seriousness) and victims (e.g., age) (Bureau of Justice Statistics 1985). Since offenses involving injury to the victim or substantial property loss are more likely to be reported to the police, it has been proposed that UCR crime rates may be a better indicator of variations in serious crime than the more inclusive NCS rates (Gove et al. 1985). On the other hand, since older victims are more likely than younger victims to report crimes to the police, UCR rates may rise and fall with changes in the age composition of the population (Biderman et al. 1983, pp. 16-24). Such factors known to influence crime reporting should be used to systematically evaluate claims that block watch programs, "get tough" attitudes, and greater

trust in the police have led to "divergence" between UCR and NCS crime estimates by driving up reporting rates.

The evidence presented in this paper supports a conclusion of strong consistency between UCR and NCS data on crime, and this contradicts the conclusions of most previous temporal comparisons of the two data series. Over the years the two series have tracked each other quite closely, at least for the serious crime types of burglary and robbery. This is particularly so for the year-to-year variations, which provide the answers to the most frequently asked question of whether crime is "up" or "down". Within the context of the models estimated here, knowing the rates from one data source provides a basis for obtaining good estimates of the corresponding rates from the other data source--an encouraging finding with regard to the original NCS goal of providing a national time series on unreported crimes to complement UCR data on crimes known to the police.

NOTES

1. E.g., O'Brien (1985, p. 106): "In my comparisons of UCR and NCS crime trends for the period 1973 to 1981, I found a low degree of convergence." Messner (1984, p. 440) adopts the same usage and draws the same conclusion: "The picture of trends in crime is noticeably different when estimates are based on NCS sources in comparison with UCR sources...."

2. Commercial burglaries comprised roughly one-third of all burglaries reported to the police between 1976 and 1986 (Flanagan and Jamieson 1988, p. 343, Table 3.117). While it is more difficult to clearly isolate commercial from personal robberies in UCR data (see Biderman et al. 1983, pp. 46-48), between one-fifth and one-quarter of all robberies known to the police occurred in convenience stores, gas stations, banks, or other commerical establishments over the same period (Flanagan and Jamieson 1988, p. 342, Table 3.114).

3. Biderman et al. (1983, pp. 24-28) found that excluding commercial crimes from the UCR data had little effect on the divergence between UCR and NCS crime rates between 1973 and 1979; they concluded that "there is slightly less apparent correspondence than without the adjustment" (p. 25). This finding is based on comparisons of offense indexes which include larceny and vehicle theft in addition to robbery and burglary.

4. We report the unadjusted R^2 for these trend regressions because it exhaustively partitions the total sum of squares into trend and deviation components (i.e., Deviation = 1.00 - R^2 (Trend)). Adjusting R^2 for degrees of freedom in each regression does not alter these substantive conclusions.

The results in Table 2 reflect the influence of linear trend in

the data. Conceptually, it is not clear what a more complex pattern of trend would mean in a series comprised of only 13 observations. It seems reasonable to treat observations that depart from linear trend in a 13-point series as deviations from trend rather than as parts of more complex quadratic or higher-order polynomial trends. This approach is also consistent with previous research comparing trends in UCR and NCS data (Biderman et al. 1983; Menard 1987).

5. "Forward telescoping" of crimes into the reference period was an important problem in the early victimization surveys (O'Brien 1985, pp. 51-52; see also Bureau of Justice Statistics 1989, p. 4).

6. The half-period regression results are as follows (substantive conclusions remain the same when the R^2 is corrected for degrees of freedom used in the estimates):

	1973-1978		1979-1985	
	b	R^2	b	R^2
ROBU	-1.354	.037	-4.698	.255
ROBN	-14.674*	.701	-17.870	.354
BURU	22.173	.180	-60.234*	.633
BURN	-13.402	.261	-139.220**	.768

Sig. level in a 2-tailed test

*p $\leq$ .05
**p $\leq$ .01

7. Deviation in the reporting rate for burglary (BREP(D)) is significant ($p \leq .01$) when entered alone (model 3), suggesting some influence on the UCR burglary rate (BURU) of year-to-year fluctuations in the proportion of burglaries reported to the police. However, the effect of the reporting deviation variable is quite small--the increment in variance explained in BURU by adding BREP(D) to a model that already contains the burglary victimization rate, BURN(D) (model 4 versus model 2), is .039, or less than 5% (.846 -

.807 / .807).

Moreover, some of the effect of the reporting rate on the UCR burglary rate may be an artifact of the influence of yearly fluctuations in burglary victimizations on fluctuations in the rate at which they are reported to the police. In fact, a significant association exists between BURN(D) and BREP(D) ($r = .590$, $p \leq .05$), which probably accounts for the reduction in the significance of BREP(D) observed between models 3 and 4. Such an association would be expected if year-to-year changes in the overall burglary victimization rate were driven largely by changes in subclasses of more serious offenses (e.g, completed versus attempted burglaries), which victims are more likely to report to the police (see Flanagan and Jamieson 1988, p. 215, Table 3.2).

8. The increment in variance explained by trend is somewhat reduced when model 5 is contrasted with model 2, which does not contain the nonsignificant robbery deviation variable.

9. Regressing ROBNREP on ROBN and RREP yields standardized regression coefficients (beta) of .858 and .315, respectively. Both coefficients are highly significant ($p \leq .001$).

10. The relationship between the two time series is not the result of serial correlation in the error terms of the OLS estimates. Inspection of the Durban-Watson statistics for final model 5 in Table 3 reveals no significant first-order autocorrelation for either crime type. In his examination of crime rate trends between 1973 and 1982, Menard (1987, p. 459n) found only one instance of significant autocorrelation (for larceny victimizations), although results for several offenses, including the UCR and NCS burglary rates and the NCS robbery rate, were inconclusive.

11. Between 1986 and 1987, UCR rates fell from 1345.79 to 1329.58 for burglary and from 225.35 to 212.70 for robbery. Our 1986 and 1987 adjusted NCS rates are, respectively, 2307.19 and 2310.19 for burglary, 418.92 and 423.17 for robbery. The adjusted NCS robbery rate in 1985 was 412.58. The unadjusted NCS data show the same patterns of change during these years (Bureau of Statistics 1988, p. 2, Table 2).

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Table 1. UCR and NCS Robbery and Burglary Series, 1973-1985

YEAR	ROBU	BURU	ROBN	BURN	RREP	BREP
1973	181.79	1213.82	524.23	3055.82	0.53	0.47
1974	207.37	1424.57	562.01	3150.15	0.54	0.48
1975	215.80	1509.34	532.34	3129.84	0.53	0.49
1976	194.17	1424.78	510.66	3062.75	0.53	0.48
1977	185.40	1393.66	492.81	3078.31	0.56	0.49
1978	189.82	1404.49	467.37	3018.53	0.51	0.47
1979	211.38	1477.60	496.96	2977.02	0.56	0.48
1980	245.87	1665.22	532.00	3068.36	0.57	0.51
1981	254.96	1641.20	601.38	3219.86	0.56	0.51
1982	235.44	1481.58	575.01	2872.03	0.56	0.49
1983	213.51	1332.06	490.43	2587.88	0.53	0.49
1984	205.08	1261.94	463.86	2386.10	0.54	0.49
1985	208.54	1287.32	412.58	2343.13	0.54	0.50
Mean	211.47	1424.43	512.43	2919.21	0.54	0.49
St D	22.49	134.69	50.56	291.00	0.02	0.01
CV	0.11	0.09	0.10	0.10	0.04	0.02

Note: ROBU, BURU = Annual UCR robbery and burglary rates (reported crimes per 100,000 population);

ROBN, BURN = Annual NCS robbery and burglary victimization rates (as adjusted to reflect rates per 100,000 population);

RREP, BREP = Annual NCS rates of victims reporting crimes to the police for burglary and robbery.

CV = Coefficient of variation obtained from the ratio of the standard deviation (St D) to the mean.

Table 2. Trends in UCR and NCS Rates, 1973-85

Variable	Burglary			Robbery		
	Intercept	Trend b (t stat.)	R^2	Intercept	Trend b (t stat.)	R^2
UCR Crime Rates (BURU, ROBU)	1430.393	-.852 (-.082)	.001	193.823	2.521 (1.610)	.191
NCS Crime Rates (BURN, ROBN)	3323.193	-57.711** (-4.033)	.597	545.260	-4.689 (-1.285)	.131
NCS Reporting Rates (BREP, RREP)	.475	.002* (2.289)	.323	.535	.001 (.881)	.066
NCS "Reported Crime" Rates (BURNREP, ROBNREP)	1584.688	-22.744* (-2.579)	.377	291.830	-1.888 (-.778)	.052

Significance Level in a 2-Tailed Test

* $p \leq .05$
** $p \leq .01$

Table 3. Alternative Models Relating UCR Crime Rates to NCS Data

a. UCR Burglary Crime Rate, BURU (1973-85)

NCS Variables[a]	1	2	3	4	5
Intercept	620.082	1424.431	1429.328	1426.303	1401.565
BURN	.276* (t= 2.457)				
BURN(D)		.661*** (t= 7.152)		.544*** (t= 5.315)	.544*** (t= 5.045)
BREP(D)			9096.862** (t= 3.372)	3477.926 (t= 1.941)	3467.063 (t= 1.833)
BURNREP(T)					.017 (t= .095)
Adj R^2	.296	.807	.464	.846	.829

b. UCR Robbery Crime Rate, ROBU (1973-85)

Intercept	83.656	211.473	210.703	211.228	578.835
ROBN	.249* (t= 2.247)				
ROBN(D)		.368** (t= 4.010)		.323* (t= 2.907)	.329** (t= 3.897)
RREP(D)			713.790 (t= 2.113)	227.252 (t= .733)	198.604 (t= .844)
ROBNREP(T)					-1.319* (t= -2.894)
Adj R^2	.252	.557	.224	.537	.734

Table 3. Alternative Models Relating UCR Crime Rates to NCS Data (Continued)

Significance in a 2-tailed test:

* $p \leq .05$
** $p \leq .01$
*** $p \leq .001$

[a]The variables are defined as follows:

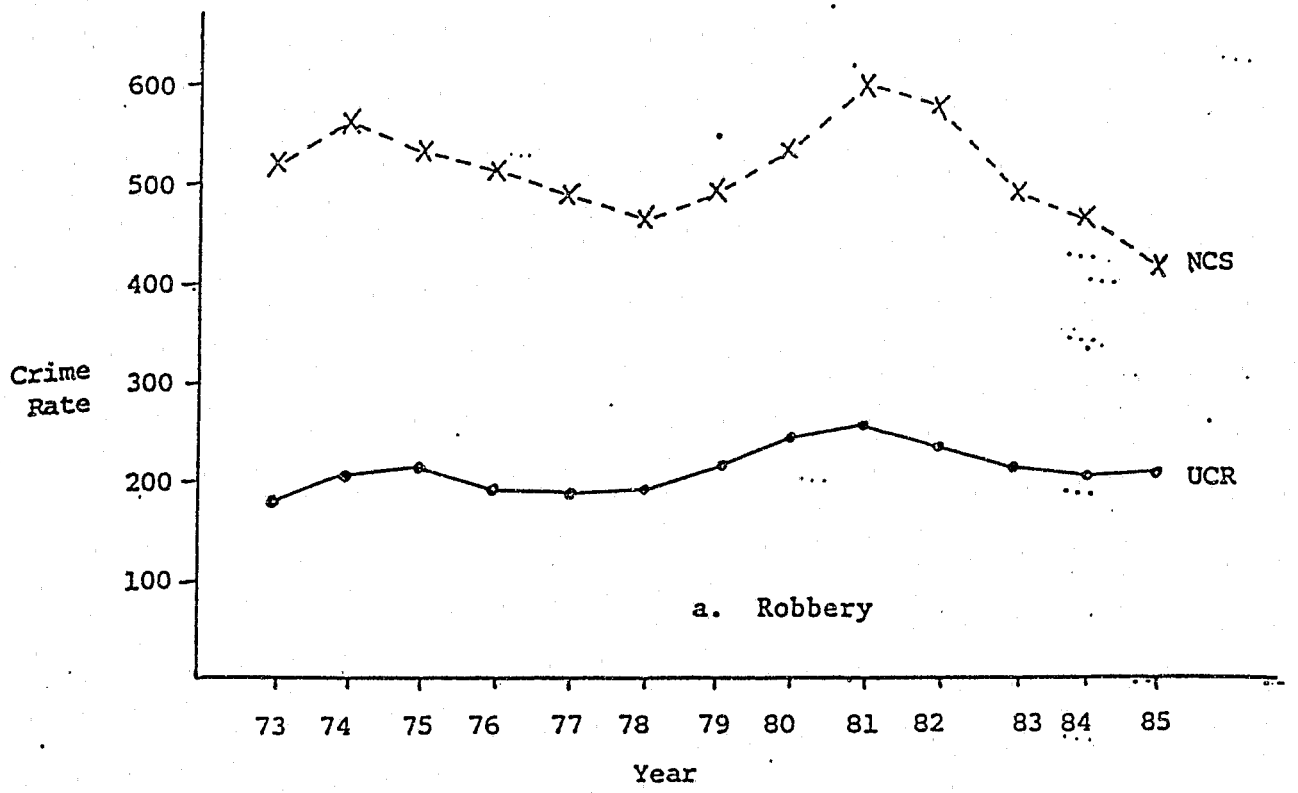
BURU, ROBU	-	Annual UCR crime rates for burglary and robbery (reported crimes per 100,000 population);
BURN, ROBN	-	Annual NCS crime victimization rates for burglary and robbery (as adjusted to reflect rates per total resident population);
BURN(D), ROBN(D)	-	Yearly deviations from the simple time trend in annual NCS crime victimization rates for burglary and robbery;
BREP(D), RREP(D)	-	Yearly deviations from the simple time trend in annual NCS rates of victims reporting crimes to the police for burglary and robbery;
BURNREP(T), ROBNREP(T)	-	Annual time trend values of NCS "reported" crime rates for burglary and robbery (obtained from the product of NCS crime victimization rates and NCS reporting rates).

Table 4. The Role of Recent Reporting Changes in Predicting 1986 and 1987 UCR Rates from 1973-85 Models

Alternative UCR Rates	1986	1987
1. Burglary		
a. Observed	1345.79	1329.60
b. Estimated Using Actual Reporting Change[a]	1368.85	1394.56
(% Error)	(+1.7)	(+4.9)
c. Estimated Using Predicted Reporting Change[b]	1309.91	1342.55
(% Error)	-2.7	(+1.0)
2. Robbery		
a. Observed	225.35	212.70
b. Estimated Using Actual Reporting Change	214.96	216.22
(% Error)	(-4.6)	(+1.9)
c. Estimated Using Predicted Reporting Change	208.81	214.24
(% Error)	(-7.1)	(+0.9)

[a]All predictions for 1986 and 1987 extend the 1973-85 trends for all variables into 1987 and calculate deviations as the difference between the observed and the estimated trend values for each variable. "Actual reporting change" utilizes the actual deviation from the 1973-85 trend that is observed in the 1986 and 1987 reporting rates.

[b]The "predicted reporting change" is based solely on extending the 1973-85 trend in reporting rates through 1987. The deviation from this predicted reporting rate is set to zero for 1986 and 1987.



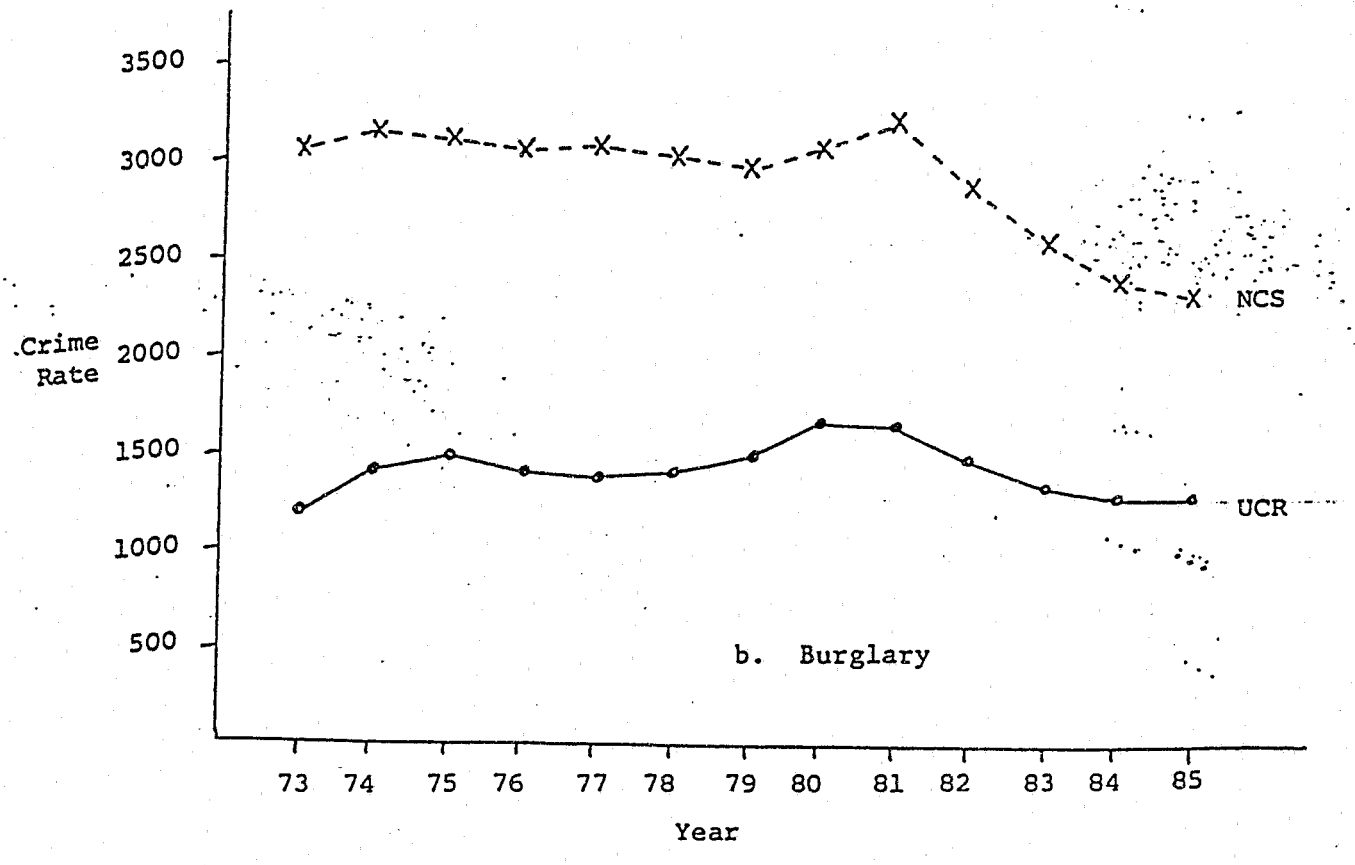
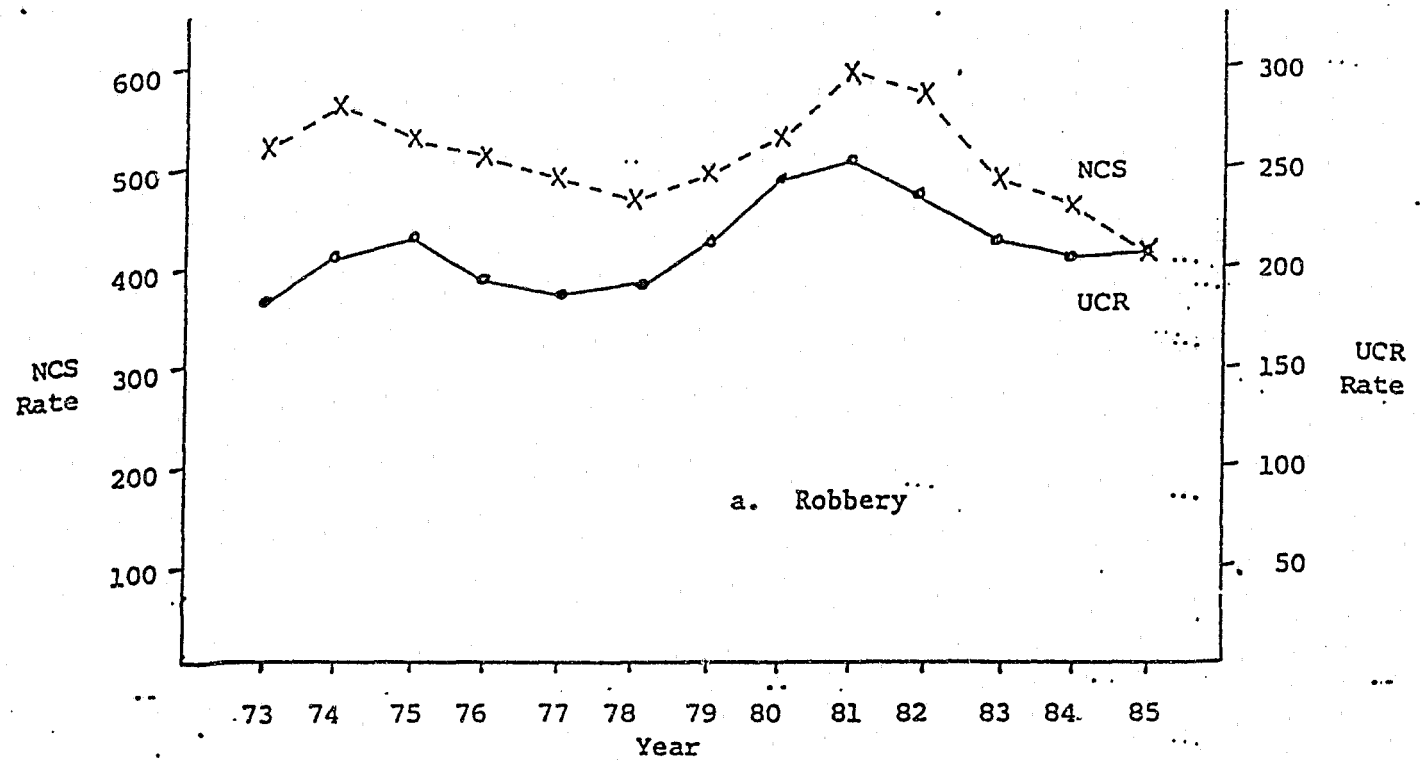


Figure 1. Comparison of Annual UCR and NCS Crime Rates (per 100,000 total population) - 1973 to 1985



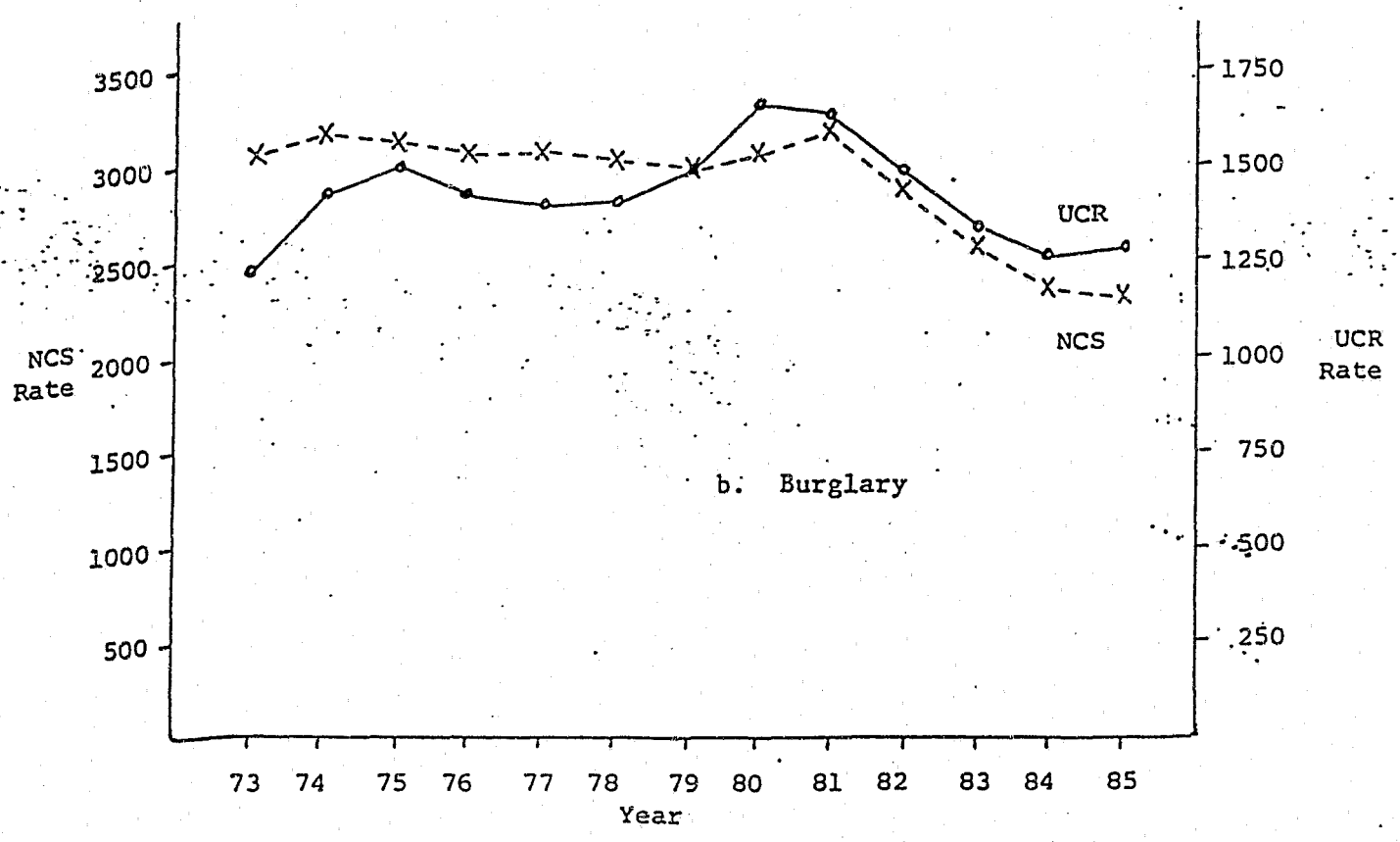


Figure 2. Comparison of Annual UCR and NCS Crime Rates (per 100,000 population) - 1973 to 1985

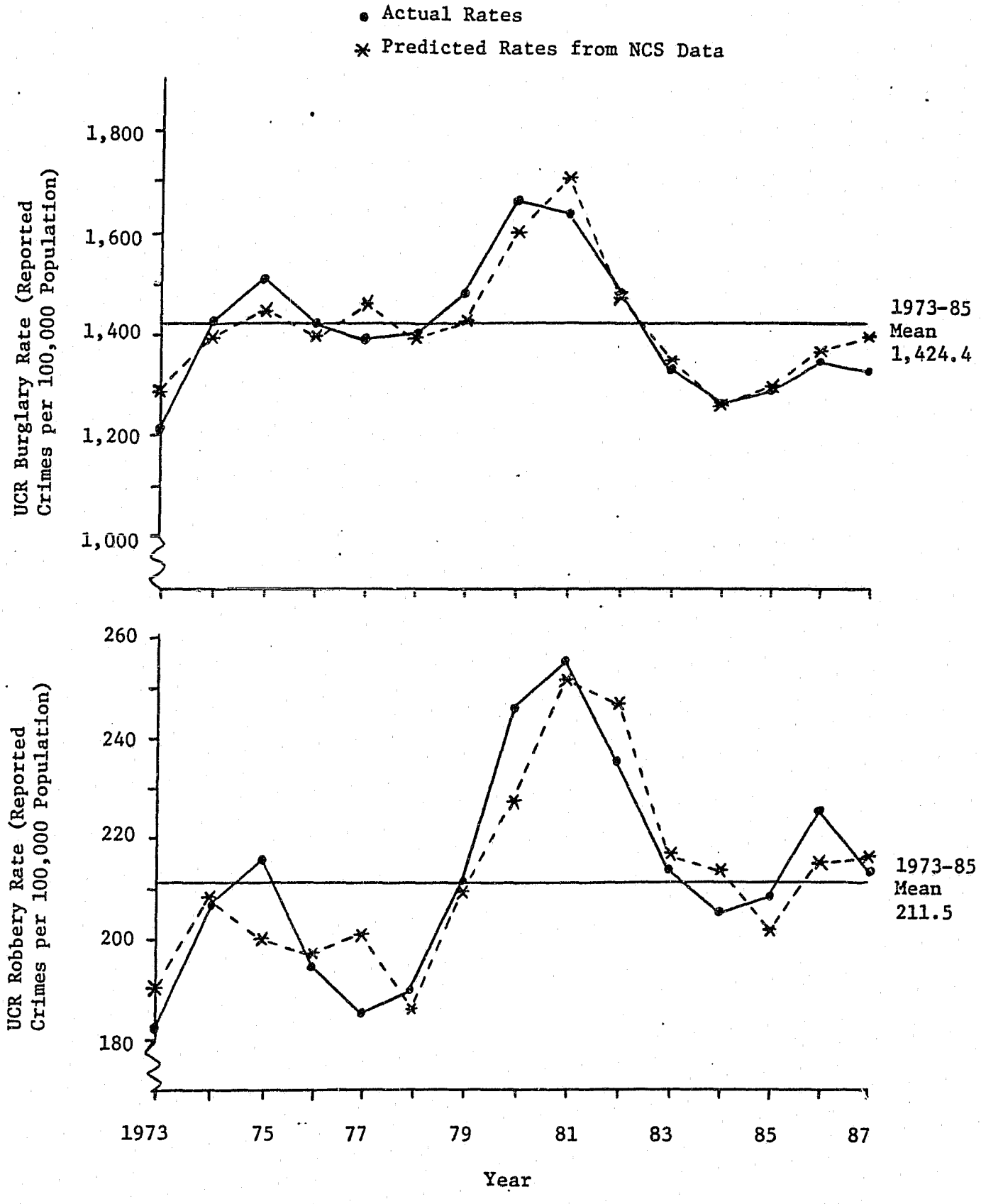


Figure 3. Predicting UCR Rates from NCS Rates: 1973-85 Model

Figure 3 Notes:

[a]The relationships between UCR and NCS rates were estimated using 1973 to 1985 data in model 5 from Table 3 as follows:

$$BURU = 1401.565 + .544\ BURN(D) + 3467.063\ BREP(D) + .017\ BURNREP(T) \quad (\text{Adj } R^2 = .829)$$

$$ROBU = 578.835 + .329\ ROBN(D) + 198.604\ RREP(D) - 1.319\ ROBNREP(T) \quad (\text{Adj } R^2 = .734)$$

The observed 1986 and 1987 NCS crime rates and reporting rates were separated into their trend (T) and deviation (D) components by extending the 1973 to 1985 trends for each variable through 1987. Deviations from trend for each variable were calculated as the difference between the observed value and the estimated trend value.