CRIME AND ECONOMIC TRENDS

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Abstract

This study uses a pooled time series-cross section research design to explore the relationship between the UCR reported crime categories and economic trends as measured by: 1) real personal income, 2) gross state product, and 3) unemployment rates. An initial finding is that there is a force uniform across almost all crime categories, pushing crime levels up and down approximately every three years. We have been unable to find the cause.

The major finding is strong evidence that crime has a substantial impact on the economy, whereas the economy probably has little impact on crime. When economic variables are regressed against property crime, especially burglary, a highly significant negative relationship is found. For violent crime, the weaker positive relationship emerged. The reciprocal causation problems were addressed by applying a Granger-Sims test and by using regressions with multiple lags of independent variables.

1) The Issues.

The large body of research concerning the connection between crime and the economy has reached a wide variety of results. On the balance, most researchers find little or no connection; the major exceptions are several time series analyses finding that economic downturns and higher unemployment rates lead to more property crime, especially burglary.

A likely reason for the disparate results is the multitude of theories concerning why the economy might either increase or decrease crime. Also there are several reasons for believing that more crime causes the economy to increase or decrease. The literature has concentrated almost exclusively on the first aspect, economic trends causing crime (for summaries see Cook and Zarkin 1985; Cohen and Land 1987).

Although most arguments relate to either property or violent crime, a few are more general. Economic downturns may induce police departments to reduce personnel and other resources, which in turn may reduce the likelihood of apprehension. On the other hand, downturns may increase apprehension because victims have more free time with which to aid police investigations.

The arguments concerning property crime are especially numerous. Perhaps the most common reason for a negative relationship is that when the economy declines, many persons have lower incomes. Also economic hardship reduces the effectiveness of sanctions; there is a greater difference, for example, between

being in prison and having a well paid job than between being in prison and being unemployed. Thus, one might expect that property crime varies inversely with the economy.

The major argument for a positive causal connection is that the opportunity for successful crimes is greater during better economic conditions. There are many reasons for this, including increases in the worth of the crime targets, increased number of targets, and reduced incentives for persons to secure and defend their belongings. Better economic times may increase the demand for the fruits of crime, as part of a general rising demand for goods. In better times when more people have jobs, they are more likely to be away from their homes - working, vacationing, dining out, and so on - thus creating more opportunities by leaving property unprotected.

It is also not hard to find arguments going both ways with respect to violent crime. A better economy tends to lead to more alcohol consumption, which in turn leads to more violent crime, especially assaults. Also, poor economic conditions may make citizens more wary of entering into situations where they may be criminally injured because the cost of health care is more threatening. On the other hand, poor economic conditions may lead to more psychological stress or more interpersonal stress, conditions that may be conducive to violent crime.

The opposite causal direction - crime causing the economy - had received almost no discussion. Again, a wide range of arguments are possible. The most likely connection is that persons

involved in economic actives tend to stay away from high crime areas. Thus store customers and tourists may be influenced in their choices of consumption location by their views of the amount of crime in their various possible choices. High crime rates may prompt businesses to move away. Crime is a factor businesses consider when selecting communities to relocate or expand into. It is noteworthy that studies ranking communities for their suitability for business or for residential living include crime rates, along with such factors as tax rates and school quality. Economic research, we note, has studied the impact of states' taxing and spending patterns on attracting economic growth. Helms (1985) for example found that taxes retard economic growth when the funds are spent on transfer (e.g., welfare) payments, but funds spent to improve schools and other public services had a favorable impact on location and production decisions, increasing economic growth.

In a separate line of reasoning, one may argue that if more people resort to crime as a way of life, there are fewer people available for legitimate employment.

On the other side of the coin, it is possible that more crime indirectly leads to economic growth. From the class conflict perspective, it is possible to argue that civil and business leaders may view crime increases as a sign of citizen unrest based on dissatisfaction with their living standards, and they may respond by stimulating the economy generally or by allocating more business and government resources into the high crime areas.

There are probably many more plausible links between crime and the economy. The above discussion is sufficient to illustrate the fact that one cannot a priori assume that any particular relationship must dominate for any particular type of crime. More important, because these putative causal forces work against each other, researchers cannot feasibly distinguish the impact of any particular relationship theorized. Rather, we can only discern the net effect. A finding that there is a negative impact between the crime and economy does not suggest that there is no positive impact, only that the negative impact predominates. Also, a statistical relationship is very likely to understate the impact of any particular theory because the finding may be reduced by opposite forces.

As is often remarked, research results in this area largely depend on the research design used. Econometric time series studies often find positive relationships between unemployment and economic crime. For example, Cook and Zarkin (1985) found highly significant relationships (but with moderate coefficients) between unemployment and robbery and burglary, but little or none with murder and auto theft; Wolpin (1978) found a significant relationship for burglary only; Canter and Land (1985) found negative relationships for all property crimes plus robbery. Time series studies, however, have been criticized on the grounds that they may be simply capturing common, but unrelated trends (Parker and Horwitz 1986). This can be mitigated by including a trend term, but in practice such variables are seldom used, and their use

requires an assumption of a linear trend (or other function set by the researcher). Also, adequate data for time series studies is hard to come by. A rule of thumb is that 50 time periods are needed before one can claim firm conclusions (Cook and Campbell 1979). If yearly U.S. crime data are used, for example, this requires the use of very uncertain statistics.

A major problem with cross section studies is that jurisdictions are different in so many ways other than those captured by the variables included in the model that the researcher can probably never obtain an adequate specification. That is, any impact that the economy has on crime is likely to be swamped by the impact of omitted variables. Also, cross section studies based on state (although not community) data suffer from inadequate sample size. These problems may well account for the fact that many cross section studies show little or no relationship between crime and economic trends.

Finally, the field has been lax in addressing the question of possible reciprocal causation; even the most complex models of the relationship between crime and the economy posit one way causation (e.g. Cantor and Land 1985). Time series research is generally better than cross-section research in handling causal problems (e.g. Cook and Campbell 1979), but we are not aware of any time series studies that employ techniques of causal analysis. In fact, apparently the only research exploring two-way causation is a cross-section study, using cross-lags in either direction (Parker and Horwitz 1986). These researchers found slight hints that crime

caused economic change, but with different directions for different years.

2) Research Design

2.1 Time Series Cross-Section Analysis.

In the present study we combine the two previous research designs into a pooled time series-cross section design. This has long been considered one of the best designs to study causation (see especially, Campbell and Stanley 1967; Lempert 1966; Berk et al. 1979; Moody and Marvell 1987). The model combines data from several units over several years, and the total number of observations (sample size) is the product of the number of units and the number of years. In this study, which uses state-level data, the units are typically 49 states (as mentioned later Alaska is deleted) over period of from 12 to 17 years depending on the particular analysis. The overall number of observations is, therefore, usually over 600.

We use the fixed effects model, the standard econometric regression procedure for analyzing time series-cross section data (Pindyck and Rubinfeld 1981; Mundlak 1978). This model, which is an analysis of covariance, creates a dummy variable for each state in the analysis (except the first), and the coefficient associated with the variable is an estimate of the influence of specific factors ("fixed effects") unique to a state. A second set of dummies is entered for each year (except the first), controlling for effects particular to the given year. Omission of these fixed

effects, if they are correlated with other variables in the model, causes the estimates of the other variables to be biased. The fixed effect dummies reduce the degrees of freedom by almost the number of states plus years included (and an additional degree of freedom for each state is lost when correction for autocorrelation is required).

Specifically, the form of the fixed effect model is as follows:

$$Y_{it} = a + bX_{it} + cV_{it} + g_2W_{2t} + g_3W_{3t} + \ldots + g_NW_{Nt} + d_2Z_{i2} + d_3Z_{i3} + \ldots + d_TZ_{it} + e_{it}$$

where, for example, Y_{it} is the crime in state i and year t, X_{it} is the economy in state i and year t, V_{it} represents the demographic variables, and the state and year dummy variables are:
$W_{it} = 1$ for the i'th state, i = 2, . . ,N; otherwise $W_{it} = 0$, and
$Z_{it} = 1$ for the t'th year, t = 2, . . ,T; otherwise $Z_{it} = 0$.
And e_{it} is the error term.

State or year dummies can be omitted if not significant as a group (see Pindyck and Rubinfeld 1981:255 for the test of significance). The state dummies are highly significant for most analyses, indicating that there are major differences between states. The only exceptions occur when variables are transformed into first differences or percentage changes, in which case the state dummies drop out. The year dummies are highly significant in all analyses.

The use of state and year dummies has several practical results. The variables in the analysis are transformed into the

difference from the mean for the particular state. As a result, the fixed effect model produces a time-series analysis only; it combines the time series data from the several states into one regression, but ignores within-year, across-state variations. Therefore, the analysis avoids the causal uncertainties inherent in cross section studies.

The use of state dummies permits one to combine states into a single analysis even though individual states have their own particular characteristics, such as different legal definitions of crime. The dummy variables representing states control for the differences. Likewise, the year dummies control for nation-wide effects in a year. This provides a much more complete specification than is available in other research designs.

2.2 Statistical Problems.

Autocorrelation. Because it contains a time series element, the pooled time series-cross section design frequently encounters autocorrelation problems. The Durbin-Watson test can be used in the fixed effect model as long as there are gaps of missing values between the states in the time series, such that error terms for the first year in state i are not compared to the last year for state i-1. The Durbin-Watson statistic indicated autocorrelation in the regressions in Tables 3 and 9 only. We corrected for it by calculating separate autocorrelation coefficients for each state, the standard procedure in the time series-cross section analysis (Pindyck & Rubinfeld 1982:258-59). The correction in several

regressions, however, did not cure all autocorrelation problems (see Tables 3 and 9), and it has the drawback of deleting one year from the analysis, reducing the degrees of freedom.

Coefficient Disparity. A similar problem is that variables that are not ratio variables have much greater variation in larger states. For example, the year-to-year changes in number of crimes is much greater in large states, leading to greater variation (in the fixed effects model the variables are differences from their means). Ratio variables such the unemployment rate have much smaller between state differences in variation. The large states, therefore, would dominate the results with respect to such non ratios variables; so such variables are expressed in per capita terms.

Heteroscedasticity. Heteroscedasticity, a similar but distinct problem, arises because ratio variables have a (comparatively slight) tendency vary more in small states. Using the Breush-Pagan test, we discovered heteroscedasticity problems in several instances, and corrected by applying the weight found by search to eliminate the problem. The weights applied were 1) the fourth root of population in the regressions with murder, rape, or larceny as the dependent variable, and 2) the square root of population for regressions with the gross state product or state personal income as dependent variable. We found no heteroscedasticity in regressions using percent change variables.

Collinearity. Collinearity tests indicated that we could enter only a limited number of lags for variables in the analyses

(except when using percent change or first difference variables). The use of demographic variables was limited because they tend to be highly intercorrelated.

Influence. There are many complaints about the quality of crime data. A good way to mitigate this problem is to use influence analysis (Belsely, Kuh, and Welsh 1980) to locate observations that have extreme impacts on the regression results. The results of this analysis are presented in Appendix A. In general, it led us to delete Alaska and the District of Columbia from all analyses, and we deleted a few other states or observations from most other analyses. Illinois and Nevada data were often troublesome.

2.3 Variable Lags and the Granger-Sims Test.

As stressed earlier, the research encounters severe specification problems if crime and the economy affect each other. If when regressing crime on unemployment rate, for example, one found that the latter has a significant coefficient, one cannot conclude that unemployment affects crime; the result may be due to the impact of crime on the economy. Initially, we should stress, it is not enough to assume that by lagging independent variables the causal relationship must go from the right to the left side of the equation. The lagged version of the independent variable is likely to be correlated with the current year version, causing a spurious relationship with the dependant variable. The fixed effect model mitigates this problem because the variables are

transformed to differences from their means and, thus, are less likely to be correlated from year to year than the variables in their absolute form. Nevertheless, we must control for the possible impact of the other values of the independent variable.

We are aware of three ways to determine causal direction. The first is using simultaneous equations with two stage least square regressions, which involves the use of identifying variables that affect only one of the variables being explored. We do not use this technique because of the extreme difficulties associated with identifying the crime equation (Fisher and Nagel 1978).

We apply two other mechanisms for determining causal direction. The first is to use both current year and lagged values of the independent variable. Any "backward" causation should be included in the coefficient for the current year version, such that the results with respect to the lagged version indicate one way "forward" causation, from the right to the left hand side of the equation. This, however, suffers from the drawback that the results for the current year variable are ambiguous as to causal direction; hence the results only provide information about possible lagged impacts.

The main approach is the Granger-Sims test, the standard econometric technique for determining causal direction. Separate tests were developed by Granger in 1969 and Sims in 1972 and then shown to be theoretically equivalent by Boussiou (1986). We use the Granger version (Granger 1969). The test works as follows: Suppose we have reason to believe that two variables, y and x, are

simultaneously determined. If this were true, a regression of y on lagged y and lagged x would reveal significance with respect to lagged x variables. That is, in the regression:

$$y_t = a_1 y_{t-1} + \ldots + a_n y_{t-n} + b_1 x_{t-1} + \ldots + b_n x_{t-n} + u_t$$

the coefficient $b_1, \ldots, b_n$ can be expected to be jointly significant using an F test. If not, then x does not cause y. Similarly, if we regress x on itself lagged and lagged values of y, the coefficients on the lagged y will be significant if y causes x. Otherwise y does not cause x. In the present research we use three lags (t-1, t-2, and t-3), although the results would probably be the same with just two lags.

The Granger-Sims test does not actually determine causation, just a statistical relationship for variables prior in time. It does not rule out the possibility of spurious correlation due to missing variables. Here again, we have mitigated this problem by using year and state dummies, but of course the problem can never be eliminated.

3) Variables.[1]

The major variables are measures of crime and the economy. For crime, we use the two major categories of reported crime, violent and property crime, along with each specific type: murder and non-negligent manslaughter, forcible rape, robbery, aggravated assault, burglary, larceny-theft and motor vehicle theft. Crime

1. The data are available on floppy disks from the authors.

rates from 1971 to 1986 are used, except that the larceny and property crime data begin in 1973.

We use three different measures of economic trends, thus allowing for replication and robustness checks. The three are:

1) State personal income: the total personal income for residents of the state (obtained from the Bureau of Economic Analysis, U.S. Department of Commerce).

2) Gross state product: the gross market value of the goods and services attributed to labor and property located in a state, and it is the state component of the familiar gross national product, and it is available for 1972 through 1986. It was obtained from the Bureau of Economic Analysis.

3) The unemployment rate: the number unemployed as a percentage of the total labor force. The state-wide data from 1970 through 1986 were obtained from the Bureau of Labor Statistics, U.S. Department of Labor. We do not use unemployment data before 1976 in states with less then one million population because the Bureau advised us that these statistics may not be accurate.

The income and gross state product figures were adjusted for inflation by dividing by the Gross National Product deflator. As stated earlier, these variables, as well as the crime, are divided by population.

We also include as independent variables the proportion of population in different age groups. There is considerable belief that demographic trends, especially the number of teens and young adults, affect crime trends (e.g., Cohen and Land 1987). The

Census Bureau has published data from 1970 to 1986 for the numbers of people ages 0 to 5, 5 to 14, 15 to 17, 18 to 24, and every decade thereafter to the over 65 category. Unless percent change or first difference variables are used, collinearity problems prevent us from entering more than a few of the age structure variables. We selected the variables to enter as follows: When crime is the dependent variable we entered only those demographic variables that showed significant positive impacts on crime rates in the percent change and first different regressions (see Table 7). When regressing economic variables on crime, we entered the three most significant demographic variables in the percent change and first difference analyses (see Table 8).

Finally, as discussed earlier, independent variables also include the state and year dummies, which mitigate any problems of omitted variable bias.

4) Findings

4.1 State and Year Effects

One of the most important findings is the magnitude of the state and year effects in the regression of crime on economic and demographic variables. The state dummies are very significant: the F values commonly range from 40 to 80 (Table 3). The differences between states account for a very large portion of the variance explained, and these differences are by definition differences that persist from year to year. Although numerous candidates are possible (such as different criminal codes), in

practice we cannot tell what the state effects are; but it is clear that their existence makes cross state comparisons perilous.

More interesting are the year dummies, which are always highly significant. These capture forces that affect all states in a given year. Their impact on the regressions is considerable, as can be seen by comparing the variation in dummy variable coefficients (in Table 2) with the variable means (Table 1).

The most surprising feature of the year effects is that they evidence the same trends for all seven types of crime, except possibly murder (Table 2). The year dummy coefficients generally increased through 1975, declined slightly in 1976 or 1977, rose through 1980, declined through 1983, and then started to rise in 1984 or 1985. That is, some powerful force (or forces) dominate time trends, causing broad changes even after controlling for demographic and economic trends. We have labeled this the "W Factor," because that letter represents the time patterns of the trend reflected by the year dummies. Although we have spent considerable effort trying to locate this factor, we must admit that we lack information concerning its identity (prison commitments and population, for example, do not affect it).

4.2 Demographic Trends

The demographic variables deserve a quick mention. Although one or more of the age groups entered are significant in most regressions, their impact is generally quite small, especially when compared to the great faith placed on demographics by many researchers in recent years. They are also small compared to the

year dummies, representing the unknown force. Perhaps research finding that demographic factors are important are partly spurious, the result of common trends. This is supported by the fact that crime rates increased in the past four years in spite of predictions that it would fall along with the number of teens and young adults.

The problem, however, could also be caused by a failure to select the correct age groups. In some instances (such as assault and larceny) the most significant age groups are in the middle ages. Persons in these age groups may represent targets, such that their increase provides more opportunity to commit crime.

4.3 Regressing Crime on Economic Trends

At first glance, the best candidate for the W Factor appears to be economic trends: there were recessions in 1975 and 1980-82, which seem to presage downward trends in crime. Our research, however, did not support this.

Before describing the results in Table 3, we should describe the general form of the regressions presented. The table contains 21 regressions, seven types of crime times three measures of the economy. Each regression contains a current year and lagged value of the economy variable, plus the demographic and fixed effects variables. The F values are used to determine the significance of sets of independent variables as groups (i.e., the significance of current and lagged values of the economic variables). The results for the different economic measures are generally quite close.

To broadly summarize the results in Table 3, murder, rape, and assault show a positive relationship with the economy (and thus a negative relationship with unemployment rates) although the significance levels are very low considering the large sample sizes. Burglary and larceny show very substantial negative relationships with economic activity, and robbery shows a lesser one. Motor vehicle theft shows no relationship. These results are consistent with many time series studies.

But a closer look should make the reader suspicious. With respect to property crime, these relationships are almost always for the current year, and in the case of larceny and burglary the direction for the economy lagged is usually in a direction opposite to that for the current year. The current year coefficient, as was discussed earlier, is causally ambiguous. So if anything, Table 3 can stand only for the finding that there is a positive impact of the economy on crime, especially for burglary and larceny, not the negative relationships appearing in the most significant coefficients. But then Table 4 presents an argument for a negative relationship. Because changes in economic conditions, rather than the conditions themselves, may be the key factor, the four property related crimes were regressed against first differenced values of economy, both current and lagged. The negative relationship with respect to burglary and larceny occurred in lagged variables also, a finding that supports similar results in Cohen and Land (1987).

4.4 Causal Analysis - Effects of Economy on Crime

The large current year relationship that disappears in the prior year indicates a possibility of reverse causation. Tables 5 and 6 present the Granger-Sims tests, and the notes at the bottom explain the procedure used. With respect to "forward" causation - the economy affecting crime - the research gives a mixed picture. There is some evidence that the economy effects crime but with little consistency between economic measures. The gross state product (GSP) shows little or no impact. Real personal income (RPI) might have positive impacts on burglary and motor vehicle theft. The unemployment rate shows an impact, generally positive, on violent crime except robbery, as well as on motor vehicle theft. This is consistent with most of the theories concerning how the economy affects violent crime, especially the psychological and social frustration due to the effects of economic downturns. Also, one might expect unemployment to show a greater impact than the broader measures of economic trends. But the findings are not robust. The significance levels in Table 5 are low, and the results were not confirmed in the regressions using change variables, as seen in Table 7 (here as elsewhere the current year - 0 lag - results may be causally ambiguous).

In fact, taken together, the Granger-Sims test and the results of the regressions using the change variables (percent change or first differences) show little consistency among causal analysis methods and among different measures of economic trends. No

conclusions can be reached, except for the obvious one that the results depend on how the analysis is conducted.

4.5 Effects of Crime on the Economy.

The picture is far more focused when exploring reverse causation. The Granger-Sims test in Table 6 shows that the economy has an extremely strong negative relationship with property crime, as well as a likely positive relationship with violent crime. Among individual property crimes, the standout is burglary, with a possible impact for motor vehicle crimes. Larceny may be a counter example. Robbery is the standout in violent crime, and murder may contribute. These results are generally confirmed in the regressions with first differenced variables (Tables 8 and 10), but regressions with percent change variables confirm only the burglary and property results. Overall, the findings are similar for different measures of the economy.

Finally, in Table 9 we present the regression of economic variables on crime and demographic variables. There are three regressions each for 1) violent and property crime, and 2) murder, robbery, and burglary. The latter were selected on the basis of the results in Tables 6 and 8, and larceny was not included because data are not available until 1973. The results concerning larceny from a separate regression using larceny, motor vehicle, and assault cases are presented at the bottom of Table 9. The motor vehicle and assault variables showed little or no impact.

Again, the current year variables must be treated with caution, but the Granger-Sims test does supply a rationale for

assigning a causal direction. With property crime it is probably safe to conclude that the causal direction is overwhelmingly from crime to the economy, and the full impact of crime on the economy can be measured by using the sum of the coefficients for the current and lagged values. This translates to approximately a 2 to 3 percent reduction in the real personal income and gross national product for every 10 percent jump in property crime, especially burglary. This is a moderate impact. But the effect on the unemployment rate is greater; the same ten percent increase in property crime is associated with approximately a 15 to 20 percent higher unemployment rate.

These results provide strong support for the argument presented earlier that crime may repulse business and other economic activity. However, of course, we do not actually know the basis for the statistical relationship. There may be some other theories of which were are not aware. Also, as in any statistical analysis, there always remains the possibility that other factors are responsible, making the relationship spurious.

The positive relationship between violent crime and economic trends appears is less strong and less robust (see Tables 6 and 7). Because the economy may have a positive impact on violent crime, as discussed earlier, it is difficult to interpret the current year coefficients for violent crime categories in Table 9. Murder probably has at most a small impact on the economy. For robbery, however, most of the relationship is lagged, leading to a strong suggestion that it does lead to a stronger economy. Just

why violent crime would stimulate the economy is far from clear. The causal mechanism, if any, must be very indirect.

5) Conclusion.

In criminology research we must often assume that certain variables cause crime. However, conclusions regarding causality should be made only after testing for causal direction. Researchers must assume that any two variables can cause each other, and causal conclusions are possible only after using tests for causal direction. In sum, we argue that the use of theory be expanded, so that all relationships are considered, rather than just one or a few set by the researcher.

The research on demography and crime rates, for example, assumes that age structure trends cause crime trends, but not the other way around. But what effect does crime have on migration patterns? It is possible that middle aged people move away from areas of rising crime more readily than older people. Also, racial and ethnic mix may be caused by crime.

Here the possibility of a "backward" relationship between property crime and the economy probably never entered most researchers' minds. Although we believe that there are logical grounds for believing it exists, grounds based on economic research in other topics. On the other hand, we have no highly persuasive reason why violent crime should cause economic growth. It may well be a spurious relationship, caused by some common factor. But we do not know what that might be, any more than we have been able to locate a candidate for the W Factor.

Appendix A Influence Analysis and Observations Deleted

One cannot assume that the data used here is accurate or meaningful. One answer to this problem is to search for outlier observations, where values for one or more of the variables are way out of line. We used influence analysis to locate such observations. Observations were deleted from the analysis when extreme values were found and there are good reasons for believing that the data are faulty. Other observations that showed substantial influence were retained in the analyses reported here, but deleted in a second regression to determine whether the reported results differ greatly when the observations are deleted.

Influence analyses were only conducted for the "straight" regressions, and not for the regressions using percent change or first difference variables (Tables 7 and 8).

Because Alaska and the District of Columbia showed up as extreme values for most regressions, and they were deleted from all regressions. The Alaska pipeline caused extreme economic dislocations in that state during the 1970's. D.C. is unique in that it is totally urban and dominated by government activity. Illinois also frequently showed up as a problem state because of poor reporting in Chicago prior to 1984.

The following list gives 1) the states, or selected years in a state, left out of the reported analysis, and 2) the states or years left out in an alternate analysis. [Again, Alaska and D.C. are left out of all analyses, and N.D. and S.D. before 1974 in all analyses with total personal income as a variable.]

Murder as dependent variable:

a) With gross state product:
   1) none
   2) FL, NV, WY. SC before 1974, and VA before 1975.
b) With state personal income:
   1) ME before 1973.
   2) FL, NV, WY. CO before 1973 and VT before 1977.
c) With unemployment rate:
   1) none
   2) FL, GA, HI, NV. KY before 1976 and OK before 1974.

Rape as dependent variable:

a) With gross state product:
   1) none
   2) MI, NV, VT, WY
b) With state personal income:
   1) none
   2) NV, SD, VT.
c) With unemployment rate:
   1) NV
   2) FL

Robbery as dependent variable:

a) With gross state product:
   1) none
   2) IL, NV
b) With state personal income:
   1) IL
   2) NV, NY. HI before 1973.
c) With unemployment rate:
   1) none
   2) none

Assault as dependent variable:

a) With gross state product:
   1) IL, WY
   2) DE. AL and CA after 1985
b) With state personal income:
   1) IL
   2) DE, WY. AL, CA, and NV after 1985.
c) With unemployment rate:
   1) IL
   2) DE, OR, SC, WY. AL after 1985.

Burglary as dependent variable:

a) With gross state product:
   1) AZ before 1975
   2) NE. DE before 1976. NC and PA before 1975.
b) With state personal income:

1) none
2) AZ, FL, and NV.

c) With unemployment rate:
1) none
2) FL, NV, OR, VT.

Larceny as dependent variable:

a) With gross state product:
1) DE before 1976
2) MO, OH and TX before 1976

b) With state personal income:
1) DE before 1974, HI and NV before 1976, and VT before 1977.
2) NV

b) With unemployment rate:
1) IL. NJ before 1975.
2) AZ, HI, WA. CT before 1975.

Motor vehicle theft as dependent variable:

a) With gross state product:
1) MA before 1976.
2) HI, NV, RI

b) With state personal income:
1) HI, MA
2) NY before 1973.

c) With unemployment rate:
1) HI, MA
2) NY before 1977.

State personal income as dependant variable:

1) none
2) FL, IL, and IN. Also NY after 1985.

Gross state product as dependant variable:

1) ND prior to 1974.
2) IL, LA, TX, WY.

Unemployment rate as the dependant variable:

1) none
2) HI, LA, MI, WV, WY.

SELECTED BIBLIOGRAPHY

Avio, Kenneth L.
1979 "Capital punishment in Canada: a time series analysis of the deterrence hypothesis." Canadian Journal of Economics 12:647-676.

Bartel, Ann P.
1979 "Women and crime: An economic analysis." Economic Inquiry 17:46-57

Becker, Gary S.
1968 "Crime and punishment: an economic approach." Journal of Political Economy 76:169-217.

Berk, Richard A. et al.
1979 "Estimation procedures for pooled cross-sectional and time series data." Evaluation Quarterly 3:385-411.

Berk, Richard A., Kenneth J. Lenihan and Peter H. Rossi
1980 "Crime and poverty; some experimental evidence from ex-offenders." American Sociological Review 45:766-86.

Belsely, D.A., E. Kuh, and R.E. Welsh
1980 Regression Diagnostics. New York: John Wiley & Sons.

Beyleveld, Deryk
1982 "Ehrlich's analysis of deterrence." British Journal of Criminology 22:101-123.

Biles, David
1979 "Crime and the use of prisons." Federal Probation 43:39-43.

Bishop, Donna
1984 "Deterrence: a panel analysis." Justice Quarterly 1:311-28.

Block, Richard
1979 "Community, environment, and violent crime." Criminology 17:46-57.

Blumstein, Alfred, Jacqueline Cohen, and Daniel Nagin (eds.)
1978 Deterrence and Incapacitation: Estimating the Effects of Criminal Sanctions on Crime Rates. Washington: National Academy of Science.

Bowker, Lee H.
1981 "Crime and the use of prisons in the United States: a time series analysis." Crime & Delinquency 27:206-212.

Brenner, Harvey M.
1978a "Economic crises and crime." Pp. 555-72 in Leonard Savitz and Norman Johnston (eds.), Crimes in Society. New York: Wiley.

Brenner, M. Harvey, and Robert T. Swank
1981 "Homicide and economic change: recent analyses of the Joint Economic Committee report of 1984." Journal of Quantitative Criminology 2:81-104.

Brier, Stephen S. and Stephen E. Fienberg
1980 "Recent econometric modeling of crime and punishment." Evaluation Review 4:147-91.

Brown, Don W. and Steven L. MacDougal
1977 "Noncompliance with law: A utility analysis of city crime rates." Social Science Quarterly 58:195-214.

Campbell, Donald T.
1984 "Can we be scientific in applied social science?" Pp. 2648 in Ross F. Connor, David G. Altman, and Christine Jackson (eds.) Evaluation Studies Review Annual Volume 9 Beverly Hills: Sage.
1986 "Science's social system of validity-enhancing collective belief change and the problems of the social sciences," Pp. 108-135 of Donald W. Fiske and Richard A. Shweder, Metatheory in Social Science. Chicago: University of Chicago Press.

Campbell, Donald, and James Stanley
1967 Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally.

Cantor, David and Kenneth C. Land
1985 "Unemployment and crime rates in the post-World War II United States: a theoretical and empirical analysis." American Sociological Review 50:317-332.

Cohen, Lawrence E. and Marcus Felson
1979 "Social change and crime rate trends: a routine activity approach." American Sociological Review 44:588-607.

Cohen, Lawrence E., Marcus Felson and Kenneth C. Land
1980 "Property crime rates in the United States: a macrodynamic analysis, 1947-77; with ex ante forecasts for the mid-1980s." American Journal of Sociology 86:90-118.

Cohen, Lawrence E. and Kenneth C. Land
1987 "Age structure and crime: symmetry versus asymmetry and the projection of crime rates through 1990." American Sociological Review 52:170-183.

Cook, Philip J.and John H. Laub
1985 "The (surprising) stability of youth crime rates," Journal of Quantitative Criminology 2:265-279.

Cook, Philip J. and Gary A. Zarkin
1985 "Crime and the Business Cycle." Journal of Legal Studies 14:115-128.
1986 "Homicide and economic conditions: a replication and critique of M. Harvey Brenner's new report to the U.S. Congress." Journal of Quantitative Criminology 2:69-80.

Cook, Thomas, and Donald Campbell
1979 Quasi Experimentation, Design, and Analyses for Field Settings. Chicago: Rand McNally.

Danzinger, Sheldon and David Wheeler
1975 "The economics of crime: Punishment or income redistribution. Review of Social Economics 33:113-131.
1976 "Explaining Urban Crime Rates," Criminology 14:291-295.

Decker, Scott H., and Carol W. Kohfeld
1982 "Fox Reexaminated: a research note examining the perils of quantification." Journal of Research in Crime and Delinquency. 19:110-121
1986 "The deterrent effect of capital punishment in Florida: a time series analysis." Criminal Justice Policy Quarterly 1:422-437.

Dewald, William, Jerry Thursby, and Richard Anderson

1986 "Replication in empirical economics: The Journal of Money, Credit and Banking project." American Economic Review 76:587-603.

Ehrlich, Isaac

1973 "Participation in illegitimate activities: a theoretical and empirical investigation." Journal of Political Economy 81:521-565.

1975 "The deterrent effect of capital punishment: a question of life and death." American Economic Review 65:397-417.

Ehrlich, Isaac, and George D. Brower

1987 "On the issue of causality in the economic model of crime and law enforcement: some theoretical considerations and experimental evidence." American Economic Review 77:99-106.

Fisher, Franklin, and Daniel Nagin

1978 "On the Feasibility of Identifying the Crime Function in a Simultaneous Model of Crime Rates and Sanction Levels." Pp. 361-399 in Alfred Blumstein, Jacqueline Cohen, and Daniel Nagin (Eds.) Deterrence and Incapacitation: Estimating Effects of Criminal Sanctions on Crime Rates. Washington: National Academy of Sciences.

Fox, James A.

1976 An Econometric Analysis of Crime Data. Ann Arbor: University Microfilms.

1978 Forecasting Crime Data. Lexington, MA: Lexington Books.

1982 "Reexamining some perils of quantification in the econometric study of crime." Journal of Research in Crime and Delinquency 19:122-131.

Freeman, Richard B.

1983 "Crime and unemployment." Pp. 89-106 in James Q. Wilson (Ed.) Crime and Public Policy. San Francisco: ISC Press.

Galster, George C. and Laure A. Scaturo

1985 "The U.S. criminal justice system: unemployment and the severity of punishment." Journal of Research in Crime and Delinquency 22:163-189.

Garry, Eileen M.

1985 Topical Search: Unemployment and Crime. Washington, D.C.: National Institute of Justice.

Gibbs, Jack P.

1975 Crime, Punishment, and Deterrence. New York: Elsevier.

Good, David H., Maureen A. Pirog-Good, and Robin C. Sickles

1986 "An analysis of youth crime and employment patterns," Journal of Quantitative Criminology 2:219-236.

Gottfredson, Michael, and Travis Hirschi

1987 "The methodological adequacy of longitudinal research on crime." Criminology 25:581-614

Gould, Lery

1969 The changing structure of property crime in an affluent society. Social Forces 48:50-59.

Granger, C.

1969 "Investigating Causal Relations by Econometric Models and Cross-Spectal Methods." Econometrica 37:424-438.

Greenberg, David F.
1985 "Age, crime, and social explanation." American Journal of Sociology 91:1-21.
Greenberg, David F., Ronald C. Kessler, and Colin Loftin
1985 "Social inequality and crime control." Journal of Criminal Law and Criminology 76:684-703.
Greenberg, David F., Ronald C. Kessler, and Charles H. Logan
1979 "A panel model of crime rates and arrest rates." American Sociological Review 44:843-50.
1981 "Aggregate bias in deterrence research: an empirical analysis." Journal of Research in Crime and Delinquency 18:128-37.
1982 "The effect of arrests on crime: a multivariate panel analysis." Social Forces 60:771-90.
Greenwood, Michael, and Walter Wadycki
1973 "Crime rates and public expenditures for police protection: their interaction." Review of Social Economy 31:138-151.
Grove, Walter, Michael Hughes, and Michael Geerken
1985 "Are Uniform Crime Reports a valid indicator of the index crimes? An affirmative answer with minor qualifications." Criminology 23:451.
Hashimoto, Masanori
1987 "The Minimum Wage Law and Youth Crimes: Time-Series Evidence," The Journal of Law and Economics 30:443-464.
Hausman, J. A.
1978 "Specification tests in econometrics." Econometrica 46:1251-1272.
Hemley, Donald D. and Lee R. McPheters
1974 "Crime as en externality of regional economic growth." Review of Regional Studies 4:73-84.
Helms, L. Jay
1985 "The effects of state and local taxes on economic growth: A time series-cross section approach," Review of Economics and Statistics 67:574-582.
Hirschi, Travis and Michael Gottfredson
1983 "Age and the explanation of crime." American Journal of Sociology 89:552-84.
1985 "Age and crime, logic and scholarship: comment on Greenberg." American Journal of Sociology 91:22-27.
Horwitz, Allan V.
1984 "The economy and social pathology." 10 Annual Review of Sociology 10:95-119.
Huff, C. Ronald, and John Stahura
1980 "Police employment and suburban crime." Criminology 17: 461-470.
Humpries, Drew and Don Wallace
1980 "Capitalist accumulation and urban crime, 1950-1971." Social Problems 28:179-193.
Judge, George, et al.
1984 The Theory and Practice of Econometrics. New York: Wiley.
Kempf, Kimberly L.

1987 "Specialization and the criminal career," Criminology 25:399-420.

Kvalseth, Tarold O.
1977 "Note on effects of population density and unemployment on urban crime." Criminology 15:105-110.

Land, Kenneth C. and Marcus Felson
1976 "A general framework for building dynamic macro social indicator models: Including an analysis of changes in crime rates and police expenditures." American Journal of Sociology 82:565-604.

Leamer, Edward E.
1983 "Let's take the con out of econometrics." The American Economic Review 73:31-43.
1985 "Sensitivity analyses would help." The American Economic Review 75:308-313.

Lempert, Richard
1966 "Strategies of research design in the legal impact study, the control of plausible rival hypotheses." Law and Society Review 1:111-132.

Lieberson, Stanley
1986 Making it Count: the Improvement of Social Research and Theory. Berkeley: University of California Press.

Liska, Allen E., Mitchell B. Chamlin, and Mark D. Reed
1985 "Testing the economic production and conflict models of crime control." Social Forces 64:119-38.

Loftin, Colin, and David McDowall
1982 "The police, crime and economic theory: an assessment." American Sociological Review 47:376-389.

Loftin, Colin, and Robert Parker
1985 "An errors-in-variable model of the effect of poverty on urban homicide rates." Criminology 23:269-289.

Long, Sharon K. and Ann D. Witte.
1981 "Current economic trends: implications for crime and criminal justice." Pp. 69-144 in Keven N. Wright (ed.) Crime and Criminal Justice in a Declining Economy. Cambridge MA: Oelgeschlager, Gunn, & Hain.

Maddalla, G.S.
1977 Econometrics. New York: McGraw-Hill.

Mansfield, Roger, Leroy Gould, and J. Zvi Namenwirth
1974 "A socioeconomic model for the prediction of societal rates of property theft." Social Forces 52:462-472.

Moody, Carlisle, and Thomas Marvell
1987 "Appellate and trial court caseload growth: A pooled time-series--cross-section analysis," Journal of Quantitative Criminology 3:143-167.

McGuire, William J and Richard G. Sheehan
1983 "Relationships between crime rates and incarceration rates: further analysis." Journal of Research in Crime and Delinquency 20:73-85.

Moody, Carlisle, and Thomas Marvell

1987 "Appellate and trial court caseload growth: a pooled time series-cross section analysis." Journal of Quantitative Criminology. 3:143-168.

Mundlak, Yair
1978 "On the pooling of time series and cross section data." Econometrica 46:69-86.

Myers, S.L. Jr.
1980 "Why are crimes underreported? What is the crime rate? Does it really matter?" Social Science Quarterly 61:23-43.

Nagel, W.
1977 "On behalf of a moratorium on prison construction." Crime & Delinquency 23:154-172.

Nagin, Daniel
1978 "General deterrence: a review of the empirical evidence." Pp. 95-139 in Alfred Blumstein, Jacqueline Cohn, and Daniel Nagin (Eds.) Deterrence and Incapacitation: Estimating the Effects of Criminal Sanctions on Crime Rates. Washington: National Academy of Sciences.
1978a "Crime rates, sanction levels, and constraints on prison population." Law and Society Review 12:341-66.
1981 "Methodological issues in estimating the deterrent effect of sanctions." Pp. 121-40 in James A. Fox (ed.) Models in Quantitative Criminology. New York: Academic Press.

O'Brien, Robert M.
1985 Crime and Victimization Data. Beverly Hills: Sage.

Orsagh, Thomas
1979 "Interpreting results derived from aggregate data." Journal of Research in Crime and Delinquency 16:294-305.
1981 "A criminometric model of the criminal justice system." Pp. 163-87 in James A. Fox (ed.), Models in Quantitative Criminology. New York: Academic Press.

Parker, Robert N.
1985 "Aggregation, ratio variables, and measurement problems in criminological research." Journal of Quantitative Criminology 1:269-280.

Parker, Robert N. and Allan Horwitz
1986 "Unemployment, Crime, and Imprisonment: A Panel Approach," Criminology 24:751-773

Parker, Robert N. and David McDowall
1986 "Constructing an index of officially recorded crime: the use of confirmatory factor analysis." Journal of Quantitative Criminology 2:237-250.

Passell, Peter and John B. Taylor
1977 "The deterrent effect of capital punishment: another view." American Economic Review 67:445-51.

Pirog-Good, M.A.
1986 "Modeling employment and crime relationships." Social Science Quarterly. 67:767,

Pindyck, Robert S. and Daniel L. Rubinfeld
1981 Econometric Models and Economic Forecasts. New York: McGraw-Hill.

Pogue, Thomas

1975 "Effect of police expenditures on crime rates: some evidence." Public Finance Quarterly 14-44.
1986 "Offender Expectations and Identification of Crime Supply Functions," Evaluation Review 10:455-482.
1977 "Life Cycle Changes and Criminal Propensity." Sociological Quarterly 18:223-36.

Radzinowicz, Leon
1939 "The influence of economic conditions on crime." Sociological Review 33:1-36.

Sampson, Robert J.
1986 "Crime in cities: the effects of formal and informal social control." Pp. 231-270 in Albert J Reiss and Michael Tonry, Communities and Crime. Chicago: University of Chicago Press.

Sampson, Robert J. and Jacqueline Cohen
1988 "Deterrent effects of the police on crime: A replication and theoretical extension." Law and Society Review 22:137-162.

Schmidt, Peter and Ann D. Witte
1984 An Economic Analysis of Crime and Justice. San Diego: Academic Press.

Spector, Paul E.
1975 "Population density and unemployment: The effects on the incidence of violent crime in the American city. Criminology 12:399-491.

Steffensmeier, Darrell J., and Miles D. Harer
1987 "Is the crime rate really falling? An `aging' U.S. population and its impact on the nation's crime rate, 1980-1984." Journal of Research in Crime and Delinquency 24:23-48.

Thornberry, Terence P. and R. L. Christenson
1984 "Unemployment and criminal involvement: an investigation of reciprocal causal structures." American Sociological Review 49:398-411.

Vandaele, Walter
1978 "Participation in illegitimate activities: Ehrlich revisited." Pp. 270-335 in Alfred Blumstein, Jacqueline Cohn, and Daniel Nagin (eds.) Deterrence and Incapacitation: Estimating the Effects of Criminal Sanctions on Crime Rates. Washington: National Academy of Sciences.

Wellford, Charles F.
1973 "Age composition and the increase in recorded crime." Criminology 11:61-70.

Wilson, James Q., and Barbara Boland
1978 "The effects of the police on crime." Law and Society Review 12:365-90.

Wolpin, Kenneth I.
1978 "An economic analysis of crime and punishment in England and Wales, 1894-1967" Journal of Political Economy 86:815-840.

1980 "A time series-cross section analysis of international variation in crime and punishment." Review of Economics and Statistics 62:417-423.

Zedlewski, Edwin W.

1983 "Deterrence findings and data sources: a comparison of the Uniform Crime Reports and the National Crime Surveys." Journal of Research in Crime and Delinquency 20:262-276.

Table 1 Variable Means

Murder (CRMUR)	7.3	State personal income (RRTPI)	5080
Rape (CRRAP)	26.5	Gross state product (RRGSP)	631
Robbery (CRROB)	133	Unemployment rate (UNRATE)	6.9%
Assault (CRASS)	215	Population 5 to 14 (P05t14)	16.6%
Burglary (CRBUR)	1242	Population 15 to 17 (P15T17)	5.5%
Larceny (CRLAR)	2739	Population 18 to 24 (P18T24)	12.9%
Mot. Veh. (CRMV)	352	Population 25 to 34 (P25T34)	15.7%
Property (CRPRO)	4450	Population 35 to 44 (P35T44)	11.4%
Violent (CRVIO)	401	Population 45 to 54 (P45T54)	9.9%
		Population 55 to 64 (P55t64)	9.2%

Crime figures are per 100,000 population. State personal income is per capita, adjusted for inflation by dividing by the GNP price deflator (1972 = 1.00). Gross state product is per ten population, and it is also divided by the GNP price deflator. The population figures are the number in the particular age group divided by total population. The means for individual regressions vary slightly from the figures here, due to differences in years and states for which data are available.

Table 2 Year Effects Coefficients in Crime Regressions

		Violent Crime			Property Crime		
Year	Murder	Rape	Robbery	Assault	Burglary	Larceny	Auto
1973	-.13	.7	7	2	132	--	22
1974	**.25**	**1.0**	**26**	**7**	**343**	--	**38**
1975	.09	.4	**33**	**25**	**431**	235	**42**
1976	-1.23	-.4	17	25	377	**389**	20
1977	-1.47	**.9**	15	**31**	**407**	247	**26**
1978	-1.81	**1.0**	**21**	**39**	**469**	**364**	**38**
1979	**-1.51**	**3.5**	**34**	**53**	**586**	**648**	**72**
1980	**-1.22**	**4.8**	**54**	**61**	**792**	**886**	71
1981	-1.73	3.8	**61**	57	**835**	**963**	55
1982	-2.13	2.0	48	56	744	925	40
1983	-2.98	2.0	36	47	676	820	23
1984	-3.59	**3.5**	32	**52**	667	**891**	**30**
1985	-3.63	**4.1**	**38**	**58**	**725**	**1041**	**49**
1986	**-3.32**	**4.8**	**52**	**77**	**791**	**1241**	**75**

The figures are the coefficients for the year dummies in the regressions (using real personal income) in Table 3. The figures in bold are increases from the prior year. For the first year we do not know whether the coefficient increased.

Table 3 Regression of Reported Crime on Economic and Demographic Trends

A) Dependent Variable: **Murder**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp. Rate
Economy			
Current	.0010	.002	-.14
year	(2.9)	(1.0)	(3.2)
Prior	.0002	.003	-.10
year	(.4)	(1.5)	(2.2)
Age groups			
15 to 17	.37	.49	.83
	(1.1)	(1.3)	(1.9)
25 to 34	.33	.31	.36
	(2.7)	(2.0)	(2.1)
F value for:			
Ec. vars.	**12.2**	**6.3**	**15.9**
Age vars.	3.8	2.2	2.7
Year dums.	**9.9**	**9.8**	**5.6**
State dums.	**81.4**	**74.6**	**66.4**
N	726	637	603
df	659	572	537
F	111	151	108
R Sqr.	.91	.94	.92
DW	2.03	1.93	2.02

B) Dependent Variable: **Rape**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp Rate
Economy			
Current	.001	.009	-.33
year	(1.1)	(1.9)	(2.7)
Prior	.001	.008	-.24
year	(1.1)	(1.7)	(1.9)
Age groups			
25 to 34	1.0	.5	.9
	(2.1)	(1.1)	(1.5)
35 to 44	.3	.4	-1.7
	(.4)	(.6)	(1.6)
55 to 64	3.6	3.9	2.9
	(4.6)	**(5.0)**	(2.4)
F value for:			
Ec. vars.	2.8	**7.4**	**7.4**
Age vars.	**7.2**	**8.4**	**4.3**
Year dums.	**7.9**	**9.8**	**5.0**
State dums.	**48.9**	**60.4**	**39.2**
N	727	636	594
df	659	573	528
F	127	158	106
R Sqr.	.92	.94	.92
DW	1.96	1.92	1.94

C) Dependent Variable: **Robbery**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp Rate
Economy			
Current	-.003	-.09	.8
year	(.5)	**(2.7)**	(.8)
Prior	-.001	.01	-1.2
year	(.1)	(.3)	(1.4)
Age groups			
18 to 24	-3.8	7.8	-.4
	(1.1)	(1.9)	(.1)
25 to 34	5.9	10.9	4.2
	(1.4)	**(2.6)**	(.8)
F value for:			
Ec. vars.	.2	4.3	1.1
Age vars.	2.6	3.7	.5
Year dums.	**15.3**	**15.6**	**10.8**
State dums.	**50.9**	**66.7**	**53.6**
N	712	637	603
df	646	572	536
F	70	71	48
R Sqr.	.86	.88	.84
DW	1.51	1.47	1.49

D) Dependent Variable: **Assault**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp Rate
Economy			
Current	.010	-.08	.34
year	(1.3)	(1.6)	(.3)
Prior	.023	.12	-.25
year	**(2.9)**	**(2.7)**	(.2)
Age groups			
15 to 17	3.9	5.5	2.9
	(.4)	(.6)	(.3)
18 to 24	.8	3.1	5.5
	(.2)	(.6)	(1.2)
55 to 64	7.3	41.6	41.9
	(1.1)	**(4.5)**	**(4.6)**
F value for:			
Ec. vars.	**8.3**	3.7	.1
Age vars.	.6	**8.0**	**9.8**
Year dums.	**7.5**	**6.2**	**14.2**
State dums.	**41.6**	**54.8**	**60.0**
N	712	624	588
df	645	560	521
F	111	120	148
R Sqr.	.91	.92	.94
DW	1.82	1.86	1.88

E) Dependent Variable: **Burglary**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp Rate
Economy			
Current year	-.092	-1.41	17.3
	(2.9)	(8.3)	(4.5)
Prior year	-.003	.83	-1.0
	(.1)	(4.9)	(.3)
Age groups			
5 to 14	46.2	26.4	70.5
	(2.5)	(1.8)	(3.8)
15 to 17	150.1	96.1	106.6
	(4.3)	(3.1)	(2.5)
18 to 24	34.9	66.0	15.6
	(1.8)	(3.4)	(.8)
F value for:			
Ec. vars.	**4.7**	**34.8**	**10.3**
Age vars.	**7.6**	**7.4**	6.4
Year dums.	**41.0**	**34.4**	**41.6**
State dums.	**55.4**	**93.9**	**57.4**
N	727	635	603
df	659	569	535
F	147	247	200
R Sqr.	.93	.96	.96
DW	1.55	1.54	1.64

F) Dependent Variable: **Larceny**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp Rate
Economy			
Current year	-.38	-1.95	33.3
	(6.3)	(6.4)	(4.9)
Prior year	.20	1.34	-8.4
	(3.3)	(4.2)	(1.2)
Age groups			
5 to 14	32.6	48.8	44.6
	(1.1)	(1.7)	(1.4)
18 to 24	164.8	153.1	147.6
	(4.3)	(3.8)	(3.8)
45 to 54	219.6	228.1	212.4
	(4.1)	(4.0)	(2.8)
F value for:			
Ec. vars.	**19.9**	**20.5**	**12.0**
Age vars.	**13.8**	**11.8**	**9.4**
Year dums.	**45.4**	**40.4**	**40.3**
State dums.	**72.9**	**67.5**	**79.8**
N	607	621	536
df	542	556	471
F	438	352	391
R Sqr.	.98	.97	.98
DW	1.82	1.77	1.78

G) Dependent Variable: **Motor Vehicle**

Ind. Vars.	Economic Variable: Real Personal Income	Gross State Product	Unemp Rate
Economy			
Current year	.00	-.02	.2
	(.3)	(.4)	(.2)
Prior year	.02	.10	-.9
	(1.9)	(1.7)	(.6)
Age groups			
15 to 17	29.8	32.2	33.9
	(2.4)	(2.3)	(2.1)
18 to 24	7.3	21.4	15.4
	(.9)	(2.7)	(1.8)
F value for:			
Ec. vars.	1.9	1.5	.2
Age vars.	3.1	**5.8**	3.6
Year dums.	**7.9**	**12.6**	**10.7**
State dums.	**28.7**	**36.2**	**48.8**
N	697	634	579
df	632	570	514
F	74	89	102
R Sqr.	.87	.90	.92
DW	1.62	1.68	1.60

T values are in parentheses. The F values are for all the variables in the group. Coefficients for state and year dummies are not given. The T and F values completely in bold are significant to the .0001 level, and those with a bold first digit are significant to the .01 level. The Durban-Watson statistics are for the regression after correction for autocorrelation; beforehand they varied from .67 to 1.23.

Table 4 First Difference of Economic Variables

	Economic Variable: Real Personal Income	Gross State Product	Unemp. Rate
1) Ind. var. = Robbery			
Economy			
Current	-.002	-.035	1.05
year	(.4)	(1.0)	(1.3)
Prior	-.001	-.065	.99
year	(.1)	(2.1)	(1.2)
F value	.1	2.3	1.1
2) Ind. var. = Burglary			
Economy			
Current	-.047	-.57	9.2
year	(1.4)	(3.5)	(2.7)
Prior	.026	-.47	2.3
year	(.8)	(3.2)	(.7)
F value	2.3	**9.6**	3.7
3) Ind. var. = Larceny			
Economy			
Current	-.41	-.47	39.6
year	**(7.5)**	(1.6)	**(6.5)**
Prior	-.24	-1.52	28.0
year	**(4.3)**	**(5.6)**	**(4.6)**
F value	**29.5**	**16.2**	**26.2**
4) Ind. var. = Motor Vehicles			
Economy			
Current	.003	.017	-.97
year	(.4)	(.3)	(.7)
Prior	.017	.096	-1.7
year	(1.5)	(1.8)	(1.3)
F Value	1.1	1.6	.8

These results are from the same regressions as conducted in Table 3 except that the economic variables are first differenced. For example, the current year first difference for employment rate is the rate in the current year less the rate in the prior year, and the prior year first difference is the unemployment rate in the prior year less that two years earlier.

Table 5 Granger-Sims Analysis for Forward Causal Direction

Dep. Vars.	F Value for Economic Variables: Real Personal Income	Gross State Product	Unemp. Rate
Violent	.3	1.6	**3.9-+**
Property	.8	.7	1.5
Murder	.5	1.1	2.7-+
Rape	.5*	.3	3.3+
Robbery	1.2	1.6	1.7
Assault	.1	1.6	4.2+
Burglary	3.7-+	1.7	1.4
Larceny	.6	.6	1.3
Motor Veh.	3.5*+	1.2	3.5+

This table presents the results of nine separate Granger-Sims analyses, with the specific crime rate as the dependent variables. The independent variables are the three economic measures (lagged one, two, and three years), along with lagged values of the crime variable. The F values are for the three lags combined. The plus and minus signs indicate the dominate direction of the coefficients. When there are two signs, the first indicates the direction of the lags closer to the current year, and second sign is for the second or third year lag. The bold figures are as indicated in Table 3. F values above 2.6 are significant to the .05 level. A separate regression was conducted with personal income as the only economic variable (permitting a larger sample size); the result differed little from those presented above for personal income, except that the T value in the rape analysis (see the *) was 3.0+-, and that for motor vehicles was 1.5.

Table 6 Granger-Sims Test for Reverse Causation

	F Values Dependent Variables		
Ind. Vars.	Real Personal Income	Gross State Product	Unemp. Rate
Violent	**6.3+**	2.7+	3.2-
Property	**11.2-**	**6.7-**	**8.5+**
Murder	2.7*+-	**4.2***+-	.8
Rape	.8	1.2	3.5-
Robbery	**10.9+**	**5.7+**	**7.6-**
Assault	1.8	1.2	1.3
Burglary	**9.7-**	**10.8-**	**11.3+**
Larceny	3.6-+	3.0+	1.6-
Motor Veh.	**3.8-**	2.3#-	1.0

This table presents the results of six separate Granger-Sims analyses, three (with different economic variables) for violent/property crime and three for the remaining crime categories. The independent variables are 1) the measures of crime lagged one, two, and three years, 2) the same lagged values of the economic variable, and 3) the percent 18 to 24 years old. [The values for larceny were derived from and additional three, separate analyses, which include fewer years because larceny data are not available before 1973.] The F values are for the three lags combined. The bold values and the plus/minus signs are explained in Table 5. Asterisks (*) indicate that the F value is not significant (although in the same direction) in an analysis without observations indicating high influence (see Appendix A). Pound signs (#) indicate that the F value becomes significant when influence observations are deleted.

Table 7 Summary of Regressions Using Change Variables
(significant lags in regression of crime rates on economy)

	1) With percent change variables Independent Variable		2) With first differences Independent Variable	
Dep. Vars.	Real Personal Income	Unemployment Rate	Real Personal Income	Unemployment Rate
Murder	0+ 1-	0-		
Rape	ns-	1-	0-	ns-
Robbery	1- 2-	0+1-2-	ns	ns-
Assault	2-	ns	ns	ns
Burglary	ns	0+	2-	1+
Larceny	ns	0+	ns	0+
Motor Veh.	ns	ns	ns	ns

This table summarizes the results of regressions in which the variables are 1) transformed into percent changes from the prior year and 2) transformed into first differences. The regression includes the current year, one year lag and two year lag of the two economic variables (lags of gross state product were not included because data are not available until 1972). The analyses also include all age groups and year dummies (state dummies were dropped because they were not significant). The numbers in the table are the lags that are significant, and the sign indicates the direction of the coefficient. An "ns" means that all three lags are not significant to the .05 level.

Table 8 Summary of Results of Regressions Using Change Variables
(significant lags in the regressions of economy on crime)

	1) With percent change variables Dependent Variable			2) With first differences Dependent Variable		
Ind. Vars.	Real Personal Income	Gross State Product	Unemp. Rate	Real Personal Income	Gross State Product	Unemp. Rate
Violent	ns	ns	ns	**1+**	2+	1-
Property	**0-**	**0-1-**	0+**1+**	**0-1-2-**	**0-1-**	**0+1+**
Murder	**1-**	**1-**	**0-**	**0**+2+	2+	**0-**
Rape	ns	ns	ns	ns	**1+**	ns
Robbery	0+	ns+	ns-	1+2+	**2+**	**2-**
Assault	ns-	2-	ns-	ns	ns	ns
Burglary	**0-1-**	**0-1-**	**1+**	**0-1-2-**	0-**1-**	0+**1+**
Motor Veh.	ns	ns	**0-**	ns	ns	ns

This table summarizes the results of regressions in which the variables are transformed into 1) percent changes from the previous year and 2) first differences, the variable less the prior year value. The regression includes the current year, one year lag and two year lag of the crime rate. The analyses also include all age groups and year dummies (state dummies are not significant). The bold figures and plus and minus signs are explained in Table 5. The numbers in the table are the lags that are significant, and the sign indicates the direction of the coefficient. Larceny was not included because data are not available until 1973. If added it shows results similar to that for burglary. The "ns" means that all three lags are not significant to the .05 level.

Table 9 Economic Variables Regressed on Crime and Demographic Variables

Ind. Vars.	Dependent Variable: Real Personal Income	Gross State Product	Unemp. Rate
Murder			
Current	12.6	2.3	-.167
year	(3.4)	(2.9)	(4.6)
Prior	4.5	1.4	-.075
year	(1.3)	(1.8)	(2.2)
Robbery			
Current	.02	-.04	.0072
year	(.1)	(.9)	(3.2)
Prior	.93	.17	-.0062
year	(4.5)	(3.6)	(2.8)
Burglary			
Current	-.176	-.058	.0029
year	(3.7)	(5.6)	(6.5)
Prior	-.367	-.076	.0034
year	(7.4)	(6.8)	(7.2)
Age Groups			
18 to 24	212.5	38.6	-.52
	(7.9)	(6.9)	(2.8)
25 to 34	218.9	13.2	-.04
	(9.5)	(2.8)	(.2)
35 to 44	183.2	12.7	-.91
	(4.6)	(1.6)	(4.1)
F value for			
Murder	6.0	4.6	11.3
Robbery	10.7	6.6	14.7
Burglary	46.7	55.9	84.3
Age vars.	41.4	17.2	8.0
Year dums.	60.7	37.3	70.1
State dums.	32.4	15.6	16.6
N	682	686	600
df	611	616	529
F	2722	483	75
R. Sqr.	.996	.98	.90
DW	1.65	1.61	1.80

Ind. Vars.	Dependent Variable: Real Personal Income	Gross State Product	Unemp. Rate
Violent			
Current	.194	.045	-.0040
year	(1.9)	(1.9)	(3.4)
Prior	.545	.084	-.0047
year	(5.0)	(3.4)	(3.9)
Property			
Current	-.093	-.023	.0013
year	(5.0)	(5.4)	(7.2)
Prior	-.125	-.020	.0013
year	(7.1)	(5.0)	(6.9)
Age Groups			
18 to 24	213	43.3	-.24
	(8.2)	(7.4)	(1.0)
25 to 34	88	14.6	.46
	(3.5)	(2.5)	(2.0)
35 to 44	183	6.8	-.81
	(4.9)	(.8)	(3.1)
F value for			
Violent	16.8	9.3	18.9
Property	59.5	42.6	92.6
Age vars.	25.4	19.4	7.4
Year dums	728	19.4	65.7
State dum	66.8	20.1	16.3
N	588	588	546
df	521	521	479
F	2659	548	61
R. Sqr.	.997	.98	.88
DW	1.72	1.35	1.85

The results below are from a separate regression, with a smaller sample size because larceny data are not available before 1973.

Larceny			
current	-.14	-.034	.0022
year	(5.1)	(5.4)	(7.0)
Prior	-.13	-.023	.0017
year	(5.2)	(3.9)	(5.9)
F value	44.2	33.5	68.4

Table 10 Economy Regressed on Crime
First Difference Variables

	Dependent Variable		
Ind. Vars.	Real Personal Income	Gross State Product	Unemp. Rate
Violent			
Current year	.13 (1.1)	.04 (1.7)	-.0023 (1.9)
Prior year	.34 (2.8)	.05 (1.9)	-.0030 (2.4)
Lagged two	.17 (1.4)	.06 (2.1)	.0011 (.9)
Property			
Current year	-.09 (4.1)	-.020 (4.3)	.00073 (3.8)
Prior year	-.08 (3.8)	-.017 (3.7)	.00086 (4.3)
Lagged two	-.06 (2.7)	-.006 (1.3)	-.00019 (1.0)
T value for Prior and Lagged two:			
Violent	5.3	4.8	3.6
Property	11.9	8.2	9.8

See notes to Table 8.