CRIME, CRIME CONTROL, AND THE COSTS OF LAW ENFORCEMENT: AN ECONOMIC PERSPECTIVE

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ABSTRACT

This report traces the pattern of crime rates, crime control levels and law enforcement costs over the past half century. The emphasis of the analysis is on the economics of crime control and a substantial effort is devoted to analyzing both the relationship between crime levels and crime control costs and the determinants of the increase in these costs over the period.

Using data for the second largest city in the United States, Los Angeles, it is shown that the explosion in costs over the past 50 years is of recent origin. It is also shown that increases in salary and benefit levels do not account for this pattern in costs. It is a decrease in productivity that is most closely associated with the rise in costs. Arrests per employee are shown to have declined dramatically in the past 20 years. The report includes a test of whether this is a consequence of court decisions that restrain police conduct and, while this cannot be ruled out, the test does not provide an unambiguous answer. The concluding section of the report provides some perspective by showing that imprisonment costs evidence much the same pattern as law enforcement costs.

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EXECUTIVE SUMMARY

We begin this report by reviewing the dramatic shift in the secular behavior of crime rates that has occurred in the United States during the past half century. Our analysis of crime trends reconfirms the observation that there were in fact some "good old days", and that the last several decades have been a "boom" time for crime. After a number of years of relative tranquility, in about 1960, the major cities in the United States began experiencing a very rapid increase in crime rates. In fact, by 1980, the somewhat rare crime of homicide had increased to the point where it alone accounted for more than 1% of all deaths in the United States. In analyzing the rise and fall of public order, we considered national data as well as local crime data for the cities of Los Angeles, New York, St. Louis, Dallas, and Phoenix.

It is often asserted that the turnabout in behavior of crime rates that we document in this report was due primarily to a demographic shift in the population, specifically an increase in proportion of young people in the population during the 1960's and 1970's. Clearly, the proportion of 18-24 year olds in the population behavied quite differently prior to 1960 than it did during the 60's and 70's. Prior to 1960, we show that the proportion of 18-24 year olds actually declined by about 1½% per year during the period 1930-1960, while after 1960, the proportion of 18-24 year olds increased by almost 2% a year.

Interestingly enough, however, we point out that during the period that the proportion of 18-24 year olds was increasing, the death rate from accidents other than homicide actually declined. The increasing youthfulness of the population during the 1960's

and 70's did not automatically translate into a generally more dangerous society. Of the major causes of accidental deaths, only the threat and actuality of death by homicide has increased significantly since 1960. We suggest that any explanation of the boom in crime during the 1960's and 70's that relies exclusively on demographics must account for the difference in behavior between accidental deaths and homicide over the period. No doubt demographics are important, but, alone they are not powerful enough to explain the pattern in crime rates we have experienced over the past half century.

We concentrate on an alternative explanation of the recent rise and fall in domestic tranquility that emphasizes the behavior of crime control efforts over this period. In this regard we find the pattern in the clearance rate for homicide extremely interesting. Essentially, the clearance rate for homicide is the mirror image of the homicide rate over the past fifty years. We point out that in the early part of the period or until about 1960, the clearance rate increased while the homicide rate declined. During the second part of the period, essentially in the 1960's and 70's, the clearance rate declined precipitously and the homicide rate, as has been noted numerous times before, increased quite rapidly.

In general we find, as do most other investigators, that high crime periods over the past 50 years were associated with low clearance rates and low crime periods with high clearance rates. Moreover, even when controlling for the youthfulness of the population, we, as again do most other researchers, still find a strong negative and statistically significant relationship between

crime rates and the clearance rates.

Our own formal analysis of the impact of clearance rates on crime rates is quite brief and certainly not very comprehensive. However, we emphasize the fact that the evidence presented in virtually every major published econometric investigation of the topic, clearly suggests that the rise in crime during the past several decades owes much to the decline in crime control during the same period. Repeatedly, we note that the evidence linking clearance and arrest rates to crime levels is simply too persuasive and stable to ignore. The declining level of crime control during the past several decades cannot be overlooked as a major factor in the rise of crime during the same period

Having made the point that the decline in clearance rates is an important contributing factor to the recent rise in crime, we next pose the question: Why has the clearance rate been allowed to decline? Why, after nearly three decades of progress in terms of raising rates, did clearance rates begin a persistent decline in the early 1960's?

Once again, we note that the economic theory of behavior is revealing. Specifically, we suggest that the rise and fall of clearance rates over the past half century may in fact be traceable to the changing pattern in the costs of crime control. We find that the cost per arrest, or what we refer to as the unit cost of law enforcement activity, after a period of nearly 35 years of relative stability in real terms, begins a persistent climb in about 1960 in all of the cities for which we have data (Los Angeles, Dallas, St. Louis and Phoenix). We estimate that in Los Angeles the real or inflation adjusted costs per arrest

were at worst constant from about 1926 to 1960, and then from 1960 on these costs grew at an historically unprecedented rate of 3% a year. The result of these trends is that while the average cost per arrest in the early 1960's was , after-adjustment for inflation, somewhat lower than the average of such expenditures in the late 1920's, by the end of the 1970's the real expenditure per arrest was about double the level of the early 1960's. We show that neither the changing composition of arrests nor the variations in scale of operations at the Los Angeles Police Department can explain this pattern in costs.

We note that prior studies on the demand for public safety strongly suggest that the costs of crime control are an important determinant of the level of crime control. Hence, the pattern in real costs that we documented for Los Angeles is likely to be a significant factor in explaining the pattern in crime control activity. Our empirical investigation confirms this. Even the clearance rate for homicide, that most serious of crimes, is shown to be responsive to relative costs. For clearances as a whole, we estimate that for every 10% increase in real costs the clearance rate falls by between 2 and 4%.

Having demonstrated that the rise in the costs of crime control during the past several decades is an important factor in determining the decline in crime control activity, we turn our attention to exploring the causes of the growth in crime control costs. The most obvious and potentially powerful explanation of the trend in costs is the trend in police salaries. However, we find that real wages actually grew most rapidly the decade before the "take off" in unit costs. We show that the growth in wages

does not explain the growth in crime control since 1960. We also explore the possibility that it is actually an increase in benefit levels or a decrease in effective hours that is responsible for the trend in unit costs since 1960 and we find that neither are important factors in explaining this trend.

In our investigation of salary and related issues we showed that police wages relative to factory wages have been fairly stable since World War II, and any growth in this ratio that did occur, occurred relatively uniformly over the period. Moreover, relative to wages in the more traditionally unionized sector, construction, we show that police wages have actually declined since 1926 and the rate of decline has not slackened in the past several decades. We make the point that if "union-like" activities have increased in the Los Angeles Police Department during the past 20 years, it has not been reflected in relative wages.

What we do find as a potential explanation for the trend in costs is not wages or benefits, but rather productivity. We find that in Los Angeles, there is a persistent decline in the number of arrests per employee since 1960. Arrests per employee, whether the arrests are measured in terms of all arrests or only Part I arrests or the employees are measured in terms of all personnel or simply sworn personnel, evidence a persistent decline since 1960. Perhaps, most significant in all of this is the fact that the decline in arrests per employee was not restricted to arrests for crimes such as public intoxication, prostitution or traffic violations, but is quite broadly based.

Observing this "technological regression" in policing turns out to be much easier than explaining it. One factor that seems not to be at work here is a decline in the quality of police manpower. As best as we can judge, and the data is at times very difficult to interpret, there is no evidence (either from the data on retirements or on new recruits) that the quality of the labor force in the Los Angeles Police Department was declining in the 1960's and 70's. It appears, to us, to be more productive to search elsewhere for the causes of the decline in police productivity during the past 20 odd years.

One suggestion as to the possible cause of the "technological regression" that is often made by the law enforcement community is that it is due to the growth in court imposed restraint on police activity. We construct an index of such restraint and report some intriguing results. There is some indication that the growth in court imposed restraint is a factor in the recent "technological regression" in policing, but as we indicate that we have not been able to adequately test this hypothesis.

We were able to estimate the impact of defense expenditures on unit cost of law enforcement. We found that the public expenditures on defense per arrestee were significantly, if only weakly (a doubling of such expenditures would increase the cost per arrest by only about 1%) related to law enforcement costs, but did not explain the trend in costs since 1960. We suggest it is probably the case that these expenditure levels are determined primarily by decisions mandating representation and not by decision restraining police conduct.

In order to provide some perspective on the trends in law

enforcement costs, we very briefly examine the pattern of costs in imprisonment over the past 60 plus years. Using data on the Arizona State Prison, we show that adjusted cost per inmate is relatively stable from 1920 to 1959, growing at best 1% per year over the period. However, from 1960 onward, the pattern in costs here bears a remarkable resemblence to the pattern in law enforcement costs in Los Angeles. Inflation adjusted cost per inmate grew at historically unprecedented rates of 5 and 6% per year during the 1960's and 1970's. Again, the growth in wage rates really fail to account for this phenomenon. What appears to have happened is that prisoners have gotten substantially better off relative to taxpayers during the past several decades. We show that annual expenditures per inmate rose from less than half the level of per capita income in the early 1960's to over one and a third the level of per capita income in Arizona in 1980.

Finally, we conclude this report by discussing what is certainly one of the major questions in any truly general economic analysis of crime and crime control. We suggest that rising costs of crime control may simply be the "tip of the iceberg" and that understanding the trends in crime and crime control may require an exercise in political economy. Put quite simply, to us the major intellectual challenge in the area is to explain why over the past several decades the political process has worked to advance the interest of the criminal at the expense of the taxpayer.

I. INTRODUCTION

While we begin this analysis with a review of trends in crime and crime control, the focus of our attention in this paper is on the costs of crime control and, in particular, on the long term trends in the expenditures per arrest over the past half century. Having stated this, the immediate question is why? Why devote so much time and effort to describing and analyzing the long term trends in the costs of crime control?

There is the obvious and not entirely satisfactory response that very little effort has been devoted to this subject in the past. Of course there may be good reasons for the lack of attention to this subject in the literature.* It may be that knowledge of the long term trends in the cost of crime control is neither very interesting nor very important. The question of interest we will leave to the reader. However, on the question of importance we think there is a good deal of evidence to suggest that knowledge of the historical trends in the costs of crime control would be useful in understanding the long run trends in crime rates themselves.

The model we have in mind linking the cost of crime control and the level of crime is really quite simple. Specifically, we assume that the costs of crime control is an important determinant of the level of crime control, i.e., the clearance or arrest rate, and that the level of crime control is in turn a significant factor in determining the level of crime in the society.

In the first instance, what we are assuming is that the demand

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*While the topic has been underanalyzed, it has not been completely neglected. For an early discussion of the costs of public services, including police services, see: Bradford, Malt and Oates (1969).

for crime control is responsive to the costs of providing that control. That is, we posit that if the costs of providing crime control rises, the level of crime control will fall and conversely, if the costs fall, the level of crime control will rise. We are not assuming that public institutions and the political process react like a caricatures of the "economic man", but rather that these institutions exhibit rational choice and substitute away from activities that become relatively more expensive and towards those activities that become relatively less resource consuming. To the extent that this is the case, the historical pattern in the costs of crime will be important in understanding the historical pattern in crime control. This in turn will translate into knowledge concerning the historical pattern in crime rates if there is a stable relationship between the level of crime control and the level of crime.

Clearly, nothing in this specification requires that there be a deterrent effect of enforcement and punishment. Incapacitation is sufficient for our purposes.*

There is, however, a confounding factor here, and it is the potential simultaneity of the crime rate and the level of crime control. We have posited a negative relationship between the crime rate and the level of crime control acting through the deterrent and/or incapacitation effect of arrest with imprisonment. It is often asserted, however, that there is an effect running in the opposite direction, i.e., that the level of crime control is,

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*Incapacitation would be sufficient to link arrests and crime levels as long as some arrests were followed by imprisonment. Of course, deterrence would amplify the impact of the costs of crime control on the crime rate.

in part, determined by the crime rate.* The crude version of this specification is based on the "crowding" hypothesis or the idea that high crime rates "overwhelm" the system and cause the arrest rates or equivalently the level of crime control to fall (e.g. see Nagin (1978)). While the theory behind this "crowding" relationship has never been entirely clear, we leave the discussion of the logic of this assertion to other forums and for now concentrate on its implications for our study.

If in fact there is a "crowding" or "overwhelming" effect of crime on crime control, then it may not be possible to infer anything about movements in crime rates directly from changes in the costs of crime control. That is, if there is a crowding effect, then it may be necessary to know much more about the structure of the crime control market before we can make inferences about changes in the level of crime from changes in the costs of crime control.**

However, there is some empirical evidence that suggests that the structure of the crime and crime control markets are such that one can make inferences about trends in crime rates from trends in costs. The estimates of the structural equations for offense and enforcement relationships in the studies by Ehrlich (1972), Votey and Phillips (1975) and Wolpin (1978) as well as the reduced form estimates of the arrest equation in Block (1981), all imply that there is a positive relationship between the costs of crime control and the level of crime. That is, all other things equal, increases in the cost of crime control will result in an increase

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*See, for example, Hoenack, Kudrle and Sjoquist (1978), or Nagin (1978).

**See Appendix II for a more complete discussion of this issue.

in the optimal level of crime. Conversely, a decrease in the cost of crime control would imply a reduction in the desired level of crime.

- Hence, the empirical evidence on the structure of crime control markets does suggest that knowledge concerning the pattern in the costs of crime control may be useful in understanding the trends in overall crime rates. In addition, it is also quite likely that such knowledge concerning trends in the cost of crime control will be instrumental in increasing the relevance of econometric investigations of the cost structure in police departments. While there have been a number of technically sophisticated investigations of cost functions for crime control, these studies have not been particularly edifying for those interested in the major policy issues in crime control.* We suggest that increased awareness of the trends in the costs of crime control will help focus future work in this area.**

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*See Appendix III.

**See, for example, Darrough and Heineke (1978) and Phillips (1978).

II. THE HISTORICAL DIMENSIONS OF THE CRIME PROBLEM

Having very briefly sketched the potential relevance of our analysis of historical trends in the cost of crime control, we now turn our attention to the crime phenomenon itself. Below we describe, in some detail, the trends in crime over the past half century. While we are certainly not the first to notice these trends nor the first to analyze them, what follows is one of the most complete discussions in the literature of crime trends during the past 50 odd years.*

We think that the trends in crime that are described below are one of the most intriguing aspects of the crime problem and the explanation to which we consider the most intellectually challanging topic in criminal justice research today. In subsequent chapters of this report, we suggest that the economic approach to the crime problem provides important insights into the behavior of crime rates over the past half century. We maintain throughout that the economic perspective on crime and crime control can make a significant contribution to our understanding of the recent explosion in crime rates.

Our analysis of the crime problem begins with homicide. We begin with homicide, first because we consider it the most important crime and, second because historical trends in this crime are least likely to be compounded by changes in the frequency with

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*For examples of prior reports on time trends in crime levels see Cohn et. al. (1980), Ehrlich (1977b), Farley (1980), and Wolpin (1978).

which the crime is reported to or by the police.* That is, trends in the crime of homicide are least likely to be subject to the "reporting problem".** As Nagin [1978] put the matter: "Since homicide is perhaps the most serious of all crimes it does not offer too much leeway for the exercise of discretion."

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* In terms of the importance of homicide, it is interesting to note that homicide is now the fourth most common cause of death for non-white males, and it accounts for more than 1% of all deaths in the United States. For more detail on the relative importance of homicide see Farley (1980).

** As we note in the text the reporting problem refers to the phenomenon of unreported crimes. While this appears to be a trivial problem for homicide it is important for other crimes.

Below in Table A we reproduce reporting rates according to the U.S. Bureau of Justice Statistics in 1979 for selected major crimes:

Table A

CRIME	PERCENT OF VICTIMIZATIONS REPORTED TO POLICE
Assault	42.4
Rape	50.5
Robbery	55.5
Burglary	47.6
Larceny (Household)	25.1
Motor Theft	68.2
Motor Theft (Completed)	85.7

More disturbing from our perspective than the difference in reporting rates for different types of crimes is the possibility that reporting rates have varied over time. Unfortunately our evidence on this phenomenon is quite limited. While we have some victimization data for 1965, systematic data collection on reporting rates did not begin until 1973. The data we do have is somewhat ambiguous.

In Table B we present the percentages of various types of victimizations that were, according to the victims, reported to the police in the years 1965 and 1973-80. While the reporting rates appear stable during the period 1973-80, there are substantial differences between the reporting rates in 1965 and 1973. This difference is probably due to the difference in survey techniques between the 1965 NORC survey and the more recent victimization surveys. However, at this point we have no entirely satisfactory method of isolating the effect of the measurement schemes on reporting rates.

Discretion, that is, in reporting to the police and by the police. On this latter point, we note that in Nagin's [1978, p. 115] analysis of the impact of the change in police administrations in New York City on the reported crime rate, he finds that reported homicides increased "only" 3% between 1965 and 1966 while other crimes increased between 29 and 164 percent. The reporting of homicides appears to be quite well insulated from police discretion. Likewise it is also the crime that is least subject to distortion in reporting to the police. Almost all homicides appear to be actually reported to the police.*

In Figure 1 we present a plot of the homicide rate for the entire country from 1930-1978. In this series the homicide rate

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TABLE B
% of Victimizations Reported to Police

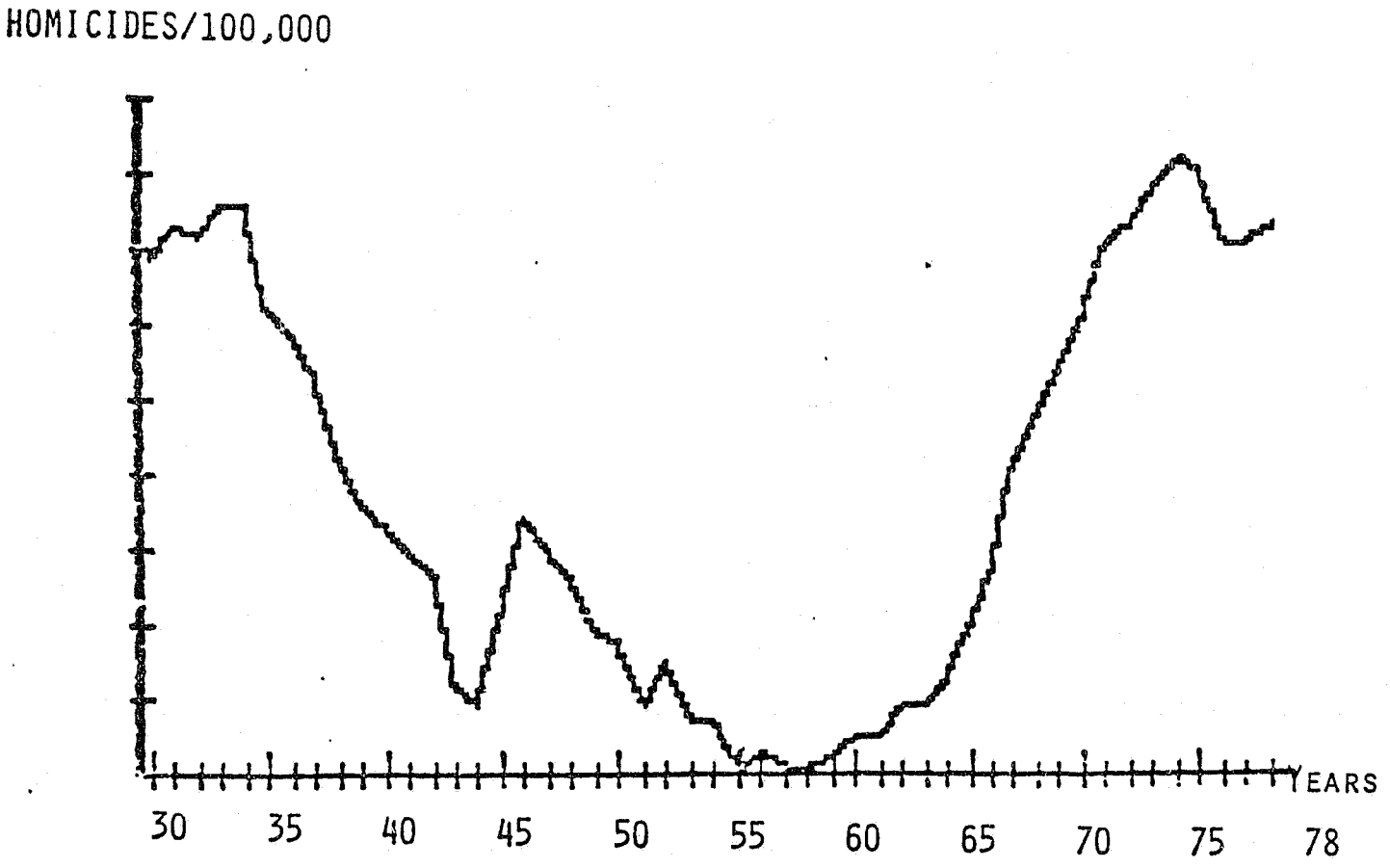
Year	Household Rape	Vehicle Robbery	Assault	Burglary	Larceny	Theft
1965*	27	65	49	32	-	-
1973	44	51	43	46	25	67
1974	51.8	53.6	44.7	47.8	25.2	67.4
1975	56.2	53.3	45.2	48.6	27.1	71.1
1976	52.7	53.3	47.5	48.1	27.0	69.5
1977	58	56	44	49	25	68
1978	48.8	50.6	42.7	47.1	24.5	66.1
1979	50.5	55.5	42.4	47.6	25.1	68.2
1980	41.5	56.9	44.9	51.3	27.5	69.3

While we agree with Cohen et al. (1980) that all of the movement in crime rates during the period cannot be accounted for by changes in reporting rates, precisely how much of the movement they do account for is not clear. This is of course particularly problematic for any analysis of historical trends in crime rates.

*It is interesting to note that in the original NORC victimization survey the victimization rate for homicide was actually less than the UCR rate. In a discussion of this phenomenon and probable reasons for its occurance see Ennis, P.H., (1967).

FIGURE 1

HOMICIDE RATES IN U.S. CITIES: 1930-78



SOURCE: U.S. NATIONAL CENTER FOR HEALTH STATISTICS, VITAL STATISTICS OF THE U.S.

is computed using data from Vital Statistics of the United States.* In Figure 2 we have a plot of the homicide for all cities according to the Uniform Crime Reports (UCR) over the period 1932-1978.** Finally in Figure 3 we have the UCR homicide rates for large cities, i.e., cities with populations over 250,000, for this period 1932-1978.

One thing that is apparent from all of this homicide data is that there were in fact some "good old days." Of course, exactly how good they were depends on what data source you read and how carefully you read it. While our emphasis may be new, we were not the first to notice this phenomenon. For example Ehrlich (1977b) notes ". . . that from the late 1930's to 1963 the murder rate in the United States has been continuously on the decline. . ." A similar observation was made by Farley (1980) in his analysis of homicide in the U.S.*** The point is clear, prior to the early 1960's, the most serious of crimes, homicide, appeared not to be increasing and in fact to be on the decline. After the early

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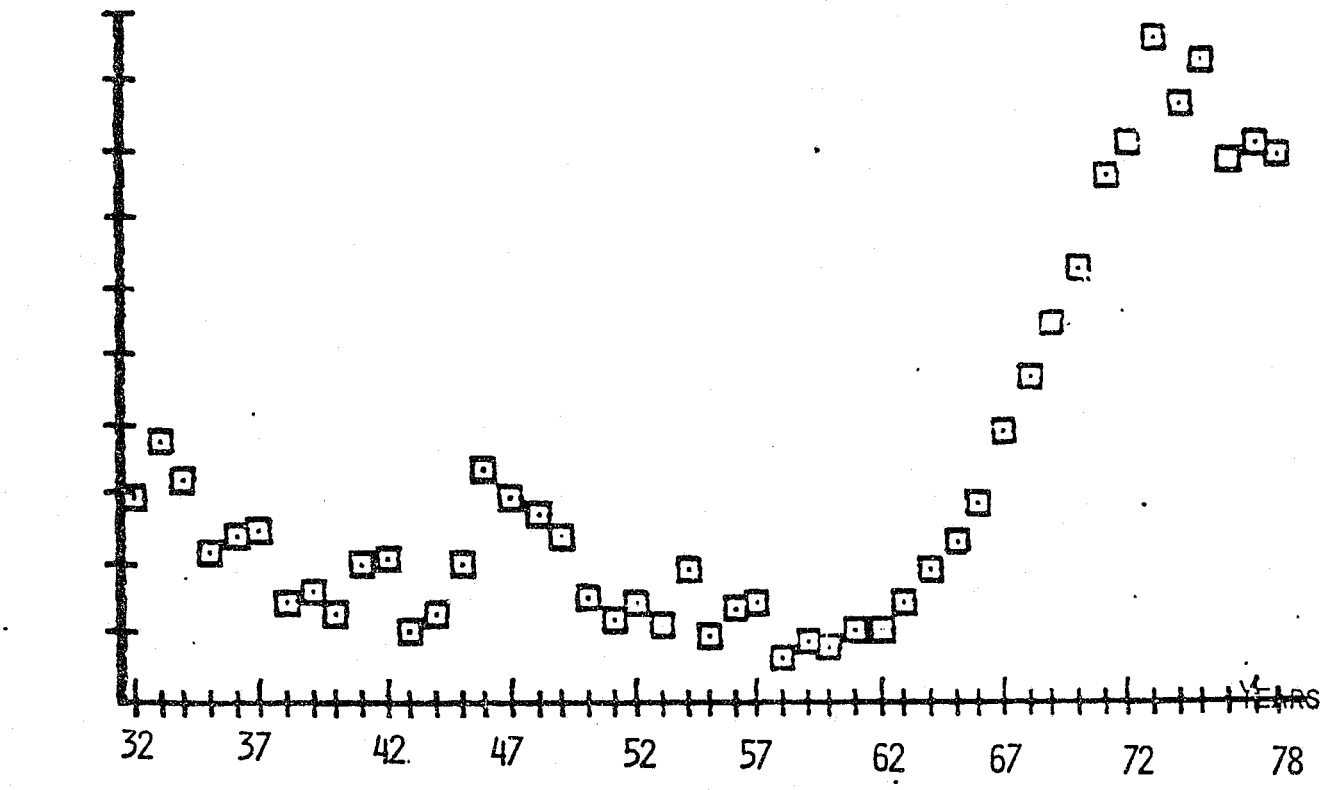
*In Bowers & Pierce (1975) the authors argue that the homicide rate based on vital statistics is more accurate than the UCR data for the early part of this time period. Ehrlich (1975b), argues that UCR data is the most appropriate. See Bowers & Pierce (1975) p. 188a and Ehrlich (1975b) p. 212 for a discussion of these points.

**In Hinderlang (1974), the author maintains that CHS or Vital Statistics data and UCR data are essentially equivalent over the period for which both are reported. See Hinderlang (1974) p. 5 for this discussion.

***Farley (1980) notes that homicide rates were "moderately falling" for some years after 1940.

FIGURE 2

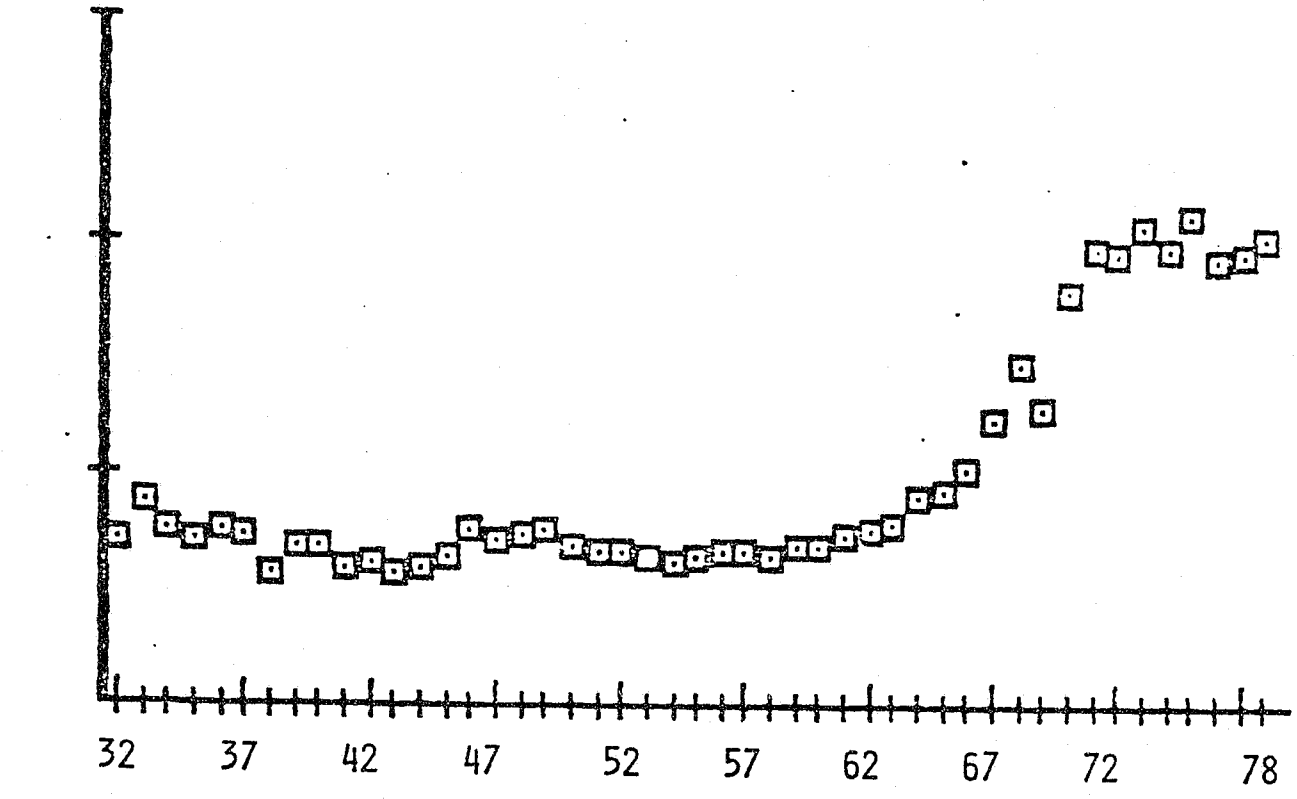
HOMICIDE RATES IN U.S. CITIES: 1932-78



SOURCE: FEDERAL BUREAU OF INVESTIGATION, UNIFORM CRIME REPORTS

FIGURE 3

HOMICIDE RATES IN LARGE U.S. CITIES: 1932-78



SOURCE: FEDERAL BUREAU OF INVESTIGATION, UNIFORM CRIME REPORTS (ANNUAL)

1960's the problem appears to have renewed itself. The homicide rate begins a sustained rise in the early 1960's.

In Tables 1-3 we report the results of estimating time trends for the homicide data shown in the corresponding figures. Specifically, Table 1 contains the results of estimating time trends for the data in Figure 1, Table 2 the results for the data in Figure 2 and Table 3 the results for the data in Figure 3. Because of the pattern we observe in Figures 1-3, we estimate two time trends in all cases.* As we discussed above, the data in Figures 1-3, especially the data based on Vital Statistics, evidence a decline in homicide rates over approximately the first thirty years of the period followed, in all cases, by a quite dramatic and sustained increase in the homicide rate during the final twenty or so years of the period. Hence, in Table 1-3 we use variable TIME1 to indicate the time trend during the first part of the period and TIME2 the time trend during the second time period. Various ending dates for the initial period (TIME1) are used in this analysis. Time trends estimated using dates between 1958 and 1962 as ending dates for TIME1 are shown in Tables 1-3.** The variable PERIODSHIFT is a dummy variable that is equal to 1 during the second period and zero otherwise. PERIODSHIFT allows the intercept of the equations to differ between periods.

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*In all of the regressions the hypothesis that the coefficients in Time 1 and Time 2 are identical can be rejected at conventional levels of significance (i.e. .05 and .01).

**Similar results were obtained using 1956, 1957, 1963, and 1964 as ending dates for TIME1.

TABLE 1

ESTIMATED TIME TRENDS IN HOMICIDE FOR THE UNITED STATES: 1930-78

VARIABLE	REGRESSION I	II	III	IV	V
CONSTANT	2.22934	2.22082	2.21049	2.2009	2.18718
TIME 1	-.027706* (-12.982)**	-.026881 (-13.059)	-.025913 (-12.896)	-.024968 (-12.705)	-.023828 (-12.217)
TIME 2	.048641 (13.045)	.049315 (12.065)	.049693 (10.931)	.049126 (9.668)	.048132 (8.319)
PERIODSHIFT	-2.2009 (-14.357)	-2.2213 (-13.142)	-2.2274 (-11.771)	-2.1923 (-10.288)	-2.1356 (-8.732)
TERMINAL YEAR TIME 1	1958	1959	1960	1961	1962
INITIAL YEAR PERIODSHIFT	1959	1960	1961	1962	1963
R-SQUARE	.889	.886	.880	.874	.864
SAMPLE SIZE	49	49	49	49	49

Source: U.S. National Center for Health Statistics, Vital Statistics of the U.S. (Annual).

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 2

ESTIMATED TIME TRENDS IN HOMICIDE FOR ALL U.S. CITIES: 1932-78

	REGRESSION				
VARIABLE	I	II	III	IV	V
CONSTANT	1.79959	1.80240	1.80489	1.80413	1.80270
TIME 1	-.08010* (-3.351)**	-.08299 (-3.675)	-.08549 (-3.985)	-.08575 (-4.160)	-.08341 (-4.344)
TIME 2	.053722 (14.321)	.054604 (13.506)	.054538 (12.419)	.054000 (11.293)	.051972 (10.022)
PERIODSHIFT	-1.8180 (-12.334)	-1.8569 (-11.629)	-1.8567 (-10.638)	-1.8335 (-9.579)	-1.7469 (-8.350)
TERMINAL YEAR TIME 1	1958	1959	1960	1961	1962
INITIAL YEAR PERIODSHIFT	1959	1960	1961	1962	1963
R-SQUARE	.885	.886	.885	.886	.888
SAMPLE SIZE	47	47	47	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 3

ESTIMATED TIME TRENDS IN HOMICIDE FOR LARGE U.S. CITIES: 1932-78

	REGRESSION				
VARIABLE	I	II	III	IV	V
CONSTANT	1.97103	1.96429	1.95956	1.95081	1.93974
TIME 1	-.04899* (-1.689)**	-.04203 (-1.523)	-.03729 (-1.422)	-.02882 (-1.146)	-.01844 (-.760)
TIME 2	.070670 (15.528)	.071315 (14.434)	.070470 (13.130)	.069233 (11.730)	.067091 (10.239)
PERIODSHIFT	-2.0585 (-11.512)	-2.0783 (-10.650)	-2.0386 (-9.557)	-1.9783 (-8.373)	-1.8773 (-7.102)
TERMINAL YEAR TIME 1	1958	1959	1960	1961	1962
INITIAL YEAR PERIODSHIFT	1959	1960	1961	1962	1963
R-SQUARE	.933	.933	.933	.931	.929
SAMPLE SIZE	47	47	47	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

Turning our attention now to the results in Table 1, we note that according to these estimates the homicide rate in the U.S. was declining at about 3% a year during the first part of the period. During the second part of the period, or from approximately 1960 to 1978, the homicide rate grew by about 5% per year. As the various regression reported in the table clearly indicate, the time trends are not very sensitive to the precise ending year chosen for TIME1. The coefficients on TIME1 and TIME2 are virtually identical in all of the regressions presented in Table 1. In fact, this stability appears quite general in estimating homicide trends. Note that only the coefficients on TIME1 in Table 3 vary at all with the dating of TIME1 and these coefficients are not very precisely estimated.

The results of estimating time trends using the UCR data in Figure 2 and 3 are qualitatively similar to the results obtained using Vital Statistics data. There are, however, some substantial quantitative differences between the UCR estimates as shown in Tables 2 and 3 and the estimates based on Vital Statistics data shown in Table 1. For example, in Table 2 while the homicide rate based on UCR data for all cities declines during the first period, this decline is much less dramatic than the decline suggested by the Vital Statistics data for the entire country (Table 1). Specifically, using the UCR data for all cities (Table 2) we estimate that the rate of decline during the first period was only about 1% as opposed to the 3% decline suggested by the estimates for the same period using Vital Statistics data. Balancing out, to some extent, the quantitative

differences in these results is the fact that the rate of increase in homicide estimated using UCR data for all cities during the period 1960-80 (Table 2) is almost identical to the estimates of the growth rate in homicide during the same period implied by the Vital Statistics data (Table 1).

In Table 3 we present the results of estimating time trends in homicide using UCR data for only large cities, i.e. cities with populations over 250,000. The estimates using UCR data for large cities reveal a somewhat less sanquine picture of the old days, as well as a somewhat more pessimistic view of the 60's and 70's. Here we find that while the estimated time trend in homicide during the pre-60's period is negative, the rate of decline is less than a 1/2% per year and the results are not very robust. In most cases the time trend is statistically significant at only the 10% level. However, while the rate of decline appears more moderate for large cities during the early years of this period, the rate of increase in homicide during the latter years of the period is much more dramatic. The "good old days" may not have been as good in large cities as in small cities but the current history of the homicide rate appears much bleaker in large than in small cities. Specifically, while in large cities the homicide rate appears to have grown by about 7% per year during the 1960's and 1970's, the rate of growth in homocide for all cities was only about 5% per year.

Of course, while the data used for the estimates in Table 3 control for city size, the actual cities included in the sample

will vary over the time period.* In part to control for this compositional effect we supplement our analysis by presenting data on several specific cities.** This also enables us, in the cases of Los Angeles and New York, to extend the sample back before 1932. We begin our analysis of specific cities with homicide trends in the group of large cities for which we have some cost of crimes control data.*** These cities are: Dallas, Los Angeles, Phoenix, and St. Louis. In Table 4 we present estimates of time trends in homicide rates for these four major cities. The variables DALLAS, ST. LOUIS, and PHOENIX, are shifts for each of the specific cities. As is clear from Table 4 the results for these cities differ slightly from the estimates based on UCR data for groups of cities presented in Tables 2 and 3. Specifically, while the homicide rate for these four cities increased faster in the post 1960 period than in the pre-1960 period, as was true for the UCR as well as the estimates derived from Vital Statistics data, the homicide rate actually increased in the initial period. This is in contrast to the decrease in homicide rates

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*Clearly this is also true for the all city group analyzed in Table 2.

**Since the major objective of this paper is to explore the relationship between the costs of crime control and the level of crime and since detailed cost data is available only for a small number of cities, we would have supplemented our anlaysis with data for specific cities even in the absence of a compositional problem in the UCR data for large cities.

***This cost data as well as the analysis of the cost data and its relationship to crime rates is presented below.

TABLE 4

ESTIMATED TIME TRENDS IN HOMICIDE FOR FOUR MAJOR CITIES (LOS ANGELES, DALLAS, PHOENIX AND ST. LOUIS): 1930-79

	REGRESSION	
VARIABLE	I	II
CONSTANT	4.242848	3.266415
TIME 1	.020934* (5.009947)**	.017294 (4.199788)
TIME 2	.041297 (20.09825)	.067103 (9.864435)
DALLAS	-.424451 (-6.02030)	-.424451 (-6.266906)
ST. LOUIS	-.394925 (-5.60151)	-.394925 (-5.830962)
PHOENIX	-2.082659 (-29.19135)	-2.079900 (-30,34528)
PERIODSHIFT	- -	1.042606 (3.964125)
R-SQUARE	.90130	.90943
F-STATISTIC	321.463	292.901

Source: Los Angeles Police Department, Dallas Police Department, Phoenix Police Department, St. Louis Police Department, and FBI Uniform Crime Reports.

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

during the pre-1960's evidenced in Tables 1-3. That is, while it appears that for the U.S. as a whole and for cities and even for large cities as a group homicide rates declined from 1930 to 1960, this was not the case for four large cities in this study: Dallas, Los Angeles, Phoenix and St. Louis. What is true, however, is that estimates of the trends in homicide based on this small group of cities show a much more rapid growth in homicide during the 60's and 70's than earlier in the period: 2% in the earlier years as opposed to 7% in the 1960's and 70's.* It is interesting to note that the growth rate during post 60 period is precisely the growth rate we found in the large city sample.**

Of the four cities analyzed in Table 4, Los Angeles has a special significance in this study.*** We were able to obtain the most complete cost data for Los Angeles and for this reason it is the city we concentrate on in the subsequent analysis of the costs of crime control. Interestingly enough the homicide rate in Los Angeles behaves slightly differently than the other cities in Table 4. Qualitatively, the estimates based on Los Angeles data alone look more like the estimates in Tables 1-3.

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*The hypothesis that the two time trends are identical, however, can be rejected at the .05 level.

**Note that the inclusion of PERIODSHIFT changes the quantitative data not the qualatative results. This is a general property of the estimation above.

***Note that while the results in Table 4 are for a specific set of cities, they are for the group of cities and not any specific city.

TABLE 5

ESTIMATED TIME TRENDS IN HOMICIDE RATES FOR LOS ANGELES: 1930-80

	REGRESSION			
			CORC	
VARIABLE	I	II	III	IV
CONSTANT	-9.682 (-171.49)	-9.698 (-170.87)	-9.643 (-97.436	-9.719 (167.45)
TIME 1	-.010 (-3.12)	-.009 (2.73)	-.010 (-2.06)	-.007 (-2.212)
TIME 2	.078 (15.71)	.0786 (14.41)	.0821 (10.87)	.080 (13.07)
PERIODSHIFT	-2.449* (-11.57)**	-2.461 (-10.52)	-2.667 (-7.93)	-2.491 (-9.48)
TERMINAL YEAR TIME 1	1958	1959	1959	1960
INITIAL YEAR PERIODSHIFT	1959	1960	1960	1961
R-SQUARE	.94	.93	.95	.93
F-STATISTIC	229	218	282	200
SAMPLE SIZE	51	51	50	51
RHO	-	-	.442	-
YRS	1930-80	1930-80	1931-80	1930-80

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

In Table 5 we present the estimated trends for the homicide rate for Los Angeles. As in the case of the estimates based on Vital Statistics data for the U.S. and UCR data for all cities, we see evidence here of a statistically significant decline in the homicide rate from 1930 to 1960. This period of mildly increasing tranquility is, as in all the other cases we have examined, followed by a period of sustained growth in the level of homicide. In Los Angeles, as in all other urban areas, the homicide rate increased persistently during the 1960's and 1970's. During this period we estimate that the homicide rate increased by about 8% a year. This is in contrast to a decline of about 1% a year during the early part of the period. It is interesting to note that once again the results are not sensitive to the specific choice of ending date for TIME1. Also, as the coefficients in column III indicate the results are not very sensitive to correction for autocorrelation. The estimate in column III (CORC) were obtained by using the Cochrane-Orcutt procedure.*

The other specific city that we present estimates of the homicide rate is for New York City. While we do not have historical cost data for New York City and do not analyze the city in the subsequent sections of this paper, we singled it out at this point because it provides us with an opportunity to analyze the behavior of homicide rates over a somewhat longer time period. We have been able to obtain roughly comparable homicide data for New York City back to 1918.

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*See Pindyck and Rubinfeld (1981).

Dividing the New York City data at 1960, as we did with the Los Angeles data, we note from the results in the first column of Table 6 that the homicide rate in New York City appears to evidence a pattern similar to Los Angeles. During the period prior to 1960 (TIME 1) the homicide rate declines by about 1% per year while from 1960 on the homicide rate increases by about 5% per year. While the growth rate in homicide during the 1960's and 70's is somewhat slower than Los Angeles, the general pattern appears similar.

However a plot of the New York City data revealed that the additional years of data could add some depth to our knowledge of trends in homicide rates. In particular, we observe that there is a local peak in the data in the early 1930's, i.e. the homicide rate actually increases in the period from 1918 to the early 1930's. To accommodate this additional trend as well as to allow for a somewhat more complex pattern in the period between 1930 and 1960, we estimated a homicide equation with 4 time trends and a shift for World War II. The results of this estimation are shown in columns 2 and 3 of Table 6. In this estimation TIME1A is the time trend between 1918 and 1931, TIME1B the trend between 1932 and 1942, TIME1C the trend between 1943 and 1960 and TIME 2 the trend after 1960. The variable WWII is a dummy variable that is equal to 1 during World War II and is zero otherwise. The role of this variable is to capture the structural shift in homicide rates that may have been occurred during World War II. As the results in Table 6 indicate the homicide rate increased at

TABLE 6

ESTIMATED TIME TRENDS IN HOMICIDE FOR NEW YORK CITY: 1918-78

	REGRESSION		
VARIABLE	I	II	III
CONSTANT	1.80118	1.561317	1.56132
TIME 1	-.01049* (-2.98548)**	- -	- -
TIME 1A	- -	.026589 (1.674098)	.02659 (1.65808)
TIME 1B	- -	-.080788 (-3.536919)	-.080790 (-3.503090)
TIME 1C	- -	.018383 (1.671410)	.015323 (.085873)
TIME 2	.05175 (4.10389	.05175 (4.7549)	.05175 (4.7094)
PERIODSHIFT 1	- -	1.644248 (3.412224)	1.64425 (3.37958)
PERIODSHIFT 2	- -	-.799954 (-1.948096)	-.68023 (-.99149)
PERIODSHIFT 3	-2.077457 (-3.09247)	-1.834701 (-3.110276)	-1.83470 (-3.08052)
WWII	- -	- -	-.72993 (-1.39425)
R-SQUARE	.7303	.81397	.81415
F-STATISTIC	8.7388	31.2537	26.8323
SAMPLE SIZE	61	61	61

Source: New York City Police Department

Notes:

* Estimated Coefficient
** Estimated Coefficient/Standard Error

about 2 3/4% a year during the period between 1918 and 1932. It is quite instructive to note that this rate of increase was substantially less than the rate of increase during the 1960's and 70's. Also it is worth recalling that the homicide rate itself was much lower during the 1920's, when it was increasing at 2 3/4% per year, than it was in the 1960's and 70's when it was increasing at over 5% per year.

Dividing the period between 1932 and 1960 into two subperiods is really quite revealing in the case of New York City. We observe here that in the pre-war period (1932-1942) the homicide rate actually declined by over 8% per year. This was followed by relative stability in the homicide rate and in the post war period up to 1960 the homicide rate appeared at best to be constant or at worst to be increasing at a relatively slow rate. Of course, after 1960 we see the familiar pattern. Specifically, the homicide rate begins a persistent growth at a rate that is extremely high by historical standards. In this case the post 1960 growth rate is, as we note above, slightly more than 5%.

What is apparent in all of the recent historical data on homicide that we have analyzed in this study is the dramatic difference in behavior of the homicide rate before and after 1960. The thirty or so years before 1960 were characterized, in most cases, by declining homicide rates. The twenty years since 1960 have, on the other hand, been characterized in all cases by a persistent and rapid gowth in the homicide rate at rates very high by historical standards.

We have argued above that homicide is likely to be the best indicator of the overall trend in crime because it suffers least from the "reporting problem." Trends in the measured or reported level of homicide are least likely to be confounded by trends in reporting behavior. Nevertheless, since there is no logical requirement that all crimes move together it is of some interest to actually analyze recent time trends in the other major crimes. In Figures 4-9 below we present plots for the rate of occurance of the Index crimes of Auto Theft, Robbery, Burglary, Assault, Larceny and Rape during the period 1932-78. With the exception of rape and larceny these crimes are arranged in descending order of their reporting rate: Auto Theft having a reporting rate of about 70% and larceny about 25%.* While rape had a reporting rate of about 50% in 1979, it is presented last because of the potential confounding effect of the time trend in reporting behavior for this crime.

What is striking about these Figures is that they all reveal the same rapid increase in activity during the 1960's and 70's that we observed in homicide rates. The only real diversity in these plots of crime rates is the behavior of specific crime rates prior to 1960. Based on this historical data there is little question that the crime problem has increased dramatically in the past several decades.

In order to explore the similarity in trends in these crimes and homicide more formally we estimated the same time trends for

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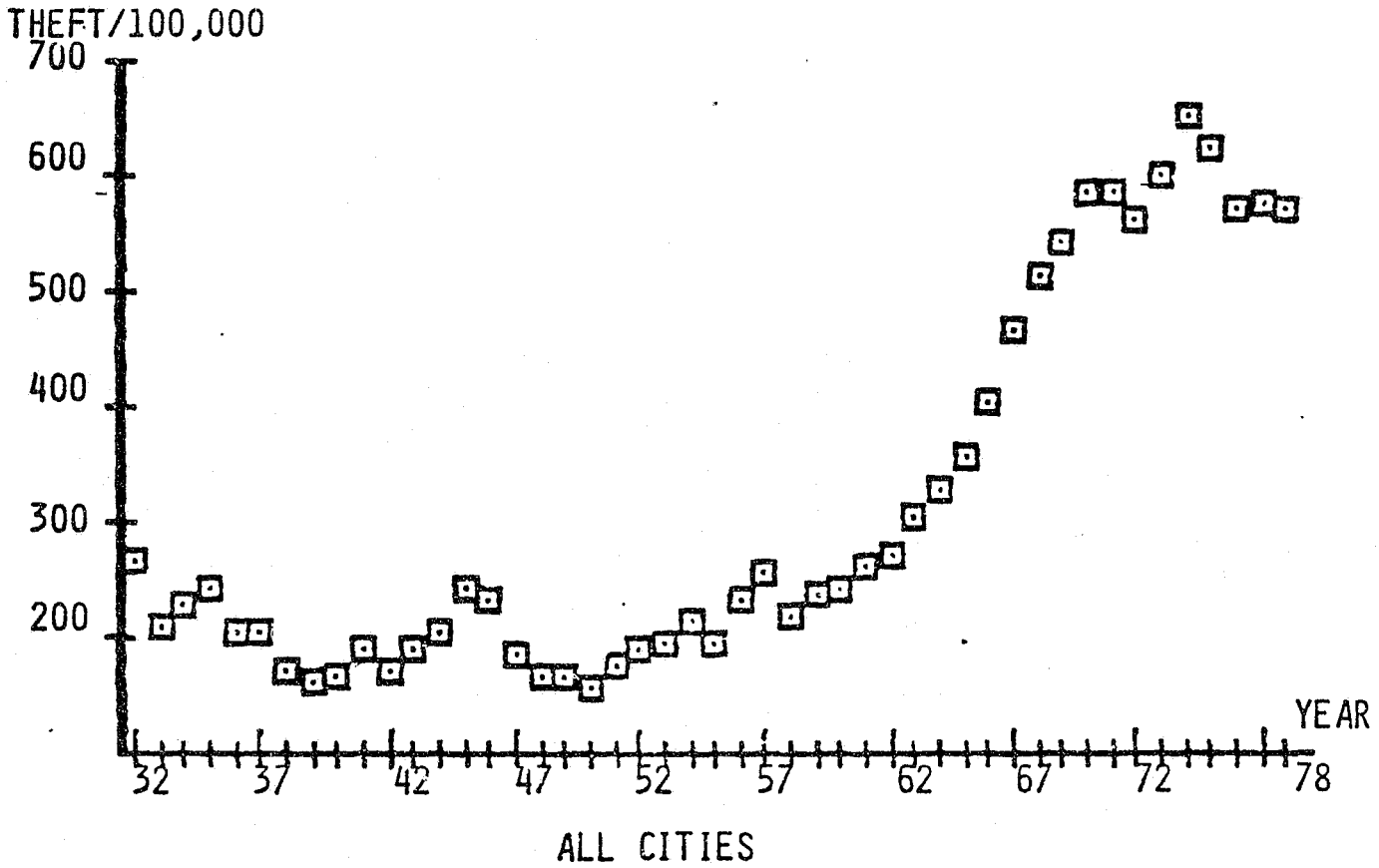
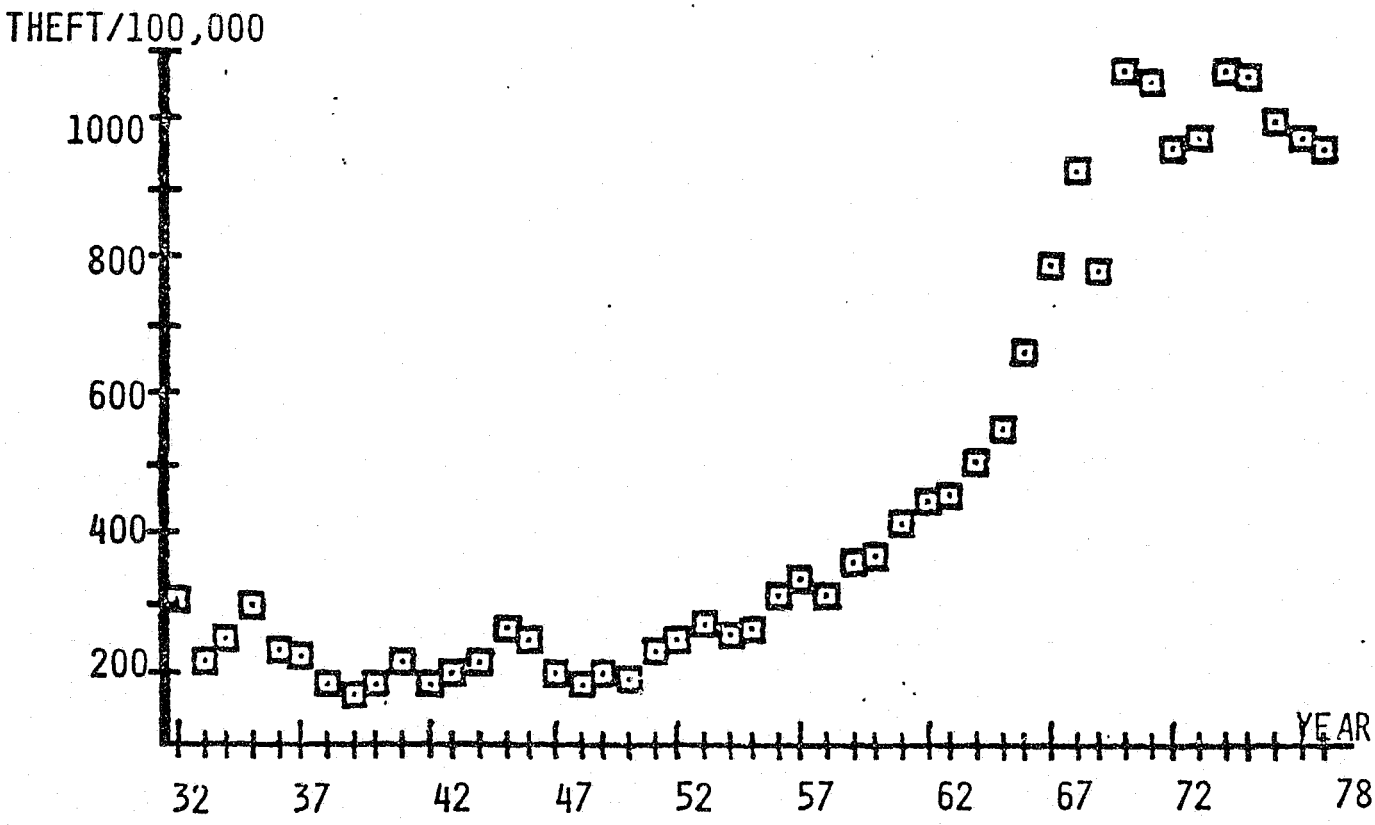
*See Footnote ** on page 6 .

FIGURE 4
AUTO THEFT RATES FOR U.S. CITIES: 1932-78



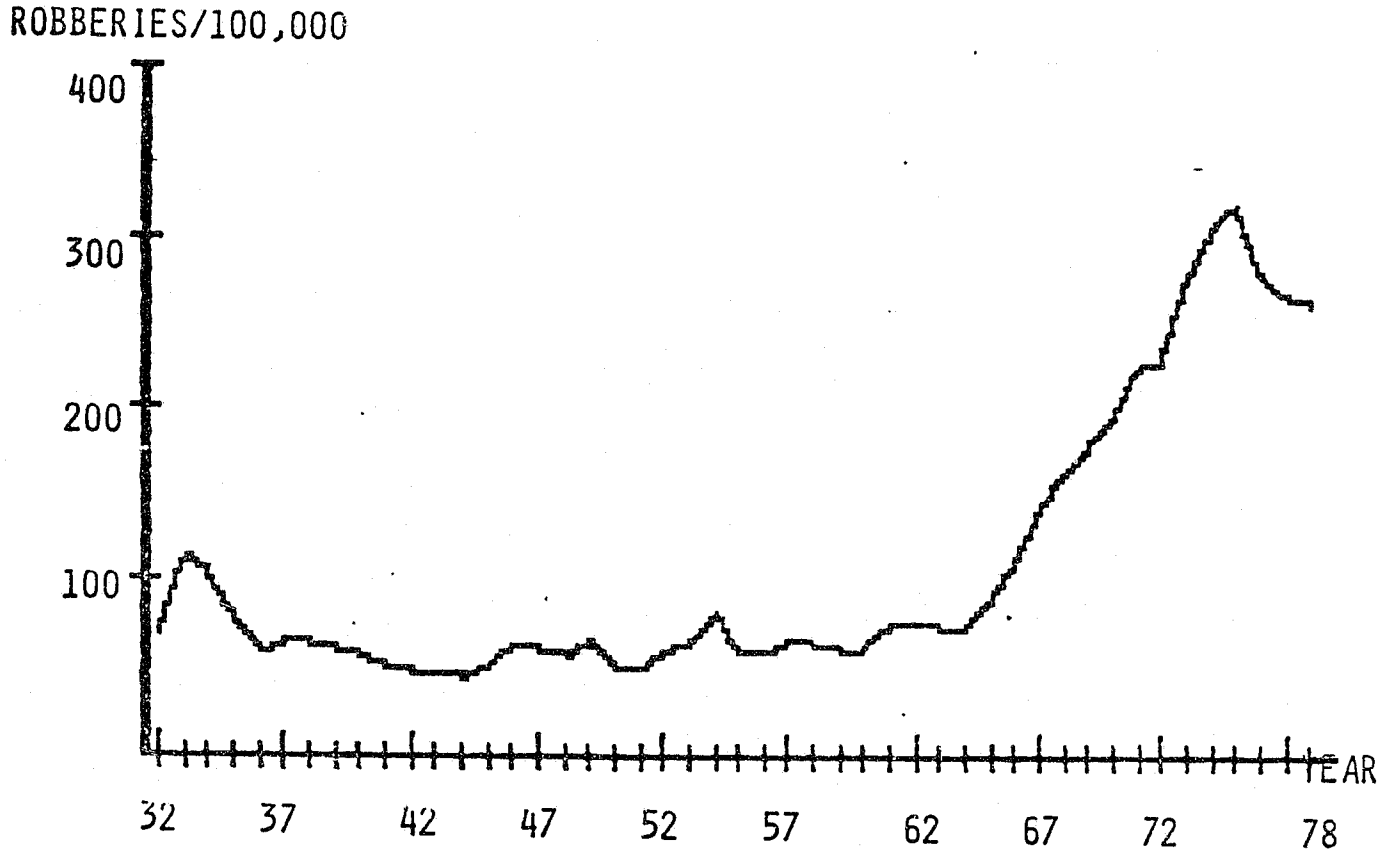
ALL CITIES



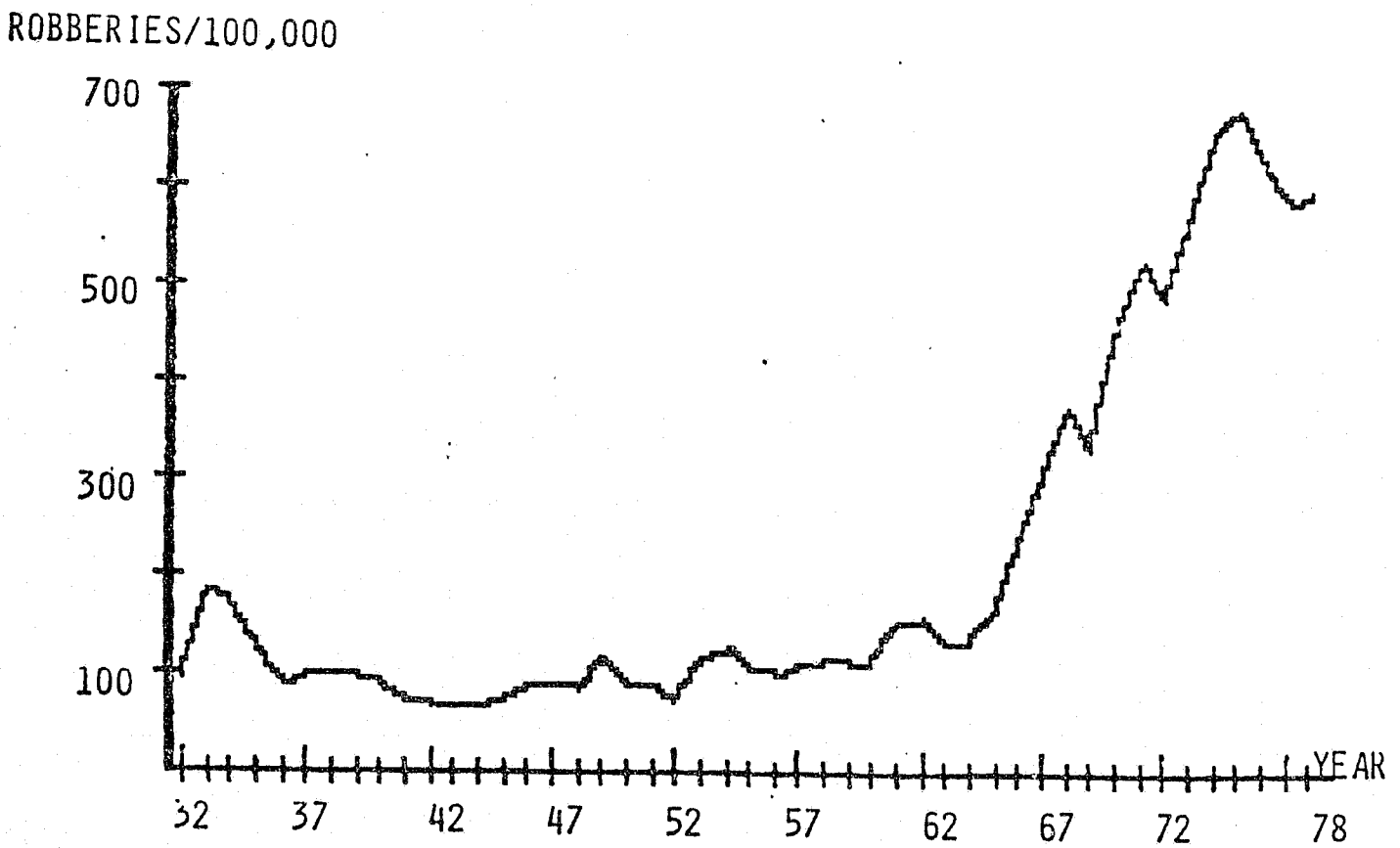
CITIES OVER 250,000

FIGURE 5

ROBBERY RATE FOR U.S. CITIES: 1932-78



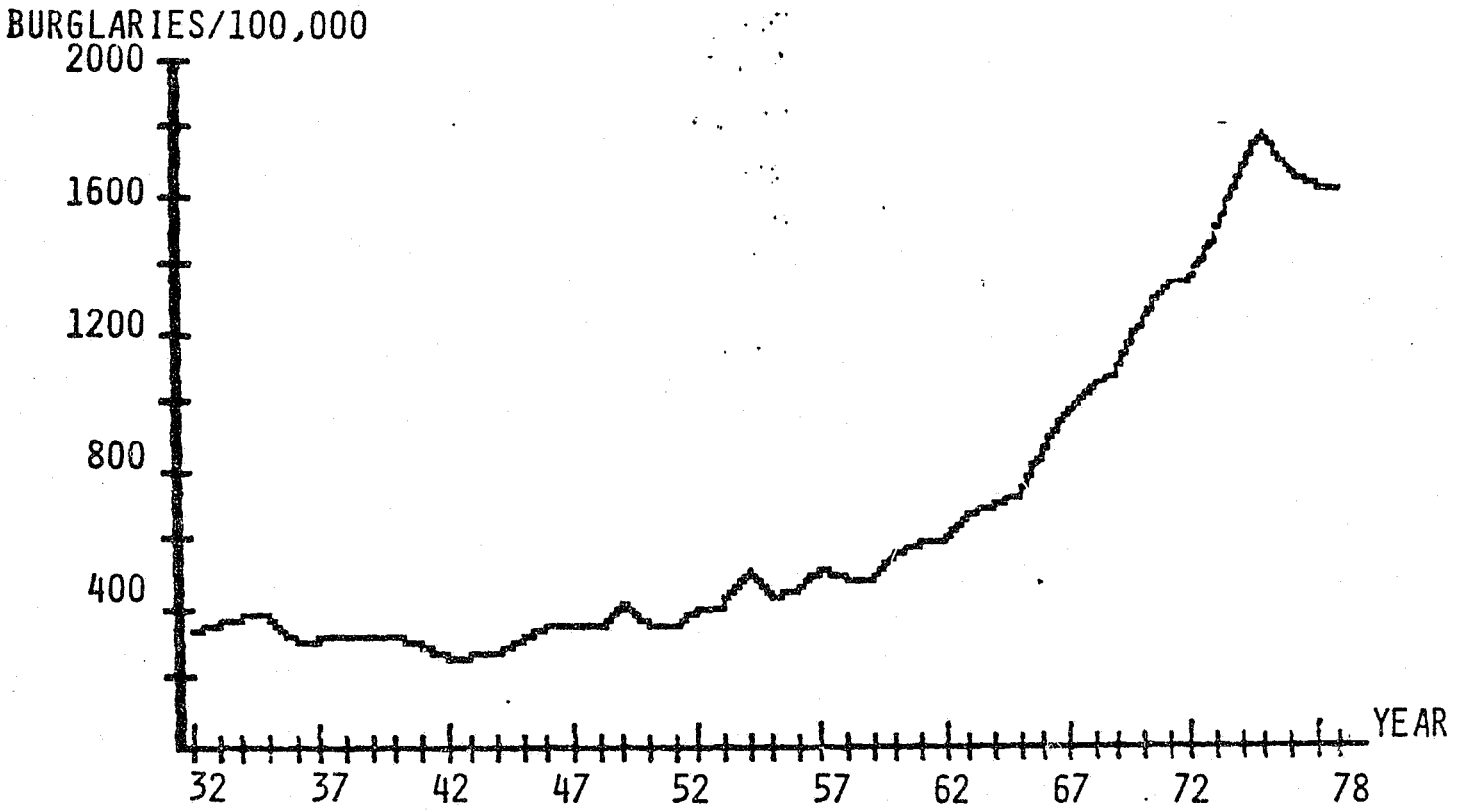
ALL CITIES



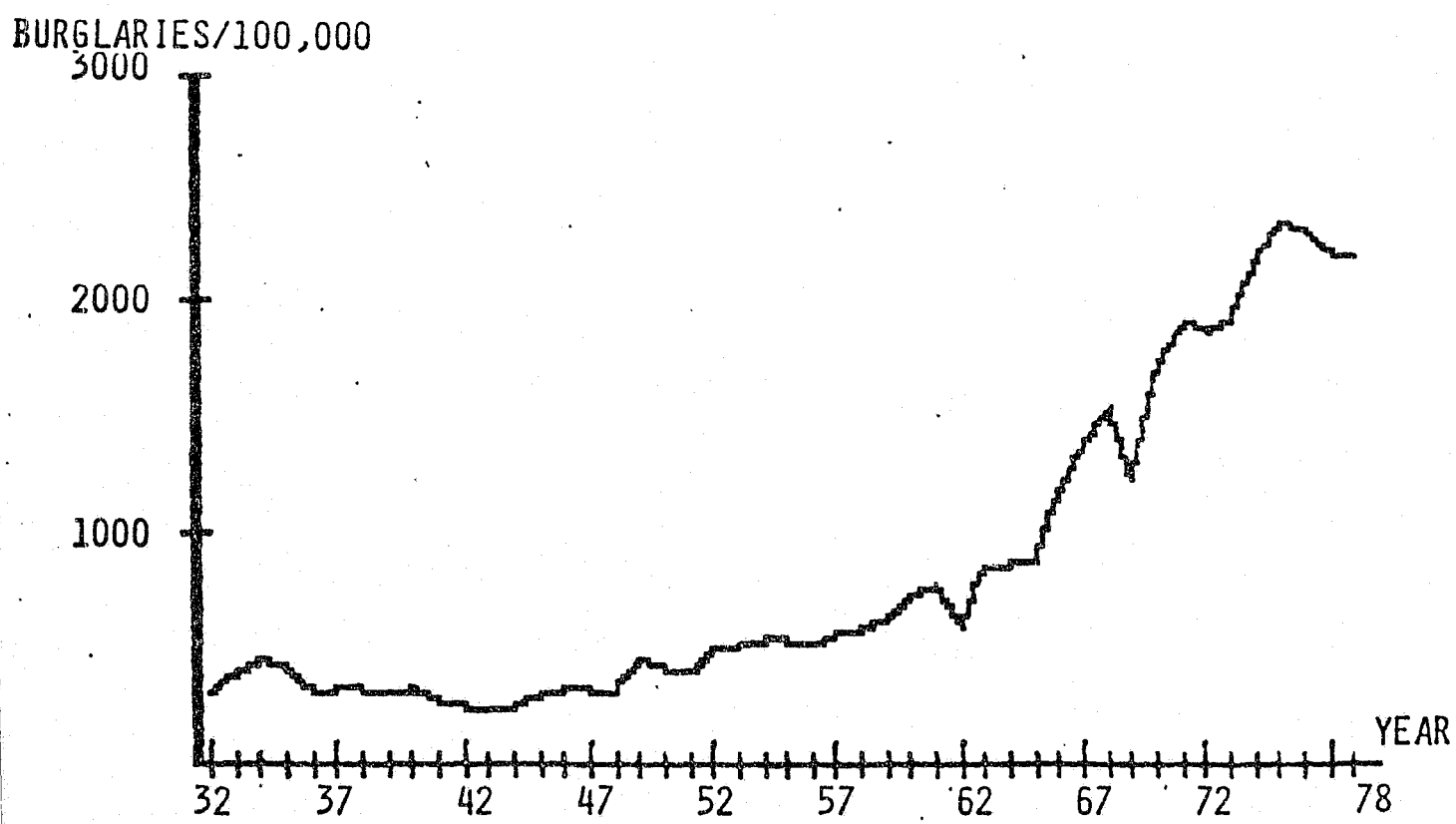
CITIES OVER 250,000

FIGURE 6

BURGLARY RATE FOR U.S. CITIES: 1932-78



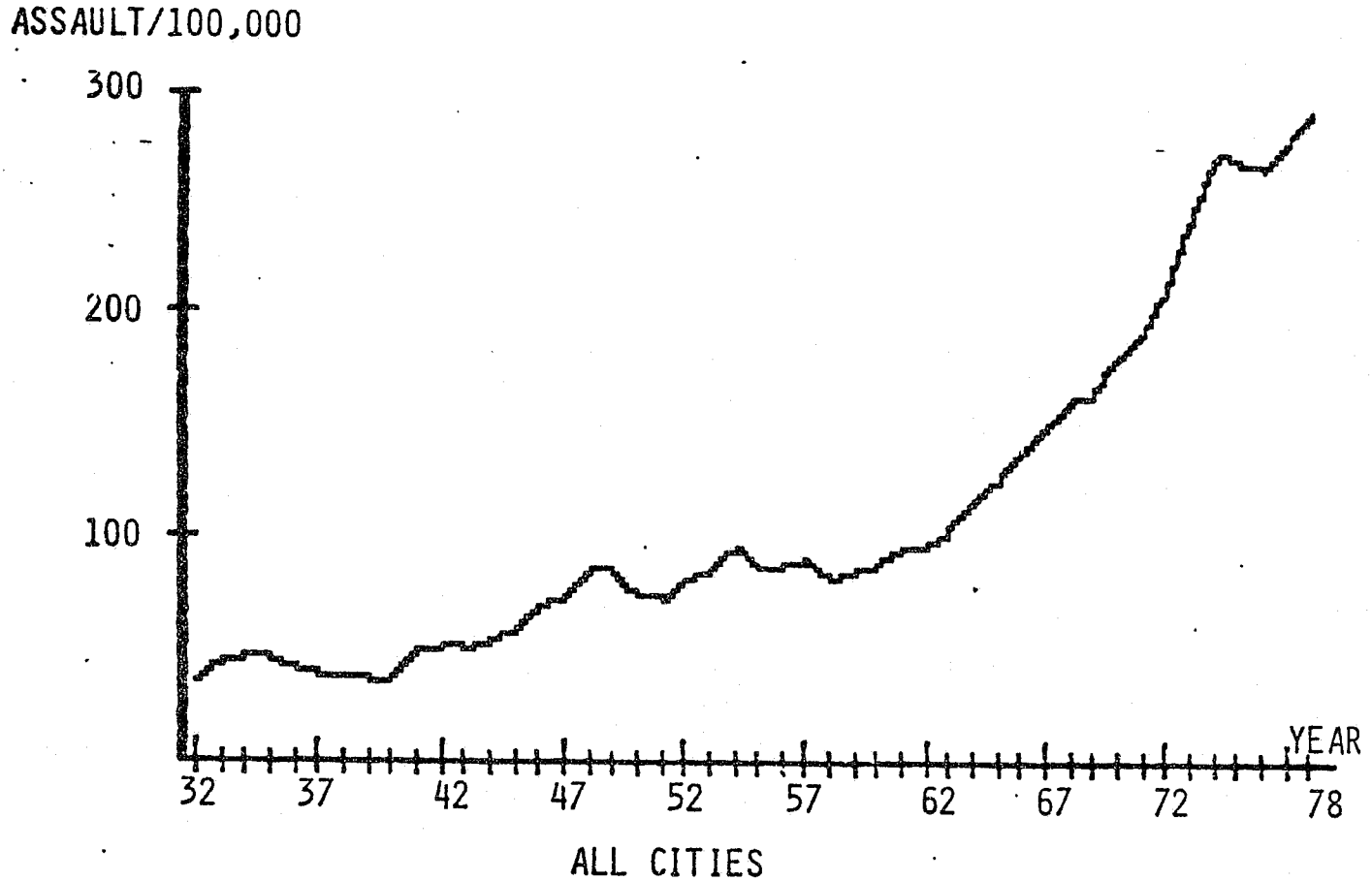
ALL CITIES



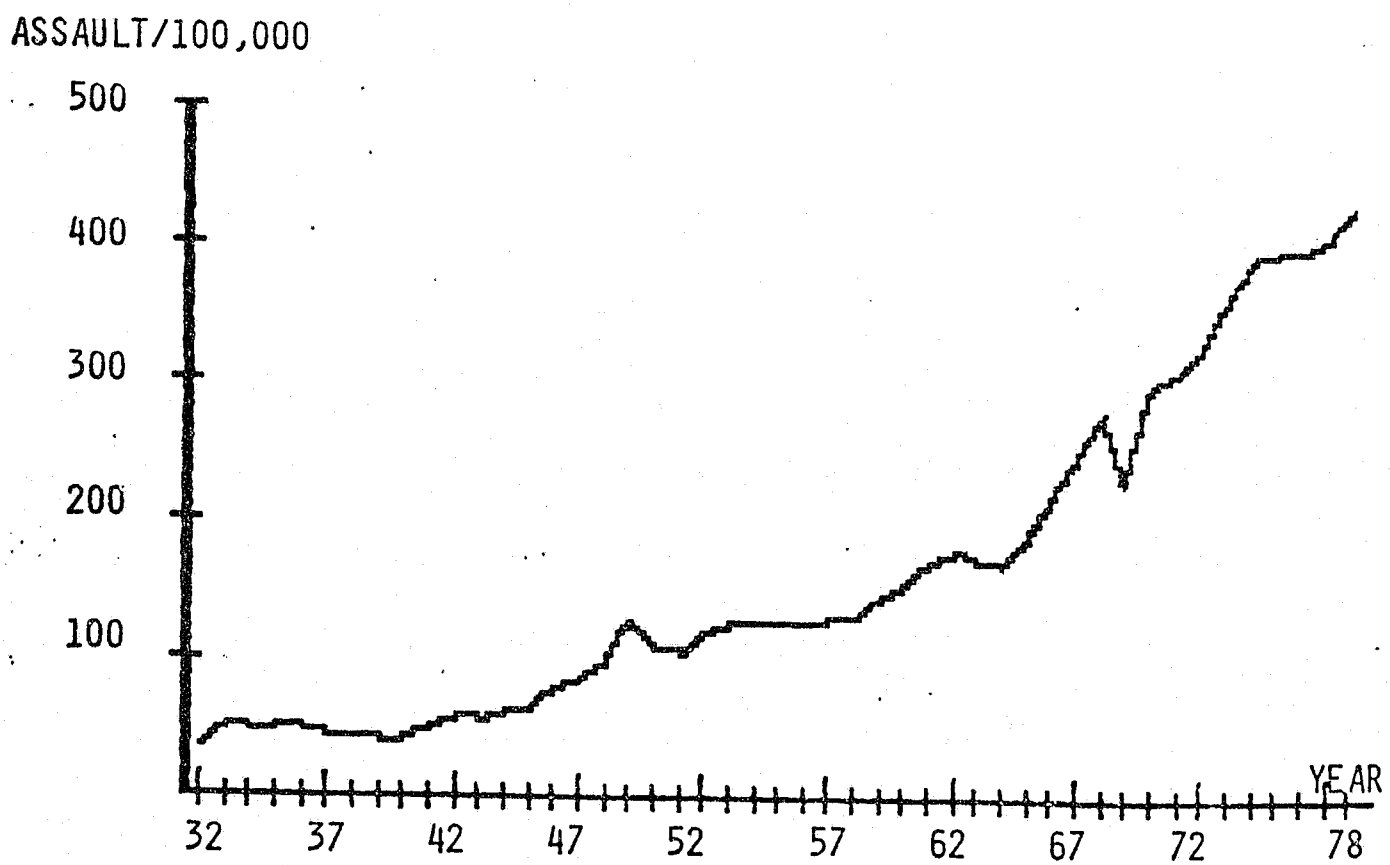
CITIES OVER 250,000

FIGURE 7

ASSAULT RATE FOR U.S. CITIES: 1932-78



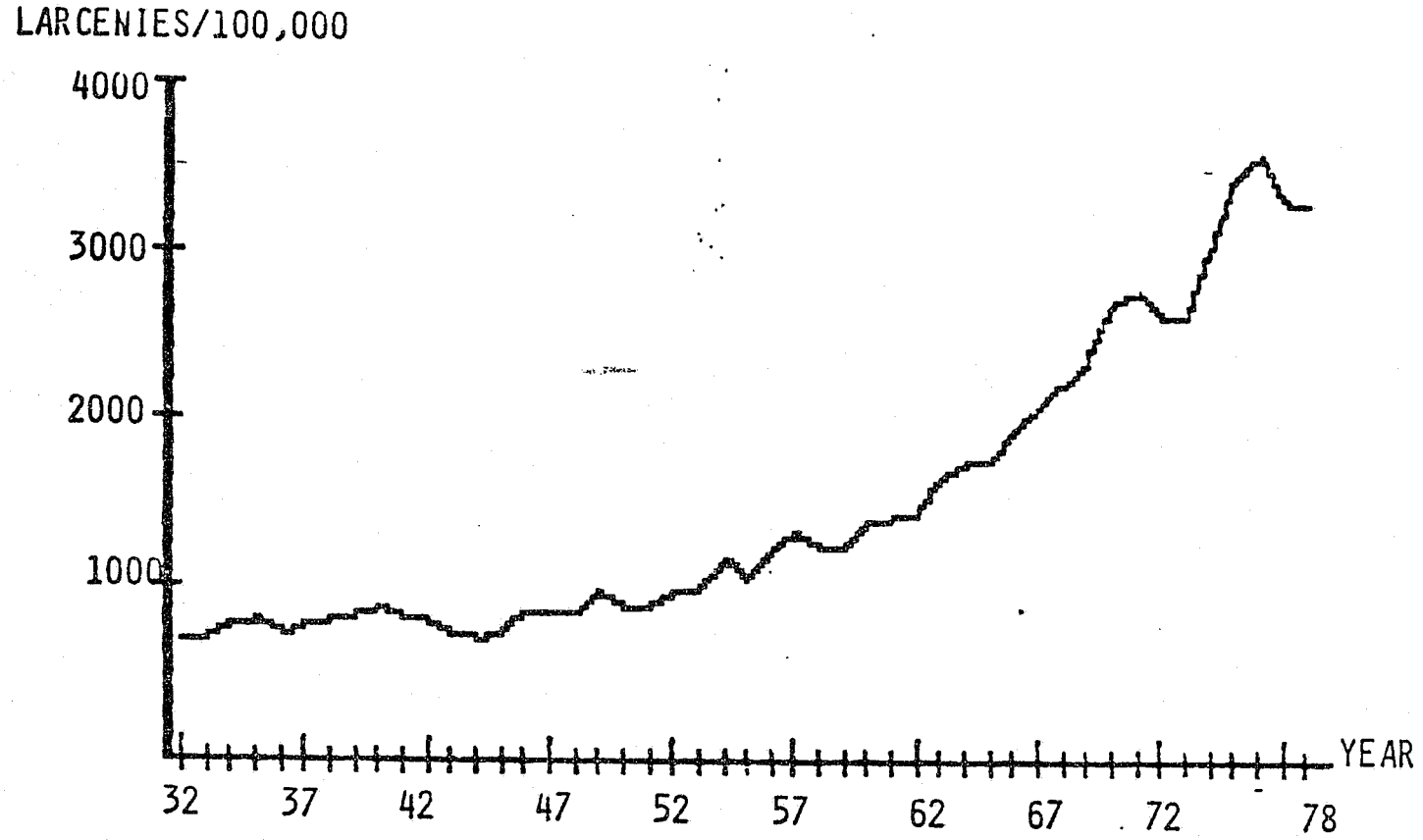
ALL CITIES



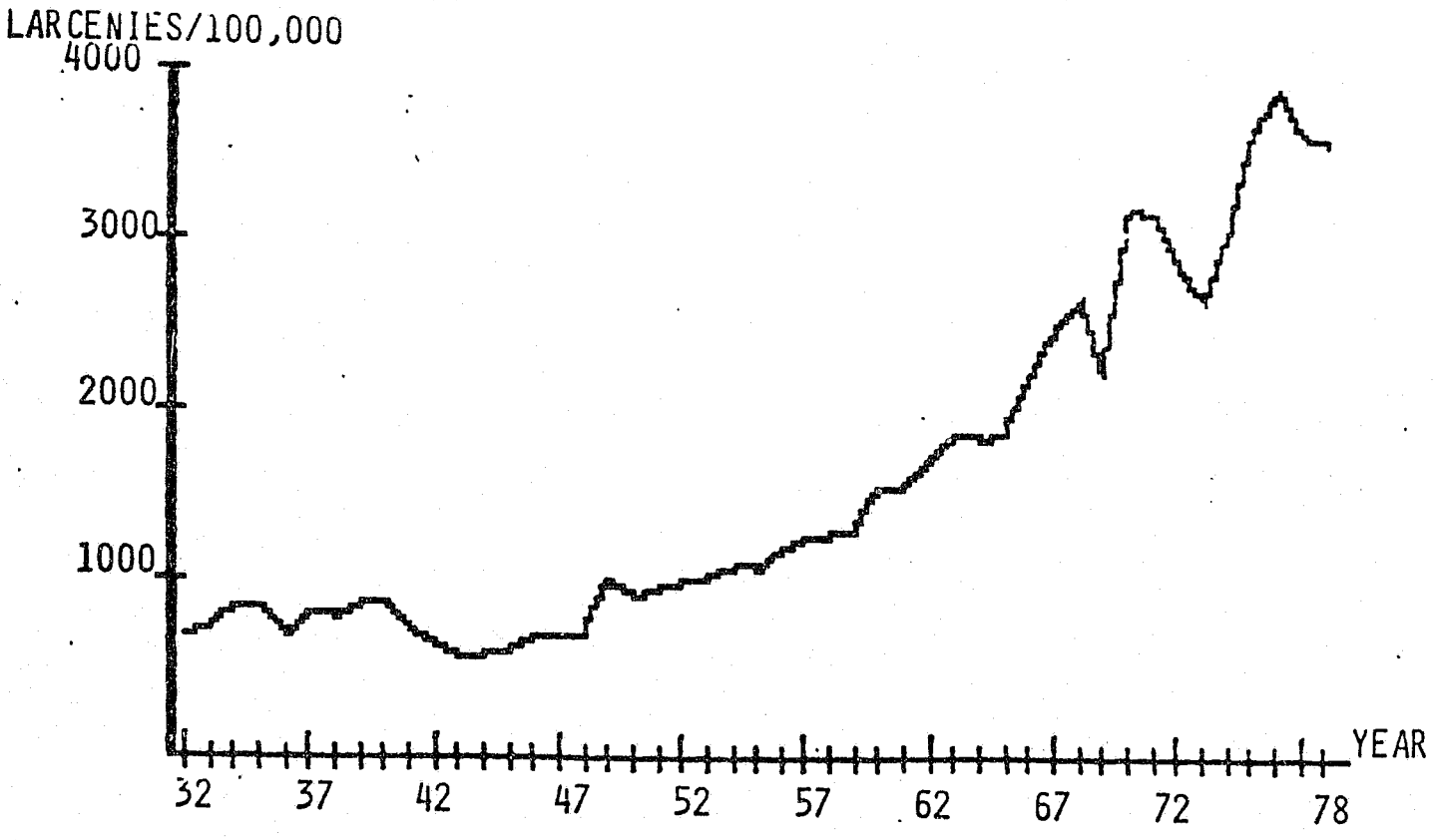
CITIES OVER 250,000

FIGURE 8

LARCENY RATE FOR U.S. CITIES: 1932-78

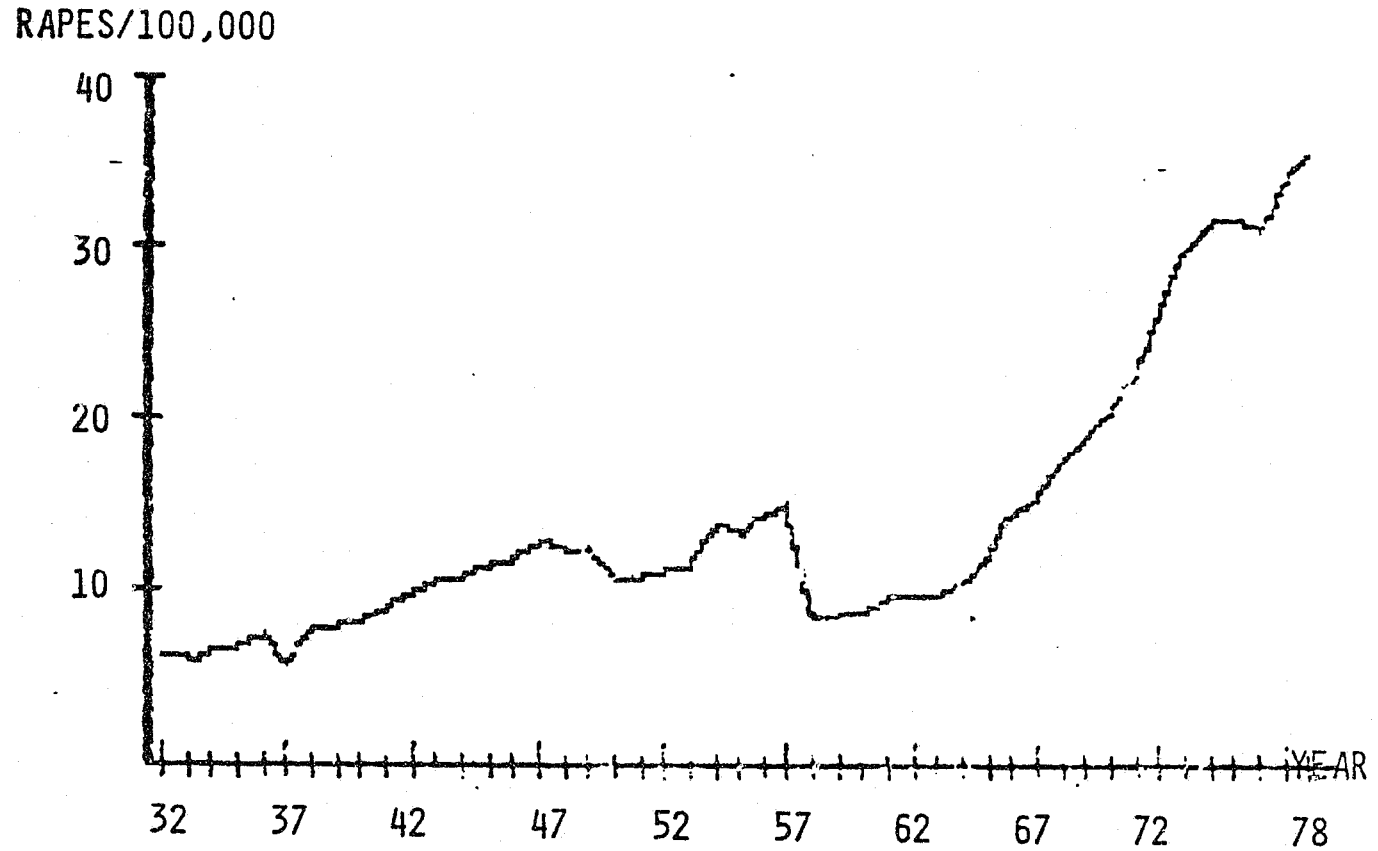


ALL CITIES

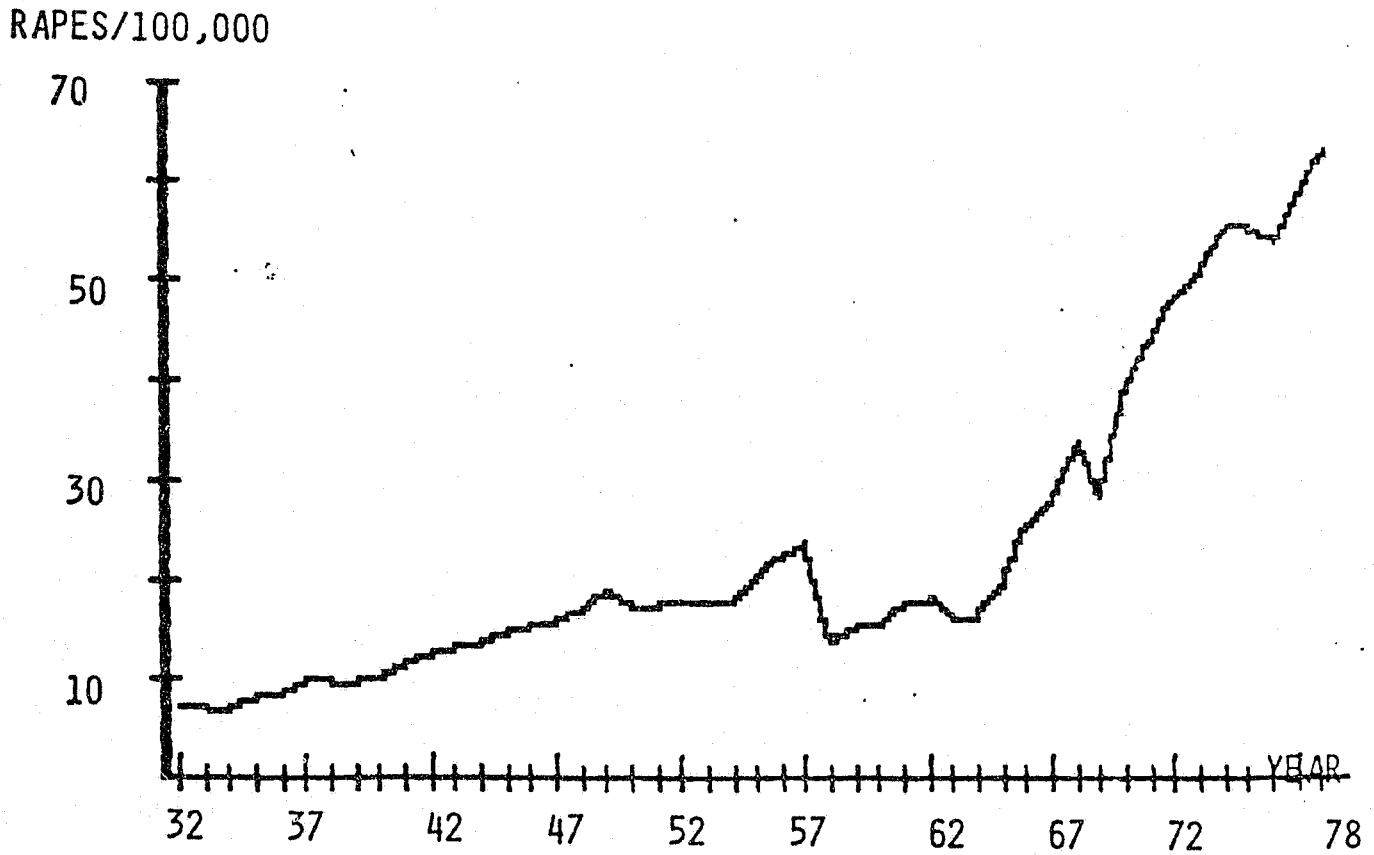


CITIES OVER 250,000

FIGURE 9
RAPE RATE FOR U.S. CITIES: 1932-78



ALL CITIES



CITIES OVER 250,000

these crimes that are estimated for homicide. The results of these estimations appear in Tables 7-11. The first column of each table contains the regression results using UCR data for all cities while the second column contains the regression results using UCR data for cities with population over 250,000. The precise date chosen for ending TIME1 is, of course, somewhat arbitrary. However, as in homicide, the results do not depend on the specific year chosen for ending TIME1.

Considering the two crimes among this group with the highest reporting rates, auto theft and robbery, we note that in Tables 7 and 8 several of the coefficients on TIME1 are negative. Although the negative time trend is statistically significant in only one case, the predominant behavior of these crime rates is non-increasing during the period prior to 1960. Only in the case of auto theft in large cities does the auto theft rate appear to have actually increased prior to 1960. Overall it appears that for the next two most frequently reported crimes after homicide, the historical pattern in time trends is almost identically the same as for homicide. Of course, while auto theft is a well reported crime the trends in auto theft are particularly susceptible to being confounded by the increase in automobile ownership over the period.* This of course is not true for robbery, and hence it is also interesting to note the magnitude of the growth rate for robbery during the 1960's and 70's. Our

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*For example even between 1953 and 1980 auto ownership increased by over 20% a year in Los Angeles.

TABLE 7

ESTIMATED TIME TRENDS FOR AUTO THEFT IN U.S. CITIES: 1932-78

	REGRESSION	
VARIABLE	ALL CITIES	CITIES OVER 250,000
CONSTANT	5.29963	5.31247
TIME 1	-.000948* (-.25496)**	.010613 (2.48447)
TIME 2	.055706 (9.54242)	.059813 (7.82066)
PERIODSHIFT	-1.305414 (-5.69141)	-.972227 (-3.218543)
TERMINAL YEAR TIME 1	1960	1960
INITIAL YEAR PERIODSHIFT	1961	1961
R-SQUARE	.97436	.93800
F-STATISTIC	544.710	216.850
SAMPLE SIZE	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 8

ESTIMATED TIME TRENDS IN ROBBERY FOR U.S. CITIES: 1932-78

	REGRESSION	
VARIABLE	ALL CITIES	CITIES OVER 250,000
CONSTANT	4.23389	4.58725
TIME 1	-.00837* (-1.71208)**	-.00228 (-.39826)
TIME 2	.097905 (12.75516)	.107848 (10.51704)
PERIODSHIFT	-2.91333 (-9.66025)	-2.90069 (-7.16185)
TERMINAL YEAR TIME 1	1960	1960
INITIAL YEAR PERIODSHIFT	1961	1961
R-SQUARE	.90076	.90221
F-STATISTIC	130.106	132.235
SAMPLE SIZE	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 9

ESTIMATED TIME TRENDS IN ASSAULT FOR U.S. CITIES: 1932-78

	REGRESSION	
VARIABLE	ALL CITIES	CITIES OVER 250,000
CONSTANT	3.524377	3.508848
TIME 1	.39378* (14.18730)**	.054979 (18.45983)
TIME 2	.071549 (16.42492)	.062726 (11.76371)
PERIODSHIFT	-1.118639 (-6.53593)	-.318430 (-1.511998)
TERMINAL YEAR TIME 1	1960	1960
INITIAL YEAR PERIODSHIFT	1961	1961
R-SQUARE	.97031	.97386
F-STATISTIC	468.554	534.019
SAMPLE SIZE	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 10

ESTIMATED TIME TRENDS IN BURGLARY FOR U.S. CITIES: 1932-78

REGRESSION

VARIABLE	ALL CITIES	CITIES OVER 250,000
CONSTANT	5.634557	5.565597
TIME 1	.015699* (5.03359)**	.024286 (5.190767)
TIME 2	.071045 (14.51355)	.076266 (9.104931)
PERIODSHIFT	-1.382349 (-7.18739)	-1.230086 (-3.718107)
TERMINAL YEAR TIME 1	1960	1961
INITIAL YEAR PERIODSHIFT	1961	1961
R-SQUARE	.96063	.93311
F-STATISTIC	349.760	199.974
SAMPLE SIZE	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 11

ESTIMATED TIME TRENDS IN LARCENY FOR U.S. CITIES: 1932-78

VARIABLE	REGRESSION ALL CITIES	CITIES OVER 250,000
CONSTANT	6.502164	6.44585
TIME 1	.019437* (8.97402)**	.020857 (5.79243)
TIME 2	.055728 (16.39389)	.050937 (7.90145)
PERIODSHIFT	-.890690 (-6.66883)	-.55589 (-2.18324)
TERMINAL YEAR TIME 1	1960	1960
INITIAL YEAR PERIODSHIFT	1961	1961
R-SQUARE	.97436	.93800
F-STATISTIC	544.710	216.850
SAMPLE SIZE	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

estimates indicate that the robbery rate, in large cities, appears to have grown by more than 10% per year during this period. In the all city sample the growth rate for robbery was close to 10% per year. Even in terms of recent historical experience, the growth rate we experienced in robbery rates during the 1960's and 70's was extremely high.

Turning our attention now to the crimes of assault, burglary and larceny, we note that in all but one case, the rate of growth in crime rates during the 1960's and 70's was substantially higher than the rate of growth in the period prior to 1960.* Only for the crime assault and then only in the case for large cities, do we find the estimated rate of growth similar in both periods: 5% in TIME1 and 6% in TIME2. Of course even here the difference is statistically significant at the 10% level.**

Finally in Table 12 we present estimated time trends for rape. For this crime we see evidence in Table 11 that the apparent growth rate in rape was twice as hign during the 1960's and 70's as it was during the period before 1960. These results are, however, extremely problematic. It is quite possible that there was a secular increase in the reporting rates for rape over the period and the estimates of time trends for this crime may reflect both an increase in the reporting rate and an increase in the crime rate. For example, in 1965, according

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*The estimated rate for larceny is of course confounded by the changes in UCR reporting practices during the period.

**The appropriate t-statistic here is 1.61.

TABLE 12

ESTIMATED TIME TRENDS IN RAPE FOR U.S. CITIES: 1932-78

	REGRESSION	
VARIABLE	ALL CITIES	CITIES OVER 250,000
CONSTANT	1.85125	1.98502
TIME 1	.03084* (9.25636)**	.04083 (11.95119)
TIME 2	.084705 (16.19747)	.088417 (14.4544)
PERIODSHIFT	-2.14983 (-10.46305)	-1.86797 (-7.73177)
TERMINAL YEAR TIME 1	1960	1960
INITIAL YEAR PERIODSHIFT	1961	1961
R-SQUARE	.93003	.94784
F-STATISTIC	190.519	260.483
SAMPLE SIZE	47	47

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

to the NORC survey, only about 27% of all rapes were actually reported to the police while according to BJS data over 40% of all rapes were reported to the police in 1980. Certainly part of this difference in measured reporting rates is due to differences in survey techniques between the early NORC surveys and the more recent victimization surveys used to generate the BJS data. Nevertheless, there has undoubtedly been some increase in the willingness to report rapes over the period. Unfortunatley recent BJS data does little to aid our understanding of reporting behavior for the crime of rape. The BJS data does not show any significant trend in reporting rates for rape over the peiod for which we have roughly comparable data, i.e. 1973-80.

Undoubtedly the historical trends in rape rates as well as those in most other serious crimes except homicide are confounded by trends in reporting behavior. Precisely how confounded these historical trends are is, however, not transparent at this point. Nor does it appear straightforward, given the available data, to actually estimate the impact of reporting trends on crime trends.

The problems of confounding due to reporting behavior notwithstanding, all of the historical evidence taken together does suggest that the 60's and 70's were a boom time for violent as well as property crime. We made the point above that one of the primary reasons for analyzing the costs of crime control is for the light it might shed on trends in the level of crime.

At this point it would appear that the crime phenomenon requiring explanation is quite clear: During the past half

century there has been a dramatic shift in the secular behavior of crime rates. For the thirty years prior to 1960, crime rates were stable or even declining while after 1960 crime rates evidence a persistent upward trend. It is this shift in the behavior of crime rates from a period of stability to a period of growth that requires explanation. As we shall show in subsequent sections of this report, knowledge concerning the trends in the level and costs of crime control is extremely useful in understanding this phenomenon.

III. SOME HISTORICAL EVIDENCE ON THE RELEVANCE OF CRIME CONTROL

The previous section was devoted almost entirely to a discussion of recent trends in crime rates, particularly violent crime rates. As the data in that discussion made apparent, the last several decades have been a "boom" time for crime. After a number of decades of relative tranquility, the United States, beginning in about 1960, began experiencing a very rapid increase in crime rates. The immediate question is why? Why did the homicide rate grow at between 5% and 7% per year during the 60's and 70's when it had been at worst stable between 1930 and 1960. In fact much of the evidence we presented above suggests that the crime rate may in fact have been declining prior to 1960.*

It is often asserted that this turnabout was due primarily to a demographic shift in the population, specifically an increase in proportion of young people in the population during the 60's and 70's.** In Table 13 it is apparent that the proportion of 18-24 year olds in the population behaved quite differently in the two periods. If we estimate a time trend prior to 1960 then we find that the proportion of 18-24 year olds actually declined by about 1 1/2% per year during the period 1930-1960.

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*See Tables 1 - 3.

**Review example of empirical investigation of the effect of the age distribution on crime (see Fox (1977)).

TABLE 13

ESTIMATED TIME TRENDS IN THE PROPORTION
Of 15 - 24 YEAR OLDS IN THE U.S.: 1930-79

	REGRESSION	
VARIABLE	I	II
CONSTANT	2.99	3.13
TIME 1	-.015* (-17.66)**	-.018 (3.24)
TIME 2	.019 (12.03)	.017 (4.61)
PERIODSHIFT	-.94 (-14.22)	-1.07 (-5.30)
INITIAL YEAR FOR PERIODSHIFT	1960	1960
R-SQUARE	.91	.98
F-STATISTIC	161	771
SAMPLE SIZE	50	49
RHO.	-	.92

* Estimated Coefficient
**Estimated Coefficient/Standard Error

Source: Statistical Abstract of the United States

After 1960, on the other hand, the proportion of 18-24 year olds increased by almost two percent a year.*

Conventional wisdom suggests that young people are risk takers and crime is only one manifestation of the willingness to risk "life and limb." Interestingly enough, however, as the evidence in Figure 10 indicates, during the period that the proportion of 18-24 year olds was increasing, the death rate from accidents other than homicide actually declined.** The increasing youthfulness of the population during the 1960's and 70's did not automatically translate into a generally more dangerous society. Of the major causes of accidental deaths only the threat and actuality of death by homicide increased significantly over that period. As the results in Table 14 indicate, death rates from accidents have declined over the entire period. In fact the point estimate of the rate of decline is slightly greater in the post '60 period than in the earlier period. Nevertheless, the rate of decline is statistically indistinguishable between the period before and after 1960.*** Clearly any explanation of the boom in homicide during the 60's and 70's that is based entirely on trends in the age distribution

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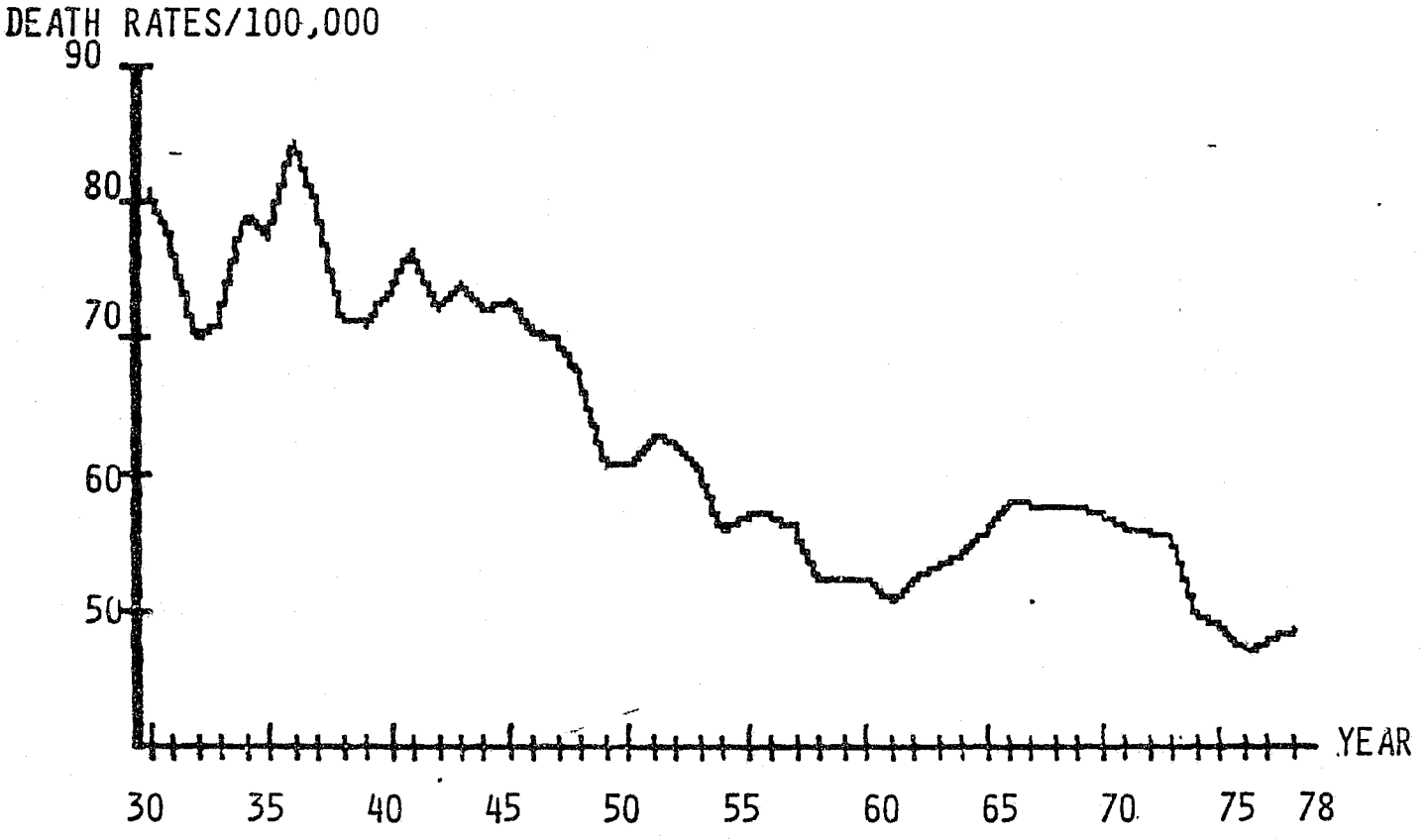
*Note that the correction for serial correllation (CORC), while it improves the precision of the estimate leaves, as one would expect, the coefficient estimates unaltered.

**While the data in Figure 10 is not age specific, age adjusted data shows the same general pattern, see Finley (1980 p. 172).

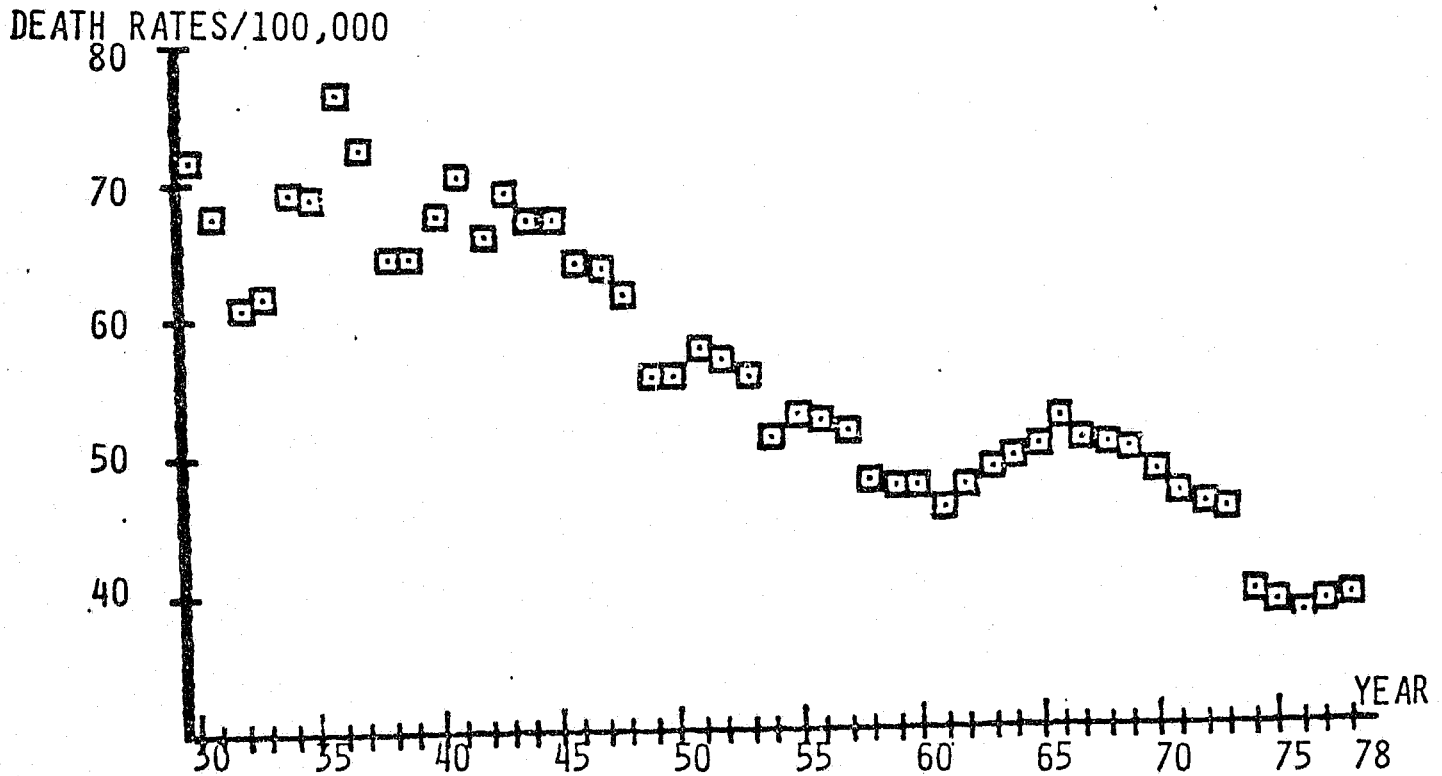
***The appropriate t-statistic for testing the difference between the coefficient in TIME1 and TIME2 is .12 and the difference would not be significant at any of the conventional levels of significance.

FIGURE 10

DEATH RATES FROM ACCIDENTS AND VIOLENCE IN THE U.S.: 1932-78



ALL ACCIDENTS AND VIOLENCE



ACCIDENTS AND VIOLENCE EXCEPT HOMICIDE

TABLE 14

ESTIMATED TIME TRENDS IN HOMICIDE CLEARANCE RATES FOR THE U.S.: 1933-78

	REGRESSION	
VARIABLE	I	II
CONSTANT	4.3119	4.30827
TIME 1	-.0128* (-8.9825)**	- -
TIME 2	-.01615 (-5.0154)	- -
TIME	- -	-.012305 (-17.21928)
PERIODSHIFT	.15904 (1.18639)	- -
TERMINAL YEAR FOR TIME 1	1959	-
R-SQUARE	.86847	.86317
F-STATISTIC	99.0440	296.503
SAMPLE SIZE	49	49

Source: U.S. National Center for Health Statistics

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

of the population must account for the difference in behavior between accidental deaths and homicide over the period.

Another explanation of the recent rise in crime that has been offered with increasing frequency is suggested by the data in Figure 11. Here we see an extremely interesting relationship between the clearance rate for homicide and the homicide rate. Essentially the clearance rate is the mirror image of the homicide rate over this period.* In the early part of the period the clearance rate increases while the homicide rate declines. During the second part of the period, during the 1960's and '70's, the clearance rate declines precipitously and the homicide rate as we noted numerous times before, increases quite rapidly.

In Table 15 we present our estimates of time trends for the clearance rate data in Figure 11. The trends in the first two columns involve splitting the time period into the two subperiods we need to analyze the trend in crime rates. Here the coefficient on TIME1 is positive and on TIME2 it is negative. Note that the CORC estimate in column two, while it eliminates any indication of serial correlation (DW = 2.01), does not alter the results of the OLS estimation. Both the OLS and the CORC estimates indicate that the clearance rate for homicide increased at a very moderate rate (less than 1/2% per year) from 1930 to 1960 and declined quite rapidly thereafter.

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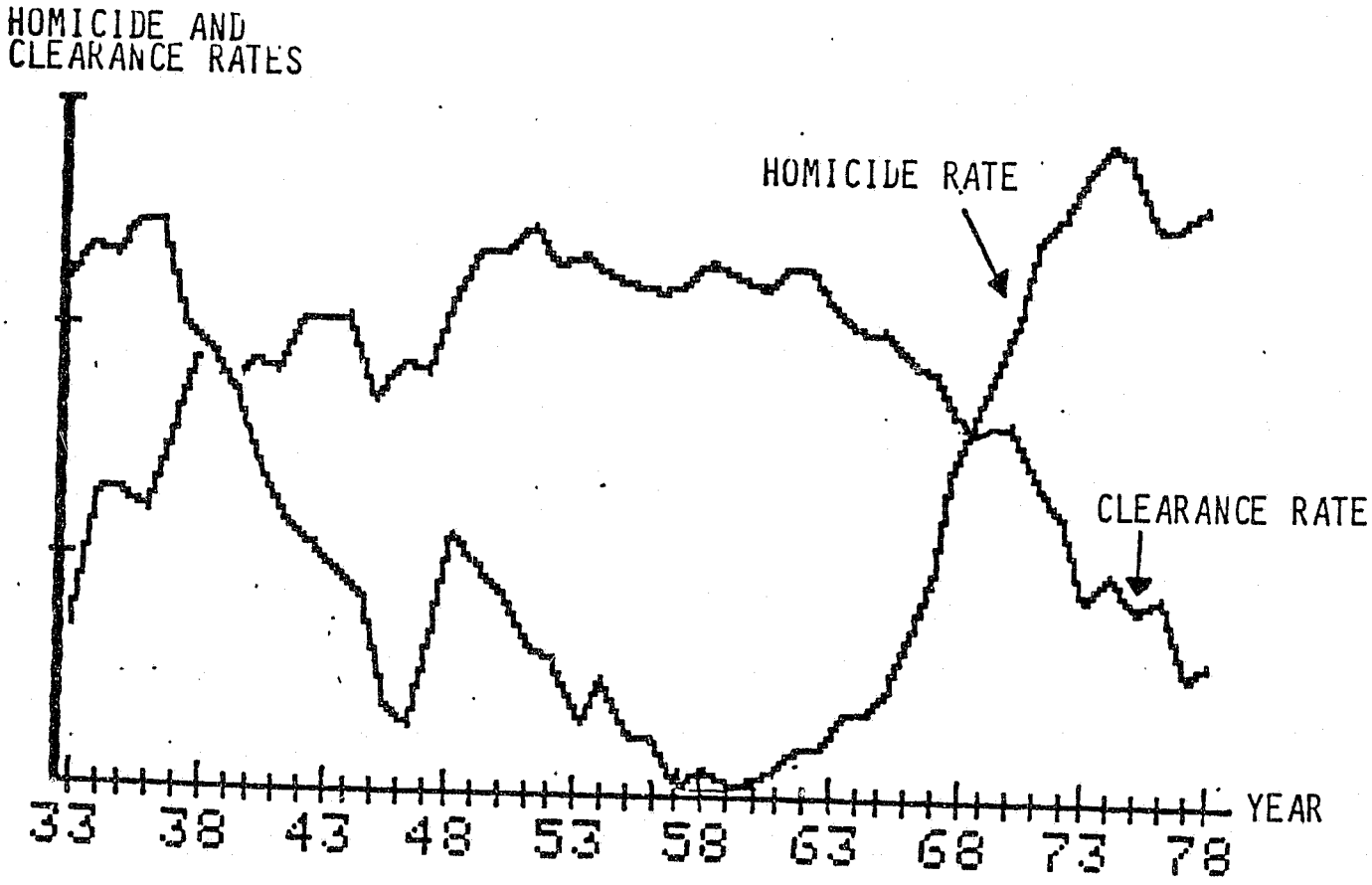
*For an excellent, albeit somewhat dated review, of the deterrence literature see Taylor (1978). A more recent survey is forthcoming in Block (1984).

FIGURE 11

HOMICIDE AND HOMICIDE CLEARANCE RATES FOR ALL CITIES IN THE U.S.: 1933-78



SOURCE: FEDERAL BUREAU OF INVESTIGATION; UNIFORM CRIME REPORTS

Up to this point what we have is a formalization of our observations about the mirror image nature of the clearance rate for homicide. However, a closer inspection of Figure 11 reveals a somewhat more complex and more interesting historical pattern in the clearance rate for homicide. That is, the clearance rate for homicide appears not to move uniformly in the period before 1960 and in columns 3 and 4 of Table 15 we divide Period 1 into two subperiods: PERIOD1A covering 1933 to 1950 and PERIOD1B covering the years 1951-59. Column 3 contains time trend estimates for all cities and Column 4 is estimates for large cities, i.e. cities with population over 250,000. From these estimates it is clear that while clearance rates did increase prior to 1960, this increase was experienced in the 30's and 40's and that the decade of the 50's was a period of, at best, stability in clearance rates. While the signs on estimated coefficients for TIME1A are negative in both cases (Columns 2 and 3) neither are statistically significant at conventional levels of significance. Interestingly enough, accounting for this more complex pattern yields a rate of increase in clearance rates during the 30's and 40's which is substantially higher and closer in absolute value to the rate of decline in the 60's and 70's. The clearance rate for homicide appears to have increased in the 30's and 40's by about 1% per year, remained relatively stable in the 50's, and declined in the 60's and 70's at about the same rate it grew in the early part of the period.

The clearance rate data shown in Table 16 for Los Angeles on the other hand evidence what at this point might be considered a

TABLE 15

ESTIMATED TIME TRENDS IN HOMICIDE CLEARANCE RATES FOR U.S. CITIES: 1933-78

	REGRESSION			
VARIABLE	I	II	III	IV
CONSTANT	4.149	4.42	4.3970	4.3542
TIME 1	.0045 (8.408)	.0043 (8.12)	- -	- -
TIME 1A	- -	- -	.0078* (8.158)**	.01026 (7.7297)
TIME 1B	- -	- -	-.0019 (-.6934)	-.00429 (-1.139)
TIME 2	-.0122 (-14.23	-.0120 (-9.67	-.0122 (-13.721)	-.0150 (-12.279)
PERIODSHIFT 1A	- -	- -	.17959 (2.7867)	.27637 (3.1247)
PERIODSHIFT 1B	- -	- -	.49898 (14.2785)	.62397 (13.0099)
PERIODSHIFT 1	.5135 (14.20)	.493 (8.76)	- -	- -
INITIAL YEAR FOR TIME 2	1960	1960	1960	1960
R-SQUARE	.8951	.925	.9007	.08817
F-STATISTIC	117	165	72.573	59.609
SAMPLE SIZE	46	45	46	46
RHO.	-	.513	-	-
D-W STATISTICS	1.09	2.01	-	-

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 16

ESTIMATED TIME TRENDS IN HOMICIDE CLEARANCE RATES
FOR THE CITY OF LOS ANGELES: 1930-80

	REGRESSION			
VARIABLE	OLSL	CORC	OLSL	CORC
CONSTANT	-.199	-.189	-.204	-.198
TIME 1	.0035* (2.61)**	.0030 (2.51)	- -	- -
TIME 2	-.0192 (-8.45)	-.0195) (-9.97)	-.0192 (8.43)	-.0195 (10.38)
TIME 1A	- -	- -	.0043 (1.86)	.0040 (1.70)
TIME 1B	- -	- -	.0132 (1.62)	.0121 (1.74)
PERIODSHIFT	.706 (7.26)	.708 (8.48)	.710 (7.19)	.716 (8.13)
PERIODSHIFT 1B	- -	- -	-.257 (7.19)	-.235 (1.29)
R-SQUARE	.743	.755	.76	.77
SAMPLE SIZE	51	50	51	50
RHO.	-	-.221	-	-.209
DW	-	2.05	-	2.02

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

slightly more conventional pattern. Specifically, the clearance rate increases during the entire period prior to 1960. In fact the point estimate for the growth rate during the 50's exceeds the estimated growth rate during the 30's and 40's. This difference, however, is statistically not very robust (the appropriate t-statistic is only 1.18). Of course as in the case of the U.S. data the clearance rate for homicide declines quite rapidly in the 1960's and 70's. Here the decline is at the rate of almost 2% per year.

A plot of the homicide clearance data as well as clearance rate plots for a number of related crimes appears in the appendix.* It is interesting to note how closely the pattern in the well reported crimes such as auto theft and robbery resembles the pattern in homicide.

At this point it is instructive to inquire somewhat more formally about the association between homicide clearance rates and homicide rates. In Table 17 we present the results of estimating the following simple relationship:

$$HR_t = C + \beta CLEAR_t$$

where HR_t is the homicide rate in year t and $CLEAR_t$ the percentage of homicides cleared during that year. The estimates for all cities appears in the first column and those for cities with population over 250,000 in the second. As in numerous previous studies we find a negative and statistically significant

*See Appendix I.

TABLE 17

ESTIMATED RELATIONSHIP BETWEEN HOMICIDE RATES AND CLEARANCE RATES FOR U.S. CITIES: 1933-78

	REGRESSION			
VARIABLE	ALL CITIES	LARGE CITIES	ALL CITIES	LARGE CITIES
CONSTANT	8.079	5.881	7.13	5.58
CLEAR	-.0669* (-8.17)**	-.0462 (-10.91)	- -	- -
CLEAR 1	- -	- -	-.0594 (-10.23)	-.0446 (-10.09)
CLEAR 2	- -	- -	-.0566 (-10.28)	-.0428 (-10.39)
CLEAR 3	- -	- -	-.0531 (-8.93)	-.0418 (-9.35)
R-SQUARE	.61	.73	.87	.81
SAMPLE SIZE	46	46	46	46

Source: FBI Uniform Crime Reports

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

relationship between homicide rates and homicide clearance rates.*

In columns three and four of Table 17 we present estimates of separate coefficients for the sub-periods described in our discussion of Table 15. CLEAR1 is the clearance rate between 1933 and 1949, CLEAR2 is the clearance rate between 1950 and 1959 and CLEAR3 is the rate from 1960 to 1978. Passell and Taylor (1977) makes the point that Ehrlich's (1975) capital punishment results depend on the choice of the subperiod used for analysis.** Our results in Table 17 suggest the same is not true for the simple association between homicide rates and clearance rates. The coefficient on all of the clearance rates in Table 16 are virtually identical, i.e., not only are the clearance rate and the homicide rate negatively associated in all sub-periods, the association is virtually identical in all sub-periods.

The results in Table 17 are for a linear relationship as described in 1 above. In Table 18 on the other hand we present coefficient estimates for the clearance value based on natural logarithims of the variable. The coefficients here are in elasticity terms, i.e., they indicate the % change in the homicide rate due to a 1 percent change in the clearance rate. Estimates are presented both for the U.S. and for the City of Los Angeles. In both cases the simple association between homicide rates and clearance rates yields very large clearance

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*See Taylor (1978).

**See Passell and Taylor (1977) for a discussion of this point.

TABLE 18

ESTIMATES OF SIMPLE CLEARANCE RATE ELASTICITIES FOR THE UNITED STATES AND THE CITY OF LOS ANGELES

	REGRESSION	
VARIABLE	UNITED STATES	LOS ANGELES
CONSTANT	-10.236	-10.206
LCLEAR	-2.15* (-14.75)**	- -
LCLRLA	- -	-3.70 (-8.94)
R-SQUARE	.62	.83
SAMPLE SIZE	46	51
YRS.	1933-78	1930-80

Source: U.S. National Center for Health Statistics and Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

elasticities. This phenomenon is very likely to be due to the absence of controls in the regression.

In the beginning of this section we took note of the argument that the driving force behind the homicide rate is the youthfulness of the population. Proponents of this theory might suggest that the results reported above on the association between homicide rates and clearance rates omit the most important causal factor, i.e. the age distribution of the population.* While there is considerable debate on the primacy of the age distribution as a causal factor there is broad agreement that it is an important factor in understanding crime rates. In Table 19 we take formal account of the age distribution of the population as a factor affecting crime rates.

The estimates in Table 19 include as an explanatory variable the proportions of 15-24 year olds in the population (YOUNG). The estimates use both Vital Statistics data and UCR data, employ both linear and log-linear specifications and are performed with (CORC) and without (OLSQ) corrections for serial correlation. The inclusion of the demographic variable YOUNG does not alter the basic qualitative results of the regressions with respect to clearance rates in any of these cases. The coefficient on clearance rates is negative and remains statistically significant in all regressions. While the magnitude of the coefficients are influenced by the addition of this control variable they are affected almost as much by the estimation technique, i.e., simply

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*See Farley (1980) for a brief dicussion of this topic.

TABLE 19

ESTIMATED RELATIONSHIP BETWEEN HOMICIDE RATES, CLEARANCE RATES AND PROPORTION OF 15 - 24 YEAR OLDS IN THE POPULATION: U.S. TIME SERIES: 1933-78

REGRESSION

VARIABLE	U.S.	ALL CITIES	U.S.	U.S. (CORC)	ALL CITIES (CORC)
CONSTANT	3.86	8.86	1.168	1.168	3.101
CLEAR	-.0317*	-.0705	-	-	-
	(-7.41)**	(-4.72)	-	-	-
YOUNG	.0412	.0324	-	-	-
	(4.28)	(.78)	-	-	-
CLEAR	-	-	-1.299	-.555	-.885
	-	-	(-7.06)	(-2.84)	(-3.12)
YOUNG	-	-	.475	.688	.623
	-	-	(5.43)	(4.69)	(2.41)
R-SQUARE	.86	.55	.90	.96	.95
F-STATISTIC	280	54	202	508	403
SAMPLE SIZE	46	46	45	46	45
RHO	-	-	-	.838	.951

Sources: U.S. National Center for Health Statistics and Federal Bureau of Investigation.

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

adjusting for serial correlation (CORC) reduces the magnitude of the coefficient by about 50%.

Obviously there are important variables other than demographic variables that are not included in the estimation described in Table 19. For example we have not included data on the trends in conviction rates, execution rates, or for that matter sentencing practices. However the estimates of Ehrlich [1975 and 1979], Wolpin [1978], and others indicate that the relationship between clearance rates and homicide rates is basically unaltered by the inclusion of these other factors.*

Our findings are clear. The trends in homicide clearance rates and crime rates appear to be mirror images of each other over the past fifty years. Moreover what limited evidence is available for other crimes suggests the same is true for most serious crimes. Using this historical data on homicide rates for the U.S. as a whole and for cities of various sizes and regressing it against the appropriate clearance rates we find a strong and stable negative relationship. A relationship that is basically unaltered in significance when we control for one of the major demographic events of the period, i.e. the decline and subsequent rise of the proportion of young people in the population.

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*Magnitudes do change but the basic negative association is unaltered by the addition of controls for numerous socioeconomic factors. See Ehrlich (1975) and Ehrlich (1977b) for analysis of arrest and conviction rates with additional variables for homicide. For an excellent analysis of the relationships between arrest rates and crime levels for crimes other than homicide that include a wide range of controls see Wolpin (1978).

There is nevertheless a very basic question here. While we have implicitly asserted that the evidence above on the negative sign of the clearance coefficient is consistent with the hypothesis that increasing clearance rates supress crime, there is as we noted above another view. Specifically, it is often asserted that in addition or even instead of clearance rates affecting crime rates, crime rates also affect clearances. There are two arguments here: The first is the one emphasized by Ehrlich [1972] and postulates a demand for safety which produces a demand for increased capture rates if there is an exogenous shift upward in the supply of crimes (crime rates). While this still poses problems of simultaneity in our estimation it would tend to bias the results against finding deterrence effects. The second argument however linking crime rates to clearance rates is more problematic for our purposes. This argument was best stated in Nagin [1978] and posits a crowding effect in which increases in crimes cause a decrease in the crime rate.

If the crowding argument has force, then the negative association we observe between homicide and homicide clearance rates above may simply reflect the effect of crowding in the system and not indicate the existence of either deterrence or incapacitation. While a complete review of this topic is well beyond the scope of this paper, Ehrlich's [1979] response to his critics on this point is particularly appropriate here. Ehrlich [1979] makes the point that the "crowding effect" should be least important in the area of homicide. His argument is simply that "the crowding effect cannot by any plausible analysis apply

equally well to all crimes." Serious offenses, that is, those imparting the greatest social loss, would be least likely to be affected. Since homicide is the most important and serious crime one would expect that it would be almost totally resistant to the crowding phenomenon. It would appear that the relationship we observe over time between clearance rates and homicide rates are unlikely to be caused entirely, or even in large measure influenced, by the "crowding effect" described in Nagin [1978].

The evidence from our historical analysis is consistent with the hypothesis that one of the major causes of the recent growth in crime is the contemporaneous decline in the level of law enforcement. In this regard our findings are quite consistent with the findings of most major econometric investigations of the topic.

IV. TRENDS IN THE COST OF CRIME CONTROL

The evidence we presented in the previous section of this report clearly indicated the historical association between crime rates, in particular homicide rates, and clearance rates. In general high crime periods were associated with low clearance rates and low crime periods with high clearance rates.* Moreover even where we controlled for the youthfulness of the population we still found a strong negative statistical relationship between the homicide crime rates and the clearance rate for homicide.** Even more significant, however, is the consistency of this finding with most of the rigorous econometric studies of the area. In case after case, using methods varying from simple correlation to simultaneous equation estimation, empirical investigators have found the evidence consistent with the deterrent effect of enforcement and punishment.

Based on our own brief econometric investigation of homicide, and more significantly on the evidence presented in virtually every major published econometric investigation of the area, it is clear that the rise in crime during the past several decades owes much to the decline in crime control during the same period. The evidence linking clearance and/or arrest rates is simply too persuasive and stable to ignore. Declining levels of crime control, measured in terms of clearance rates, during the

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*See Table 17.

**See Table 18.

past several decades cannot be overlooked as a factor in the rise of crime during the same period.

Granted that the decline in clearance rates is an important contributing factor to the recent rise in crime, we are left with the question: Why has the clearance rate been allowed to decline? After nearly three decades of progress in terms of raising clearance rates, why did clearance rates begin a persistent decline in the early 1960's? Our contention is that part of the answer is to be found in the data presented in Figure 12.

Figure 12 is a plot of the annual inflation adjusted expenditure per arrest for a major U.S. city, the City of Los Angeles, over the period 1926 to 1979.* The "take off" in the inflation adjusted expenditures per arrest in the early 1960's is unmistakable. After what appears to be a period of relative stability in real costs, the expenditure per arrest began a persistent climb around 1960. A formal rendering of this phenomenon appears in Table 20.

As we note from the estimates of time trends in Table 20, expenditure per arrest adjusted for inflation actually declined

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*In most of the work that follows we concentrate our analysis on the costs of arrests. We do so not because other criminal justice costs such as judicial and penal are less interesting but simply because of data availability. The availability constraint is especially controlling since we require historical information not only on expenditures but also on input prices and levels and it appears that only police departments, and only a few of these, have adequate historical data.

FIGURE 12

REAL EXPENDITURE PER ARREST:
LOS ANGELES POLICE DEPARTMANT

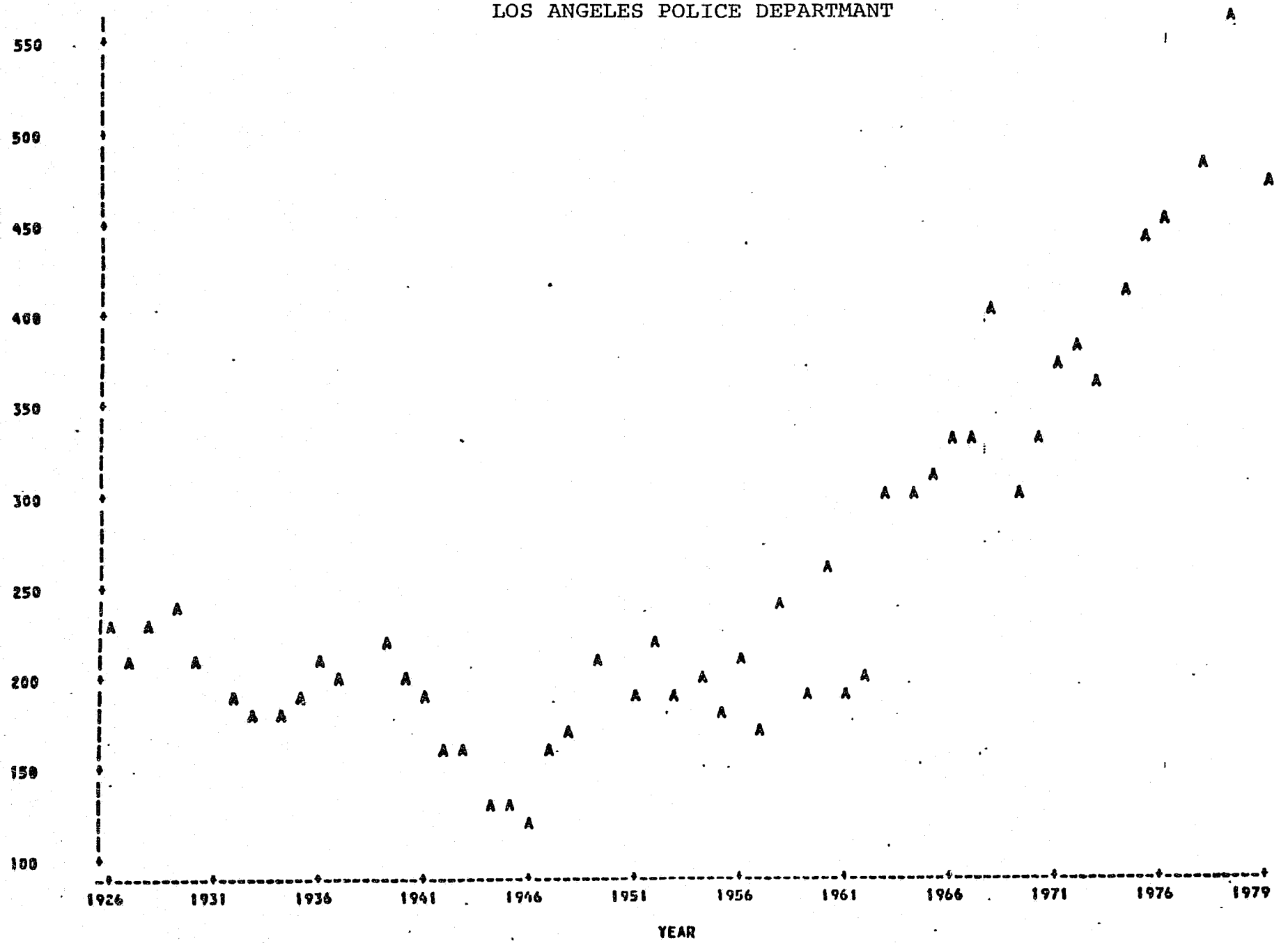

TABLE 20

ESTIMATED TIME TRENDS IN THE REAL EXPENDITURES PER ARREST FOR THE CITY OF LOS ANGELES: 1926-79

VARIABLE	REGRESSION I	II	III
CONSTANT	5.349	5.349	5.349
TIME 1	-.006636* (-2.78)**	-.006636 (-2.98)	-.006636 (2.97
TIME 2	-.043791 (7.33)	.033510 (5.10)	.030331 (3.81)
PERIODSHIFT	-1.450857 (-5.27)	-1.296649 (-4.95)	-1.180613 (-3.82)
TRF	- -	.344698 (2.93)	.364714 (3.01)
DRK	- -	- -	(.08) (.71)
TERMINAL YEAR TIME 1	1960	1960	1960
R-SQUARE	.86	.88	.88
SAMPLE SIZE	54	54	54

Source: Los Angeles Police Department.

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

annually during the period from 1926 to 1960.* Although the rate of decline was small, about 2/3% per year, the years before 1960 appear to be a period of persistent decline in the real costs of crime control. The years since 1960 appear to be a period of persistently increasing real expenditures per arrest. Interestingly enough clearances were falling precisely during the period when real expenditures per arrest were rising and they were falling during the period that costs were increasing.

In columns II and III of Table 20 we control for some major policy changes in arrest practices. In 1963 traffic arrest procedures changed quite drastically and total traffic arrests in Los Angeles dropped from 92,000 in 1962 to 35,000 in 1963.** To control for the cost implications of this shift in arrest practices, we introduced the variable DRK which takes on the value 1 from 1963 to the present and zero in other years. A similar but smaller change in the magnitude of arrest for drunkenness occurred in Los Angeles between 1977 and 1978. Arrests for drunkenness dropped from 57,000 in 1977 to 32,000 in 1978. The variable DRK was introduced to control for this shift in arrest production. As the results in Table 20 indicate the addition of these controls leave the qualitative results unaltered and in

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*The dependent variable in this regression is actually the natural logarithm of the real expenditure per arrest (XPAR67). In all of the work that follows an L preceding a variable indicates it is in logarithmic form. Hence the dependent variable in this case would be labelled LXPAR67.

**Prior to 1963 when a person was arrested for a traffic offense the number of outstanding warrants for the suspect would be added to the arrest total at the same time. Many of these were based on what for our purpose are trivial charges like parking and speeding tickets.

fact have a surprisingly minor impact on the quantitative results. The estimate of the rate of decline is, as expected, unaltered but even the growth rate of real expenditure is changed very little in magnitude. The point estimate moves from .04 to .03.

In Table 21 we test whether the pattern in costs we observe in Table 20 is due primarily to the fact that we are analyzing a service activity. In columns II and III of Table 21, we estimate time trends for expenditures per arrest using as a deflator for the expenditure series the price index for service instead of the price index for all items. The variable created by this adjustment is labelled EXPARS. Since the deflation for services was available in a consistent series only since 1935, Table 20 does not extend back as far as Table 19. Also because the sample period differs from Table 19, we provided in column I an estimate of the time trends obtained by using the traditionally deflated expenditure series over the shorter period. While the transformation mitigates both the decline in unit costs during the early period and the rise in the latter period that we observed in column I of Table 21 (which also employs the all item price index as a deflator), the pattern is essentially the same. However, here we observe virtually no growth in the service deflated expenditures per arrest during the period 1926-1960, while in the post 1960 period the growth rate against all other goods and services was about 2/3% per year.

Not only is the pattern in the costs of crime control we found in Los Angeles not fully accounted for by the fact it is

TABLE 21

ESTIMATED TIME TRENDS IN ADJUSTED EXPENDITURES FOR ARREST IN THE CITY OF LOS ANGELES: 1935-78

	REGRESSION		
VARIABLE	I	II	III
CONSTANT	5.08	1.176	.176
TIME 1	.0063* (1.61)**	.0015 (1.28)	.0015 (1.34)
TIME 2	.0355 (4.35)	.0129 (8.29)	.0106 (6.05)
PERIODSHIFT	-1.069 (3.32)	-.3879 (-5.44)	-.3505 (-5.04)
TRF	.3266 (2.42)	- -	.0682 (2.34)
TERMINAL YEAR FOR PERIOD 1	1960	1960	1960
DEPENDENT VARIABLE	LXPAR67	LEXPAR67	LEXPAR67
R-SQUARE	.86	.87	.89
SAMPLE SIZE	44	44	44

Source: Los Angeles Police Department.

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

service activity, it appears to be a general phenomenon. Obtaining historical data on police expenditures for every major city is problematic, but for those cities which replied to our request for expenditure data the pattern is quite similar to Los Angeles.* In Figure 13 we have plotted the historical expenditure per arrest data that we were able to construct for four major cities: Los Angeles, Dallas, St. Louis and Phoenix. While the actual expenditures per arrest vary somewhat between these cities, especially in the latter years, the pattern is much the same in all of the cities.**

Estimates of actual time trends using the pooled observation from Los Angeles, Dallas, St. Louis, and Phoenix appear in Table 22. Estimates allowing each city to have a separate intercept and PERIODSHIFT appear in Columns III and IV. The qualitative

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*When we initiated this project we contacted police departments in a sample of 25 major cities in the United States. We requested data on expenditures, manpower, and arrests back to 1930. A full data series was forthcoming only from Los Angeles, basically because all of the data was continuously reported in their published reports. For three other cities, St. Louis, Phoenix, and Dallas, we received enough data to construct a consistent expenditure series back to the early 1940's for Dallas and back to the mid and late forties for St. Louis and Phoenix. In Milwaukee and Kansas City we received somewhat less complete data and were unable to construct a consistent time series for these cities. What data we do have for these cities is reported in the Appendix.

**Differences in accounting conventions are responsible for some of this variation in the level of expenditure per arrest. However, we do not at this point have a satisfactory explanation of why there are such large disparities in these expenditure figures. The studies of scale effects we have reviewed are not very convincing. Obviously any cross section analysis will have to come to grips with this problem.

FIGURE 13

REAL EXPENDITURES PER ARREST IN FOUR CITIES
(LOS ANGELES, PHOENIX, ST. LOUIS AND DALLAS): 1926-79

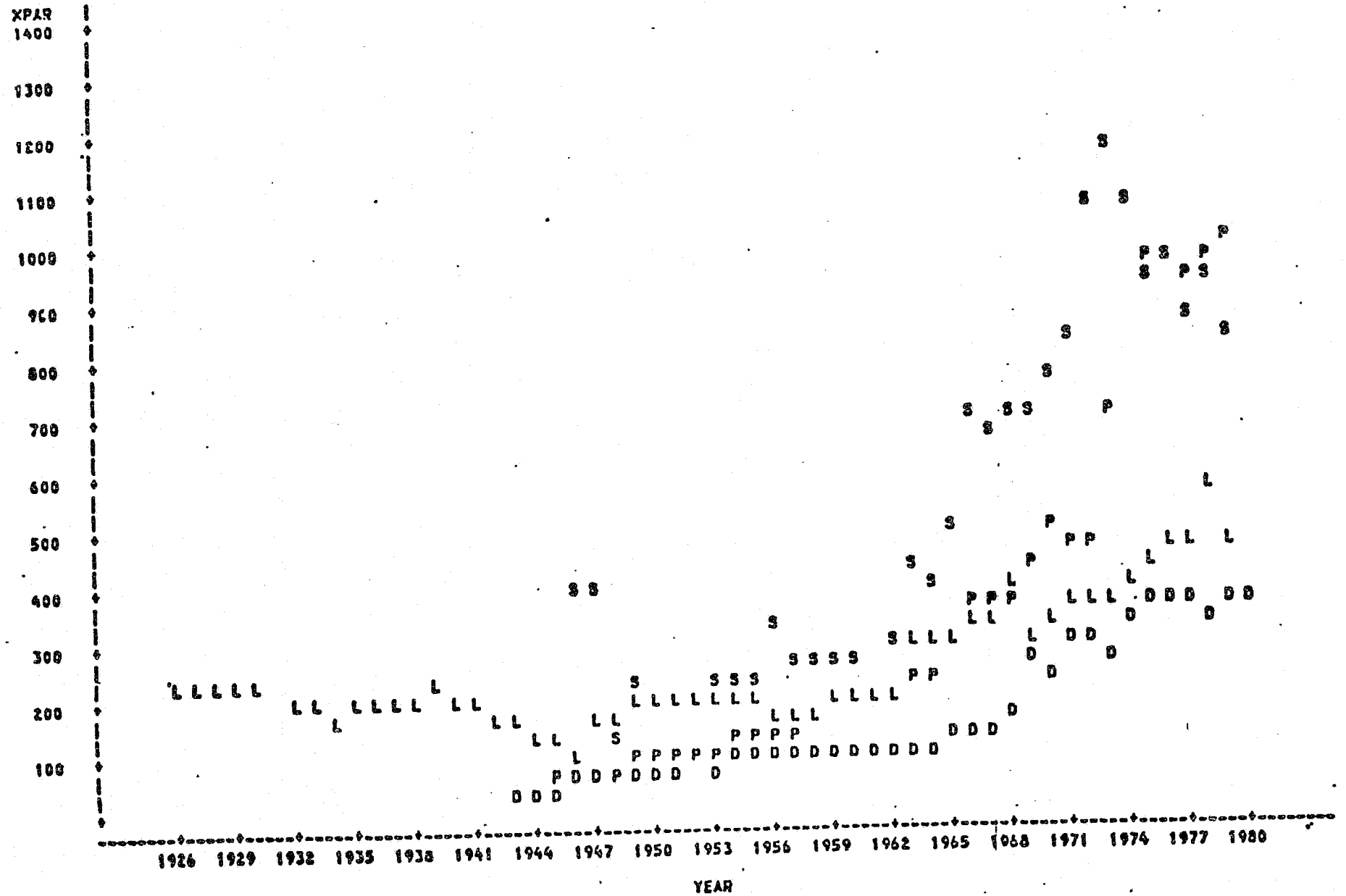

TABLE 22

ESTIMATED TIME TRENDS IN THE REAL EXPENDITURE PER ARREST IN FOUR MAJOR U.S. CITIES: 1926-79

VARIABLE	REGRESSION I	II	III	IV
CONSTANT	4.92665	-	-	-
TIME 1	.00157* (.17766)**	.00594 (1.3863)	-.00539 (-1.4825)	.00365 (1.0647)
TIME 2	.02402 (6.31317)	.02697 (10.5627)	.0739 (13.566)	.07375 (15.5739)
LOS ANGELES	- -	4.9581 (50.1716)	5.2135 (62.284)	5.1638 (70.6462)
DALLAS	- -	4.0950 (33.025)	4.4091 (42.069)	4.1120 (38.7827)
ST. LOUIS	- -	5.3306 (41.875)	5.666 (52.436)	5.4052 (47.7827)
PHOENIX	- -	4.826 (37.274)	5.1677 (47.0162)	4.6885 (39.6040)
PERIODSHIFT	- -	- -	-2.4639 (-9.2972)	- -
PERIODSHIFT (LA)	- -	- -	- -	-2.6138 (-11.2945)
PERIODSHIFT (D)	- -	- -	- -	-2.1064 (-8.5757)
PERIODSHIFT (SL)	- -	- -	- -	-2.1882 (-8.858)
PERIODSHIFT (P)	- -	- -	- -	-1.8275 (-7.326)
R-SQUARE	.49476	.8174	.88387	.91240
SAMPLE SIZE	158	158	158	158

Sources: Dallas Police Report, Los Angeles Police Report, Phoenix Police Report and St. Louis Police Report

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

results here are almost identical to the results for Los Angeles alone. While only in the case with a single periodshift is there actually a negative rate of growth in costs prior to the 1960's, in all cases the rate of increase in unit costs is dramatically higher in the post 1960 period than in the earlier period.* The partial data we have for other cities confirms this pattern.** The rapid escalation of the real cost of law enforcement that we observe in Los Angeles during the past two decades, appears to be a quite general phenomemon.

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*The use of periodshift as a variable assumes an equal shift in the intercept of the equation for all cities. One regression in Column IV, however, allows a separate shift for each city: PERIODSHIFT (LA), PERIODSHIFT (D), PERIODSHIFT (SL) and PERIODSHIFT (P).

**See Appendix I.

V. THE LEVEL OF CRIME CONTROL AND THE COST PER ARREST

The major question at this point, of course, is whether the pattern in the costs of crime control is related to the historical pattern in clearance rates (the latter being an extremely important determinant of the historical pattern in crime rates). In this connection it is interesting to note that Block (1981) showed that for a cross-section of metropolitan areas clearance rates and police salaries appeared to be negatively associated. Moreover in a comprehensive analysis of the demand for safety using a cross section of urban areas, Zedlewski (1982) found that the demand for police services was negatively related to their costs.*

In terms of analyzing the relationship between clearance levels and costs, the historical data for Los Angeles collected for this report proved quite revealing. In Table 23 we report the results of a regression of clearance rates on unit costs and on a measure of the ability and or willingness to pay for crime control in Los Angeles. The measure of unit costs, XPAR67, is simply the expenditures per arrest deflated to 1967 dollars by use of the BLS Consumer Price Index (CPI), the willingness to pay measure is PCAV which is the assessed value per capita again

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*There does, however, appear to be a problem in Zedlewski's (1982) analysis of linking the demand for police to the eventual realization in terms of clearance rates. See Zedlewski (1982, p. 188-189).

TABLE 23

ESTIMATED RELATIONSHIP BETWEEN CLEARANCE RATES AND THE COSTS OF CRIME IN THE CITY OF LOS ANGELES

	REGRESSION				
	I	II	III	IV	V(CORC)
VARIABLE	LCLR	LCLR	LHCL	LHCL	LHCL
CONSTANT	27.27	20.34	.8558	1.982	23.09
LXPAR67	-.9032* (-9.10)**	-.4697 (-2.66)	-.1913 (-5.99)	-.2488 (-3.96)	-.5321 (-3.06)
LPCAV	- -	-.8256 (-2.87)	- -	.1507 (1.47)	-3.96 (-1.07)
R-SQUARE	.66	.73	.44	.42	.83
D-W STATISTIC	.8	.9	1.5	1.91	1.9
SAMPLE SIZE	44	44	47	44	43
RHO.	-	-	-	-	.668
YRS.	1935-1978	1935-1978	1932-1978	1935-1978	1936-1978

Source: Los Angeles Police Department and California Statistical Assessment.

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

deflated by the CPI, and CLR is the overall clearance rate for the index crimes and HCL is the clearance rate for homicide. All numbers in natural logarithms are preceded by an L. As above, regressions labeled CORC are corrected for serial correlation by the Cochrane-Orcutt procedure.

There are, of course, problems with all of the variables in Table 23 as measures of the underlying activity levels. XPAR67 is clearly influenced by compositional factors in the arrest and crime mix and only makes sense as a variable if the production process is characterized by constant returns to scale.* XPCAV is only one of many possible measures of per capita income or wealth and may not be the best such measure. It is, however, in its present form the most consistently recorded historical series on income or wealth for the city of Los Angeles.** The clearance rate for all crime (CLR) is as we indicated above, problematic in an historical context because of the potential instability of reporting behavior over time. The homicide clearance rate, while it is likely to be consistent over time, is only one of the crime control outputs of a police department and this may present a major problem in analyzing the relationship between overall unit costs of arrests and clearance rates.

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*The literature on returns to scale in arrest production is not very convincing and as far as we can tell constant returns to scale has not been conclusively contradicted. Nevertheless we do address this question at somewhat greater length below.

**The series has been adjusted for the changes in assessment conventions over the period.

Data problems aside the results in Table 23 are quite interesting. In all cases the coefficient on the cost variable, LXPAR67, is negative and statistically significant. That is, an increase in unit costs is associated with a decrease in the clearance rate. The sign of the estimated coefficient on our measure of wealth, LPCAV, is less consistent both in significance and sign.

Interesting as the results in Table 23 are the interpretation of the underlying equations is not unambiguous. In the case of overall clearance rate, the relationship in Table 23 may simply be reduced form equation. That is, if the clearance rates depends on the crime rate, the equations in Table 23 may be part of a system of equations since the crime rate itself depends on the clearance rate.* While the clearance rate for homicide is less likely to be simultaneous in the sense just described, the decision is likely to be part of a larger set of decisions on crime control.

In Table 24 we introduce several measures of the overall activity level of the LAPD into the regression for homicide clearance rates. In Column I we use the overall crime rate

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*For example, if the system is actually

$$CLR = \alpha_1 + \beta_1 EXPAR67 + \beta_2 PCAV + \beta_3 CRIME$$

$$CRIME = \alpha_2 + \beta_4 CLR + \beta_5 PCAV$$

then the equations in Table 22 are reduced form equations of the following form:

$$CLR = \alpha_3 + \left(\frac{\beta_1}{1 - \beta_3\beta_4}\right) EXPARS + \left(\frac{\beta_2 \quad \beta_3\beta_5}{1 - \beta_3\beta_4}\right) PCAV$$

TABLE 24

ESTIMATED RELATIONSHIP BETWEEN HOMICIDE CLEARANCE RATES AND THE COSTS OF CRIME CONTROL IN LOS ANGELES

II

REGRESSION

VARIABLE	I	II	III	IV
CONSTANT	2.10	1.48	.254	.095
LXPAR67	-.2465* (-3.78)**	-.2054 (-3.15)	-.0871 (-1.06)	-.0991 (-1.45)
LPCAV	.2334 (1.67)	.3201 (2.60)	.1780 (1.95)	.1781 (1.38)
LLACR	-.0312 (-.793)	- -	- -	.0026 (.07)
LLACR1	- -	-.1101 (-2.19)	- -	- -
LHRLA	- -	- -	-.1575 (-1.96)	-.1491 (-3.81)
R-SQUARE	.44	.49	TSLS	TSLS
D.W.	1.92	2.05	2.20	2.23
SAMPLE SIZE	43	43	43	43
YRS.	1935-1977	1935-1977	1935-1977	1935-1977

Source: Los Angeles Police Department

Notes:

* Estimated Coefficient

** Estimated Coefficient/Standard Error

(LACR) for Los Angeles. Column II is similar except the crime rate excludes larcenies which are a problematic series in Los Angeles.* The regression results reported in columns I and II are OLS and neglect any interaction between the homicide clearance rate and the crime rates. The overall crime rate is taken as exogenous in these regressions.

Making the estimate of these essentially demand relationships part of a formal simultaneous system obviously involves some conceptual as well as practical problems. However, we have had some preliminary attempts at formulating and estimating a simultaneous system. In column III we report the results of estimating the clearance regression using TSLS where we assume that the structural equations are:

$$LHCL = \alpha_1 + \beta_1 LXPAR67 + \beta_2 LPCAV + \beta_3 LHRLA$$

$$LHRLA = \alpha_2 + \beta_4 LHCL + \beta_5 LYOUNG + \beta_6 LPCAV$$

There are, of course, several very serious problems here. First, it is unlikely that homicide clearance rate if it depends on crime levels depends only on homicide rates. Second, it is not very likely that the crowding phenomenon is a problem in homicide. If crowding is not a problem, it is not clear how the homicide rate would enter the equation. We might expect a positive relationship between homicide rates and homicide clearance rates reflecting a particular concern with this violent crime. This is, unfortunately, not borne out by the data. The

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*Recording of larcenies changes in the early 1950's. While we have been able to construct an adjusted arrest series we have not been able to correct the crime data.

estimated coefficient on the homicide rate in the TSLS specifications in Table 24 is negative. However it is not clear in this case that the homicide rate is not simply proxying for the overall crime rate. To compensate for some of the deficiencies of using only the homicide rate we ran a modified version of this system assuming that the overall crime rate (LLACR) was exogenous. The result appears in column IV and they suggest that our proxy argument itself may be flawed.

While none of the homicide clearance rate regressions above are conceptually very elegant they all have the same qualitative implications. To the extent that the overall costs per arrest (EXPAR67) measures the cost of homicide arrests, that arrest rate is negatively related to price, i.e., that is the demand for homicide arrests appears to obey the "law of demand." *

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*It is interesting to note that this relationship is still present if we adjust our measure of costs XPAR67 to reflect the increase in costs engendered simply by the shift in traffic arrest patterns. For example, using LAXHAT instead of LXPAR67 where LAXHAT is adjusted by using the TRF coefficient in Table 20, we obtain the following simple relationship between homicide clearances and "estimated" costs:

$$LHCL = .933 - .210\ LAXHAT \qquad R^2 = .20$$
$$(-2.98)$$

for the time period 1932-78.

*The second equation in this system is also of some interest. Specifically the crime equation estimated under this specification is

$$LHRLA = 7.34 - 2.959\ LHRLA + .8417\ LYOUNG + .9351\ LPCAV$$
$$(-2.07) \qquad (1.41) \qquad (3.30)$$

The magnitude of this deterrent coefficient here is quite noteworthy

TABLE 25

ESTIMATED RELATIONSHIP BETWEEN CLEARANCE RATES AND THE COST OF CRIME CONTROL IN A SIMULTANEOUS SYSTEM

	REGRESSION	
VARIABLE	TSLS	TSCOR
CONSTANT	20.53	23.04
LXPAR67	-.5561* (-2.43)**	-.4231 (-3.41)
LPCAV	1.310 (2.14)	.4015 (1.19)
LLACR	.2174 (.957)	-.3687 (-3.68)
TYPE	TSLS	TSCORC
D.W.	.9	2.00
SAMPLE SIZE	43	42
RHO.	-	.688
YRS.	1935-1977	1936-1977

Source: Los Angeles Police Department and California Statistical Abstract

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

Estimating the relationship between the overall clearance rate (CLR) and the real costs of arrests (XPAR67) within a simultaneous system is conceptually more straight forward than homicide but is plagued with even more serious measurement problems, especially in terms of variations in reporting behavior over time. Nevertheless, in Table 25 we present simultaneous equation estimates (TSLS and TSCORC) for the clearance equation (LCLR) based on the following system:

$$LCLR = \alpha_1 + \beta_1 LXPAR67 + \beta_2 LPCAV + \beta_3 LLACR$$

and

$$LLACR = \alpha_2 + \beta_4 LCLR + \beta_5 LYOUNG + \beta_6 LPCAV$$

To the extent that this estimation captures the behavior of actual clearance rates, our results suggest that the demand for arrests is negatively sloped. At the very least our evidence indicates that higher costs for arrests are associated with lower arrest rates.

VI. THE COMPOSITION OF ARRESTS AND TRENDS IN THE COST OF CRIME CONTROL

In previous sections we discussed both our findings concerning the historical pattern in expenditures per arrest and the relevance of these findings. On the first point, i.e. the actual historical pattern in the expenditure series, we presented data from several large cities, all of which appear to have experienced approximately the same movements in costs over the period. Specifically, in all of these cities expenditures per arrest adjusted for inflation were quite stable prior to the late 1950's or early 1960's. Then in all cases this was followed by a sharp and persistent increase in expenditures per arrest during the subsequent two decades.* It was also shown that at least for the City of Los Angeles where we had sufficient data to study the problem, the level of crime control and the costs of that control were inversely related.** We suggested that this relationship between the cost of the arrest process and the clearance rates when considered in conjunction with the historical pattern we observe in the costs of crime control is extremely helpful in understanding the historical pattern of crime itself.***

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*See Tables 20 and 21.

**See Tables 22-24.

***For example, the reduced form equation linking crime and costs/arrest implied by the structure would be:

$$LCRM = \alpha_1 + \alpha_2 LXPAR67 + \alpha_3 LPCAV + \alpha_4 LYOUNG$$

Estimating this equation using the LA data we obtained:

$$LCRM = -4.37 + \underset{(5.96)}{2.51}\ LXPDR67 - \underset{(-2.89)}{3.42}\ LPCAV - .818\ YOUNG$$

While analyzing the pattern in the costs of arrests for Los Angeles, we noted however that some of the shift in at least the level of costs during the past several decades might have been a result of the changing composition of the arrests made by the LAPD. In an attempt to control for this we introduced dummy variables (TRF and DRK) to act as adjustments to the level of costs induced by policy changes concerning the arrest of traffic violators and public drunks. At this point we extend that analysis by considering somewhat more interesting methods of measuring the composition of output. We do, however, retain the assumption at this point that the composition of arrests is exogenously given. That is, we assume that the composition of arrests is determined by policy decisions that were not very responsive to the costs of crime control.*

Table 26 contains estimates of the time trends in expenditure per arrest for Los Angeles employing various controls for the composition of arrests. In Column I we use RTRF, which is a continuous counterpart of the dummy variable TRF, and is simply the proportion of all arrests that are for traffic violations. The estimate in Column II uses as a control the continuous version of DRK, RDRK which is the proportion of arrests for public drunkenness and in Column III the control (RTD) is simply the sum of RDRK & RTRF. These variables enter the equations in much the same way as did their qualitative counterparts: LRTRF enters

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*We do address the simultaneity issue below. See p. 129.

TABLE 26

ESTIMATED RELATIONSHIP BETWEEN EXPENDITURES PER ARREST AND THE COMPOSITION OF ARRESTS FOR THE CITY OF LOS ANGELES: 1932-79

	REGRESSION				
VARIABLE	OLS I	OLS II	OLS III	OLS IV	OLS V
CONSTANT	5.97	5.09	5.05	4.89	5.61
TIME 1	-.0018*	-.0019	-.0051	.0052	.0052
	(1.69)**	(-.56)	(-1.16)	(1.28)	(1.32)
TIME 2	.0417	.0367	.0393	.0373	.0384
	(7.43	(4.66)	(5.89)	(5.51)	(5.76)
PERIODSHIFT	-1.606	-.8893	-.8856	-.8819	-.9149
LRTRF	.1607	-	-	-	-
	(2.03)	-	-	-	-
LRDRK	-	-.1147	-	-	-
	-	(-1.09)	-	-	-
LRTD	-	-	-.1440	-	-
	-	-	(.940)	-	-
LPP1	-	-	-	-	.2328
	-	-	-	-	(1.39)
PP1	-	-	-	1.186	-
	-	-	-	(1.42)	-
R-SQUARE	.87	.86	.86	.86	.86
SAMPLE SIZE	48	48	48	48	48
D.W. STATISTIC/RHO.	1.28/-	1.08/-	1.06/-	.09/-	.99/-

Source: Police Department, City of Los Angeles

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

positively and is significant while LRDRK enters negatively and is insignificant. A more general approach to controlling for the composition of arrests is embodied in the estimates shown in Columns IV and V. Here we control for the composition of arrests by introducing directly into the regression the proportion of arrests that were for Part 1 Crimes (PP1), i.e., homicide, rape, assault, robbery, burglary, auto theft, and larceny. While this is obviously a more sophisticated approach to controlling for changes in the composition of arrests it does make the assumption of exogeniety somewhat more tenuous.*

Table 27 contains the same estimates as Table 26 except here we have made a correction for serial correlation using the Cochrane-Orcutt procedure. It is interesting to note that the most robust estimates after this correction are those involving PP1. Hence, not only is this general measure of composition theoretically more desirable, it also appears to be more stable statistically. In any case, the composition of arrests does appear to be an important potential factor in explaining the rise in the costs of crime control.

That the composition of arrests is not, however, the entire story or for that matter the most important element of the story, is suggested by the coefficients in TIME2. While controlling for the composition of output with the variable PP1 reduces the magnitude of the time trend during the 60's and 70's, it does not

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*One would expect that the proportion of important arrests would be sensitive to the costs of arrests and thus treatment of PP1 as exogenous is problematic.

TABLE 27

ESTIMATED RELATIONSHIP BETWEEN EXPENDITURES PER ARREST AND THE COMPOSITION OF ARRESTS (CORRECTED FOR SERIAL CORRELATION): CITY OF LOS ANGELES: 1933-79

	REGRESSION				
VARIABLE	I	II	III	IV	V
CONSTANT	5.42	5.00	4.98	4.75	6.08
TIME 1	-.0051*	.0031	.0045	.004	.005
	(-.41)**	(.56)	(.71)	(.56)	(.64)
TIME 2	.0402	.0381	.0371	.0267	.0287
	(5.03)	(3.93)	(2.99)	(2.58)	(2.83)
PERIODSHIFT	-1.165	-.8591	-.6221	-.544	-.598
	(.72)	-	-	-	-
LRDRK	-	-.0345	-	-	-
	-	(-.36)	-	-	-
LRTD	-	-	-3.31	-	-
	-	-	(-1.26)	-	-
LPP1	-	-	-	-	.445
	-	-	-	-	(2.37)
PP1	-	-	-	3.28	-
	-	-	-	(2.53)	-
R-SQUARE	.89	.89	.89	.90	.90
SAMPLE SIZE	47	47	47	47	47
D.W./RHO.	2.11/.43	2.02/.45	2.06/.45	2.08/.57	2.08/.57

Source:

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

alter the basic patern. Moreover, the magnitude of the change, while substantial in percentage terms, is not very large in absolute terms. Without any correction for compositional changes we estimate that expenditures per arrest grew at about 4%/year since 1960. If we control for the change in the composition of arrests over the entire period, the growth rate declines to slightly less than 3%/year in the period since 1960. The control for compositional changes leaves the results for the period prior to 1960 basically unaltered: real expenditures per arrest evidence no significant growth trend during that period.

It is true that controlling for the composition of arrests does not basically alter the historical pattern we observe in the unadjusted series on expenditures per arrest. What controlling for the compositional changes does is simply change the observed growth rate in real expenditures per arrest. It corrects in a sense for the over-estimate in real growth engendered by a switch in the composition of arrests toward more expensive arrests during the 60's and 70's. Nevertheless, we find there was a real and persistent growth in costs during the last several decades.

VII. THE LEVEL OF CRIME CONTROL AND THE COST PER ARREST REVISITED

In Tables 22-24 above we observed a consistently negative relationship between the level of crime control as measured by the clearance rate and the costs of crime control as measured by the real expenditures per arrest. At this point we refine the analysis of the relationship between the level of crime control and its cost by adjusting the cost data for compositional effects. To the extent that the relationships in Tables 22-24 are to be interpreted as demand functions, the price or cost variables should be free of compositional effects. That is, ideally the cost variable should reflect the costs or price of an average arrest holding constant the mix of arrests.

The initial step in deriving an estimate of the responsiveness of clearance rates to costs that were free of compositional factors involved re-estimating the relationships between expenditures per arrest and a measure of arrest composition. In Table 28 we re-estimated the cost equation that employed the proportion of Part 1 arrests as a control for the composition of arrests. Since the trend in the initial time period was highly insignificant ($t = .5$) we re-estimated the coefficients without TIME1 in the regression. There is no clear way to choose between the regressions in Table 28 and we used both the fully logarithmic form (I) and the semi-log form (II) in subsequent estimations.

The first method we employed to adjust the expenditure series involved substituting the predicted value of expenditures per arrest (PLCOST) for the actual expenditures per arrest

TABLE 28

ESTIMATED RELATIONSHIP BETWEEN EXPENDITURES PER ARREST AND THE PROPORTION OF PART I ARRESTS FOR THE CITY OF LOS ANGELES: 1933-79

	REGRESSION	
VARIABLE	I	II
CONSTANT	6.16	4.81
TIME 2	.0295 * (2.91)**	.0273 (2.65)
PERIODSHIFT	-.7212 (-1.91)	-.6581 (-1.69)
LPP1	.4461 (2.41	- -
PP1	- -	3.313 (2.58)
R-SQUARE	.90	.90
SAMPLE SIZE	47	47
D.W./RHO	2.08/.59	2.06/.59

Source:

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

(LXPAR67) in the regressions relating clearance rates and costs of crime control. PLCOST was generated by using Equation I in Table 28 to predict the expenditure series holding PP1 constant at its mean value. Equations I, IV, VI and VIII in Table 29 are re-estimations of the clearance rate regressions in Table 22 with PLCOST substituted for LXPAR67. The equation reported in Column III of the table uses LXPAR67 and is reproduced here to serve as a reference equation. This is done not only for convenience but also because the equations in Table 22 were estimated on a slightly different sample. It is apparent from these results that the correction for compositional effects in the cost data makes very little difference in the results.

There is, however, a serious shortcoming in the adjustment procedure described above. The equation used to predict expenditures is really much too simple for our purposes in that it assumes that for a given arrest composition (PP1), expenditures per arrest are absolutely constant during the period prior to 1960. An alternative and quite simple method of adjusting for compositional effects that preserves more of the variation in the expenditure series was also employed in this analysis. The series ADJEXP was generated as follows:

$$ADJEXP_t = LXPAR67_t - 3.313\ (PP1_t - \overline{PP1})$$

where t is the subscript for year and $\overline{PP1}$ was the mean ratio of Part 1 arrests over the period. This is certainly an imperfect method of obtaining an estimate of the relevant price of creating arrests. However, given the simplicity of our expenditure

TABLE 29

ESTIMATED RELATIONSHIP BETWEEN CLEARANCE RATES
AND ADJUSTED EXPENDITURES PER ARREST:
CITY OF LOS ANGELES; 1936-77

	REGRESSION										
VARIABLE	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
CONSTANT	1.45	.88	.745	3.24	1.39	2.80	2.01	-1.65	2.64	-3.56	1.56
PLCOST	-.3039* (-6.61)**	-	-	-.4531 (-6.05)	-	-.7710 (-7.55)	-	-.4066 (-2.52)	-	-	-
LADJEXP	-	-.1956 (-4.34)	-	-	-.2296 (-2.70)	-	-.6111 (-7.51)	-	-.2698 (1.82)	-.1789 (-1.61)	-
LXPAR67	-	-	-.1697 (-5.14)	-	-	-	-	-	-	-	-
MAJX	-	-	-	-	-	-	-	-	-	-	-.3685 (-2.48)
LPCAV	-	-	-	.1843 (2.37)	.0513 (.47)	-	-	-.4660 (-2.78)	-.5165 (-2.73)	-.5906 (-2.92)	-.4180 (-2.47)
DEPENDENT VARIABLE	LHCLR	LHCLR	LHCLR	LHCLR	LHCLR	LCLR	LCLR	LCLR	LCLR	LCLR	LCLR
R-SQUARE	.52	.32	.39	.59	.32	.58	.56	.65	.63	.84	.72
SAMPLE SIZE	42	42	42	42	42	42	42	42	42	41	40
DNS.RHO.	1.75/-	1.51/-	1.62/-	2.05/-	1.60/-	.54/-	.57/-	.57/-	.49/-	1.74/.68	.61/-

Source: Los Angeles Police Department.

Notes: *Estimated Coefficient
**Estimated Coefficient/Standard Error

equation, at this point it is a reasonable alternative to using the predicted value of these equations. The estimates in columns II, V, VII, IX and X of Table 29 employ ADJEXP as a measure of costs.

Finally, the regression results reported in Column XI of Table 29 uses a three-year moving average of ADJEXP (MAJX). The assumption here being that it is not possible to forecast law enforcement costs with a great deal of certainty and a moving average of the costs will be a better predictor of behavior than a single contemporaneous value for unit costs. The evidence in Table 29 does appear to be consistent with this hypothesis and refinements of this analysis should address this problem of forecasting error.

Our analysis of homicide clearance rates is extended in Table 30 to include a measure of criminal activity in the regressions. The equations in Columns II and III are estimated by TSLS.* While the coefficient estimates on the cost variable are not overly robust in the simultaneous equation case, the signs are all as predicted. Nevertheless, the overall weight of the evidence does seem to suggest an inverse relationship between unit costs and homicide clearance rates. It is well to remember that we are dealing with homicide clearance rates and that a finding of price responsiveness here in the most serious of crimes is quite interesting.

In Table 31 we continue our analysis by presenting estimates of the impact of unit costs on Part I clearance rates. The

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*The structure assumed is the same as above except that the cost variable is replaced by an adjusted cost.

TABLE 30

ESTIMATED RELATIONSHIP BETWEEN HOMICIDE CLEARANCE RATES AND ADJUSTED EXPENDITURES PER ARREST WITH CONTROLS FOR LEVEL OF CRIME CONTROL ACTIVITY FOR THE CITY OF LOS ANGELES: 1936-77

	REGRESSION		
VARIABLE	I	II	III
CONSTANT	2.31	.336	.621
ADJEXP	-.195* (-2.23)**	-.093 (-1.27)	-.105 (-1.35)
LPCAV	.206 (1.40)	.1761 (1.82)	.1264 (1.00)
LCRM	-.070 (-1.55)	- -	.0217 (.48)
LHR	- -	-.169 (-3.68)	-.1680 (-3.70)
R-SQUARE	.36	TSLS	TSLS
SAMPLE SIZE	41	41	41
D.W./RHO	1.63/-	2.20/-	1.95/-

Source: Los Angeles Police Department and California Statistical Abstract

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 31

ESTIMATED RELATIONSHIP BETWEEN PART I CLEARANCE RATES AND ADJUSTED EXPENDITURES PER ARREST FOR THE CITY OF LOS ANGELES: 1936-77

	REGRESSION		
VARIABLE	I	II	III
CONSTANT	-3.27	-3.63	-4.49
ADJEXP	-.3498* (-1.55)**	-.1703 (-1.51)	- -
MAPX	- -	- -	-.1750 (-1.57)
LPCAV	-1.33 (1.70)	-.5325 (-2.10)	.0191 (.07)
LLACR	.3243 (1.11)	.0311 (.35)	-.420 (-2.97)
R-SQUARE	TSLS	TCORC	TSLS
RHO	.47/-	2.01/.70	1.47/-

Source: Los Angeles Police Department and California Statistical Abstract

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

estimates in Table 31 all involve the overall clearance rate and are estimated assuming that clearance rates affect crime and crime affects clearance rates as noted in the previous section. Given the nature of the data we had available for this estimation the results are quite impressive.

While none of the specifications above are entirely satisfactory, they do provide some evidence on the relationship between the costs of crime control and the level of crime control. The evidence reported here does suggest that, even after adjustments are made for the changes in the composition of arrests, law enforcement appears to obey the "law of demand." That is, increases in the cost of arrests do appear to reduce the desired and actual levels of enforcement.

VIII. TRENDS IN SALARIES AND COSTS: THE CASE OF THE LOS ANGELES POLICE DEPARTMENT

In a previous chapter we examined the relationship between the composition of arrests and the costs of crime control. We found that, while the composition of arrests was important in determining the level of such costs, the behavior of costs over time could not be accounted for by changes in the composition of arrests. That is, changes in the proportion of various types of arrests made by the Los Angeles Police Department over time does not itself provide an adequate explanation of the time trends in the costs per arrest. It is simply not true that the persistent increase in expenditures per arrest experienced by the Los Angeles Police Department since the early 1960's resulted from a secular change in the types of arrests made by the Department.

Arrests of any type appear to be significantly more expensive in real terms today than they were in the past. As we have noted above however, this appears to be a relatively recent phenomenon. From 1926 to about 1960 the inflation adjusted expenditure per arrest actually evidenced some decline. The average expenditures per arrest in the early 1960's were, after adjustment for inflation, somewhat lower than the average of such expenditures in the late 1920's. Nevertheless, since the early 1960's these costs have evidenced a persistent growth and by the end of the last decade inflation adjusted expenditures per arrest were about double their previous levels. Analyzing the factors potentially responsible for this pattern in the costs of crime control is the major focus of the remaining chapters in this report.

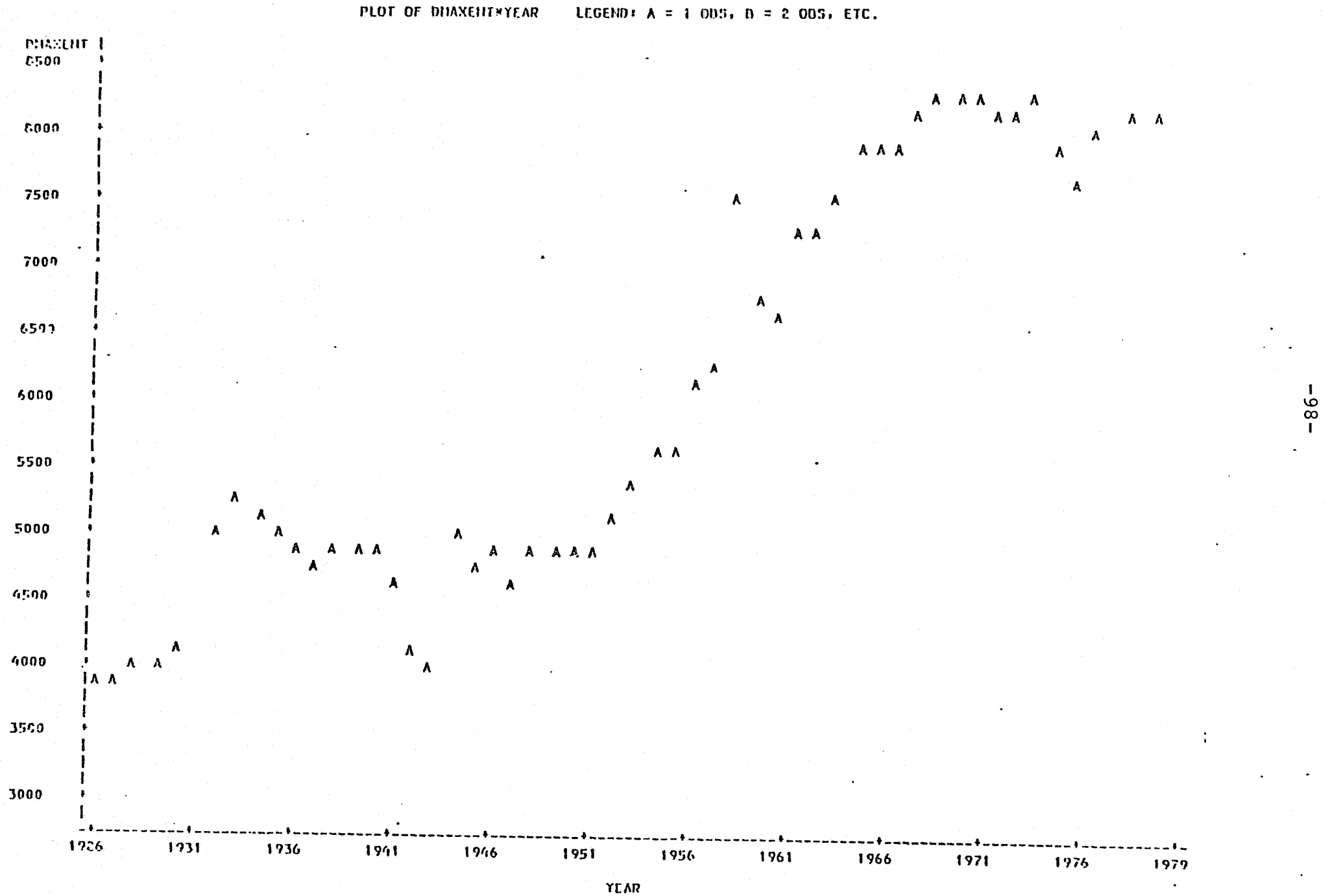
The most obvious and potentially most powerful explanation of the trend in costs may be the trend in wages. Perhaps the relative stability of costs in the early period as well as the explosive growth since 1960 is simply a reflection of the pattern in real wages. That is, the pattern in costs per arrest may be the result of rapidly escalating real wages since 1960. In order to address this question, we collected data on maximum entrance salaries for the Los Angeles Police Department since 1926. A plot of the maximum entrance salaries in constant dollars (1967) appears in Figure 14. As is apparent from this plot the deflated or constant dollar maximum entrance salary of the Los Angeles Police Department does have a pattern somewhat similar to the pattern in costs.* The timing here, however, does not appear to match the timing of the growth spurt in expenditures per arrest very closely.

A somewhat more precise rendering of this observation is provided by the estimates in Table 32. In columns 1 and 3 of the table we present estimates of the time trends in the deflated value of the maximum entrance salary for the Los Angeles Police Department. As in the case of costs, we split the time period at 1960. TIME1 is the time period prior to 1960 and TIME2 is the time period since 1961. However, in this case, unlike the situation in expenditures per arrest, the time trend is significantly larger in the early period than in the later period. Real

*Data on maximum entrance salaries was obtained from publications of the Los Angeles Police Department: Statistical Digest and Annual Report various years.

FIGURE 14

DEFLATED MAXIMUM ENTRANCE SALARY: LOS ANGELES POLICE DEPARTMENT



NOTE: 1 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

TABLE 32

ESTIMATED TIME TRENDS IN THE MAXIMUM ENTRANCE SALARY FOR THE LOS ANGELES POLICE DEPARTMENT: 1926-78

	REGRESSION			
VARIABLE	OLS I	OLS II	CORC III	CORC IV
CONSTANT	8.224	8.085	8.244	8.097
TIME 1	.0116* (7.82)**	.0142 (8.96)	.0109 (6.99)	.0137 (8.22)
TIME 2	.007 (1.88)	.007 (1.78)	.0068 (2.08)	.0068 (2.06)
PERIODSHIFT	.408 (2.22)	.546 (2.80)	.386 (2.09)	.533 (2.69)
DEPENDENT VARIABLE	LDMAXENT	LWAGE1	LDMAXENT	LWAGE1
R-SQUARE	.90	.92	.89	.91
F-STATISTIC	145.4	177.5	138.7	167.3
YRS	1926-78	1926-78	1927-78	1927-78
D.W./RHO.	1.66	1.65	.72/1.97	.74/1.96

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

wages, by this measure, grew over twice as fast in the early period as in the period since 1960.

Moreover, there is reason to suspect that the data in Figure 14, and the results in Table 32, understate the growth in real wages during the period prior to 1960. The average work week declined several times during that period and hence trends in annual data such as the maximum entrance salary, may understate the trend in hourly compensation. To account for this phenomenon, we created a new variable WAGE1 in which we adjusted DMAXENT to reflect changes in the average work week. Estimates of the trend in real wages based on this variable appear in columns 2 and 4 of Table 32. As expected, the growth rate in real wages during the pre-1960 period is larger than the estimate based on annual data. Here the estimate is about 1.4%/annum prior to 1960 while the estimate using annual salary data is about 1.1%/annum. The relatively small difference between the series is surprising. Nonetheless, the adjusted salary series re-emphasizes the fact that real wages increased most rapidly prior to the period in which costs rose most dramatically.

It is clear from the data in Figure 14 why this is the case. Most of the growth in real wages over the period appears to have taken place in the 1950's This point is made quite clearly by the results in Table 33. Here we subdivided TIME1 into two parts. TIME1A represents the period 1926 - 1949, and TIME2A represents the period between 1950 - 1959. The growth rate in real wages is about the same during the period before

TABLE 33

ADDITIONAL ESTIMATED TIME TRENDS IN THE MAXIMUM ENTRANCE SALARY FOR THE LOS ANGELES POLICE DEPARTMENT: 1926-78

	REGRESSION	
VARIABLE	CORC I	CORC II
CONSTANT	8.311	8.199
TIME 1A	.0065* (3.15)**	.0074 (3.60)
TIME 1B	.0452 (5.89)	.0508 (6.44)
TIME 2	.0067 (2.31)	.0067 (2.32)
PERIODSHIFT 1	-1.259 (-4.56)	-1.386 (-5.03)
PERIODSHIFT 2	.3201 (2.10)	.4323 (2.84)
R-SQUARE	.93	.95
F-STATISTIC	136.3	188.5
YRS	1927 - 78	1927 - 78
RHO	.317/1.85	.305/1.87

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

1950 and after 1960. However, from 1950 to 1960 real wages evidence a growth rate that is over 7 times the rate at which they grew during all the other periods. It is really quite striking that the growth rate in real wages since 1960 is no greater than what appears to be the long run average growth rate of police wages. It is only the 1950s that evidence aberrant wage behavior in the sense that the growth rate of real wages during that period was substantially above the long term growth rate.

While the pattern of time trends in costs and wages differ, this does not imply that real wages were unimportant in determining the level of crime control costs. What it does suggest is that the pattern in the costs of crime control is not merely a reflection of trends in real wages. That is, the persistent growth in the real costs of crime control during the 1960's and '70s does not appear to be due to the growth in the real wages of police officers.

To examine the relationship between the growth of wages and the rise in costs more formally, we introduced wages into the cost of crime control equation. In Table 34 we report the results of introducing various measures of real wages into the previously estimated cost of crime control relationship. The estimates in columns 1 and 2 employ DMAXENT as a measure of real wages while those in columns 3 and 4 use WAGE1 as a proxy for real wages. Several aspects of this estimation are worthy of comment. First, as we would expect from the dissimiliar patterns

TABLE 34

ESTIMATED TIME TRENDS IN THE
COST OF CRIME CONTROL AND POLICE SALARIES
IN THE CITY OF LOS ANGELES: 1932-78

	REGRESSION			
VARIABLE	I	II	III	IV
CONSTANT	.067742	.715906	-.198790	.355540
TIME 1	.000667* (.144580)**	-.004126 (.861340)	-.004312 (-1.043570)	-.001423 (-.291460)
TIME 2	.039207 (5.789160)	.034433 (4.667460)	.034349 (4.755841)	.039650 (5.953485)
D2	-1.478169 (-4.683130)	- -	-1.517268 (-4.913580)	-1.562859 (-4.892710)
XY	- -	-1.198360 (-3.272800)	.272589 (2.265699)	- -
LDMAXENT	.681955 (2.799758)	- -	- -	- -
LPP1	.323594 (1.693655	.030175 .151100	- -	.298641 (1.575981)
LWAGE1	- -	.547790 (2.677800)	.649358 (3.139051)	.652315 (3.037301)
R-SQUARE	.878730	.888850	.882080	.884290
F-STATISTIC	59.421500	65.578800	61.341300	62.670900

Source: Los Angeles Police Department

Notes: * Estimated Coefficient
** Estimated Coefficient/Standard Error

in costs and wages, the introduction of a real wage variable does not "explain" the growth in the costs of crime control since 1960. The magnitude of the post 1960 time trend is basically unaltered by the introduction of the real wage variable. Second, the real wage variable is in all cases statistically significant. Moreover the magnitude of the wage coefficient is not very sensitive to the work week adjustment in the annual salary series. The coefficients on LDMAXENT and LWAGE1 are virtually identical. Finally, as is apparent from the results in Table 35, the basic results of this estimation are not sensitive to adjustments for autocorrelation.

Up to this point we have controlled for the composition of arrests by either using a dummy variable TRF for the change in the handling of traffic arrests that occurred in 1963 or by using the proportion of Part I arrests (PPP1) as a variable in the regression. An alternative approach that combines both adjustments is to split the time trend at 1963 and introduce PPP1 into the regression. By splitting the time trend at 1963, we include in TIMEY only years in which the new traffic arrest conventions were in effect. Hence the estimate of the time trend in the latter period will not be influenced at all by the change in the way traffic arrests were recorded by the Department. This procedure is implemented in Table 36.

While the time trends in this estimation are basically the same as those obtained when the sample is partitioned in 1960, there is one potentially disturbing aspect of this estimation. The impact of the adjustment for autocorrelation in this case is

TABLE 35

ESTIMATED TIME TRENDS IN THE COST OF CRIME CONTROL AND POLICE SALARIES IN THE CITY OF LOS ANGELES (CORRECTED FOR AUTOCORRELATION): 1933-78

	REGRESSION			
VARIABLE	I	II	III	IV
CONSTANT	1.351377	-.529020	.396251	-1.167267
TIME 1	.004217* (.530258)**	-.000662 -.092310	-.001741 (-.205785)	-.005407 (-.701289)
TIME 2	.040858 (3.743539)	.049419 (5.231289)	.039538 (3.809771)	.048610 (5.314692)
PERIODSHIFT	-1.607194 (-3.135160)	-1.881947 (-4.089110)	-1.781913 (-3.564746)	-2.030411 (-4.412117)
TRF	- -	.038413 (.292843)	- -	.028296 (.220155)
LPP1	.640807 (3.846826)	- -	.639865 (3.923480)	- -
LDMAXENT	.605524 (1.986949)	.674865 (2.086710)	- -	- -
LWAGE1	- -	- -	.737925 (2.468900)	.767672 (2.510911)
R-SQUARE	.916740	.888030	.892550	.920780
F-STATISTIC	88.087200	63.452000	66.455300	92.987700
RHO.	.590000	.420000	.410000	.570000
D.W.	1.990000	2.170000	2.180000	1.950000

Source: Los Angeles Police Department

Notes: * Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE 36

ESTIMATED TIME TRENDS IN THE COST OF CRIME CONTROL WITH ADJUSTMENTS FOR POLICE SALARIES AND CHANGES IN TRAFFIC ARREST PROCEDURES FOR THE CITY OF LOS ANGELES

	REGRESSION			
VARIABLE	I	II	III	IV
CONSTANT	.718409	.715906	3.544854	2.564164
TIME X	-.001932* (-.428760)**	-.004126 (-.861434)	.001010 (.135175)	-.003064 (-.373491)
TIME Y	.034379 (4.579640)	.034433 (4.667457)	.031818 (2.716940)	.031244 (2.761931)
PERIODSHIFT	-1.127250 (-3.066960)	-1.198360 (-3.272840)	-.981740 (-1.735200)	-1.125150 (-1.999930)
LDMAXENT	.546350 (2.355820)	- -	.300324 (.981188)	- -
LPP1	.064106 (.318684)	.030175 (.151111)	.429850 (2.210910)	.425022 (2.205780)
LWAGE1	- -	.547798 (2.677760)	- -	.442733 (1.446138)
R-SQUARE	.880260	.884290	.905270	.907630
F-STATISTIC	60.286700	62.670900	76.455000	78.608600
SAMPLE PERIOD	1932-79	1932-79	1933-79	1933-79
RHO.	-	-	.540000	.520000
D.W.	1.210000	1.250000	2.220000	2.020000

Source: Los Angeles Police Department

Notes: * Estimated Coefficient
** Estimated Coefficient/Standard Error

not neutral. Adjusting for autocorrelation here changes the size of the coefficient on the composition variable quite dramatically. In one case, the coefficient is increased by an order of magnitude. Equally problematic is the change in the t-statistics for the real wage variables. When corrected for autocorrelation, the coefficient on the real wage variable would not be significant at conventional levels of significance in either regression. These somewhat problematic details aside, the implication of these regressions is clear. Changes in police salaries simply do not explain the persistent increase in the inflation-adjusted costs per arrest since 1960.

One question that immediately arises, of course, is whether the salary data (even adjusted to reflect changes in the work week) is a good proxy for the real cost of labor. After all, the salary levels of police officers is to some extent endogenous. For example, the nominal salary of a police officer might be held constant over a period of several years but the attributes of the job changed so that the effective wage is either increased or decreased over the period, depending on how the attributes are changing. Clearly, a constant salary accompanied by a decrease in the level of effort expected from the officer would represent an increase in the costs of labor. As we noted above, when the average work week decreased, using the annual salary data underestimated the change in the hourly cost of labor.

While adjustments for changes in the official work week do not appear to appreciably change our results, if all or most employment conditions have consistently become less demanding the

trend in salaries, even adjusted for changes in the official work week, may seriously understate the trend in the real costs of labor.* It is possible that the increasing costs of labor to the police department have been hidden from view and what appears to be an "unexplained" time trend in the real costs per arrest is merely an unrecorded trend in police compensation. Why, of course, the trends in working conditions and salary would differ between periods is not obvious.**

In any event, we do have some direct evidence on hours worked in the Los Angeles Police Department. From Los Angeles Police Department publications, we were able to assemble a short time series on average hours worked per sworn employee (HOURS). The series begins in 1957 and the results of analyzing the trends in that series are presented in Column 1 of Table 37. Not only is there no evidence that hours worked declined in the period since 1960, what evidence there is suggests that average hours worked actually increased during the years since 1960. The results in Table 37 show a slight upward trend of about 1/2%/annum in the average hours worked by sworn personnel in the Department.

Of course the immediate question that comes to mind is why have average hours worked increased over the period. If the

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*The last change in the work week took place in 1968 when the work week was set at 40 hours.

**One explanation could involve the tax treatment of benefits. Since tax brackets are based on nominal dollars, the increase in effective tax rates due to inflation over the period would encourage a substitution of benefits for salary.

TABLE 37

ESTIMATED TIME TRENDS IN HOURS WORKED AND DAYS OFF DUE TO SICKNESS AND INJURY FOR THE LOS ANGELES POLICE DEPARTMENT

	REGRESSION		
VARIABLE	CORC I	CORC II	CORC III
CONSTANT	7.7790 (13.1600)	1.1530 (.4730)	-24.9500 (2.6500)
TIME	-.0075* (-3.3700) **	-.0017 (-.0140)	.8080 (2.8200)
TIME	.0061 (2.2500)	-.0231 (-2.3600)	.0587 (1.4300)
PERIODSHIFT	.4801 (.7980)	.6602 (.1750)	23.6900 (2.9000)
DEPENDENT VARIABLE	LHOURS	LSICK	LIOD
R-SQUARE	.2900	.6400	.7300
F-STATISTIC	2.6800	11.7400	21.6500
YRS.	1957-79	1957-79	1957-79
RHO.	.0180	.5120	.8100
D.W.	2.1600	2.2300	1.9200

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

shift reflects simply an increased willingness to work it means one thing, if it reflects an increased demand for labor it means quite another. For example, an increase in the costs of hiring additional employees might shift the average work week up as the demand for additional labor input was being met by "overtime" instead of new employees. This shift, while it reflects a cost minimizing solution to a labor problem, certainly does not imply a decrease in the effective hourly wage. If anything, it is an indicator of an increase in labor costs. However, if average hours worked increased due to an increased willingness of employees to spend time "on the job" the shift might reflect a decrease in the labor costs.

The situation in Los Angeles probably reflects some combination of these factors. Conventional wisdom is that the Department has kept its hiring rate down and has chosen to "demand" more effort from its existing employees. Also, during the 1970's there were several changes in Department policy concerning overtime pay and pay for unused sick time that might have induced officers to supply more hours. Of course, such inducements may themselves have increased hourly wage costs.

On the narrow issue of supply response, the results in Table 38 suggest that police officers did in fact respond to the Department's inducements to reduce time off. In Table 38 we present the results of dividing the hours worked series at 1970. The coefficient in TN70 is the time trend in hours worked from 1960-69 and the coefficient in T70 the trend since that time. We note that while our results are not very robust they do

TABLE 38

ESTIMATED TIME TRENDS IN AVERAGE HOURS WORKED BY SWORN PERSONNEL IN THE LOS ANGELES POLICE DEPARTMENT: 1957-79

	REGRESSION	
VARIABLE	OLSQ I	CORC II
CONSTANT	7.8190	7.8150
TN70	-.0065* (-.9200) **	-.0064 (-1.1300)
T70	.0060 (.8400)	.0050 (.8100)
PERIODSHIFT	-.5700 (-1.1200)	-.4990 (-1.2100)
DEPENDENT VARIABLE	LHOURS	LHOURS
R-SQUARE	.2400	.2800
F-STATISTIC	1.7300	2.0800
D.W./RHO.	2.04/n.a.	1.98/-.22

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

suggest that hours worked were declining during the 60's but that this decline was arrested and hours worked actually increased during the 70's.

While this evidence is far from conclusive, it does suggest that at least some of the increase in hours worked resulted from policy changes in the Department which had the effect of increasing the officers cost of taking time off.

It is also interesting to note the results in Table 37 concerning the average sick days taken per sworn employee (SICK). Our estimates show that there has been a persistent decline in the average number of such days taken by sworn employees since 1960. Of course in 1972 there was a change in Department policy concerning payment for unused sick time and the decline in days off very likely reflects this change in policy. In Table 39, we have estimated time trends for the period before and after the policy shift. While the time trends are somewhat perverse, evidencing a decline in days off before 1972 and an increase, thereafter, the large negative period shift comforms to our estimations. Days off due to sickness appears to have declined dramatically after the change in policy regarding pay for unused sick time. Nevertheless, there does appear to be some secular decay of the impact of this policy change as evidenced by the positive time trend after 1972.

The interesting point in all this is, of course, whether the changes in compensation policy and increases in hours worked lowered or raised hourly labor costs and consequently whether

TABLE 39

ESTIMATED TIME TRENDS IN DAYS OFF DUE TO SICKNESS
FOR THE LOS ANGELES POLICE DEPARTMENT

	REGRESSION	
VARIABLE	OLSQ I	CORC II
CONSTANT	1.8400	1.9200
PERIODSHIFT	-2.1500* (-2.1900) **	-2.0700 (-1.8700)
TN72	-.0050 (.8200)	-.0070 (-.8800)
T72	.0270 (1.6600)	.0250 (1.3600)
R-SQUARE	.7600	.7600
F-STATISTIC	21.1000	20.2000
SAMPLE SIZE	24	23
D.W./RHO.	1.77/n.a.	1.97/.13
YRS.	1956-79	1957-79

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

entrance salaries are an entirely inadequate measure of labor costs. Unfortunately, we have no direct method of measuring hourly labor costs. The best we can do is observe average hourly compensation for all sworn officers. Reflected in this series are changes in actual hourly compensation as well as changes in the composition of the force.

Estimated time trends for average hourly compensation are presented in Table 40. These results suggest that hourly compensation in real terms increased about 1.5%/year during the 70's. Once again, however, the time trend is not statistically significant and the results, such as they are, do not suggest that WAGE1 or DMAXENT are seriously biased indicators of wage costs.

Another quite interesting method of investigating the labor cost issue involves using relative wages. Assuming that labor markets are in equilibrium, movements in relative wages will mirror movements in the relative desirability of various jobs. As the attributes of one job increase relative to another then, as long as markets are free to adjust, the wages of the more attractive position will fall relative to the other position. In the present case we are interested not so much in the trend over the entire period, but rather the possibility of differential movements in relative wages during the periods before and after 1960. We are interested in using data on relative wage movements to investigate the question of whether movements in the money wages of police officers actually mask underlying changes in labor costs since 1960.

TABLE 40

ESTIMATED TIME TRENDS IN AVERAGE HOURLY COMPENSATION OF SWORN PERSONNEL IN THE LOS ANGELES POLICE DEPARTMENT: 1961-78

VARIABLE	
CONSTANT	.7227
TIME	.0145* (.9260) **
R-SQUARE	.1000
D.W.	2.1000

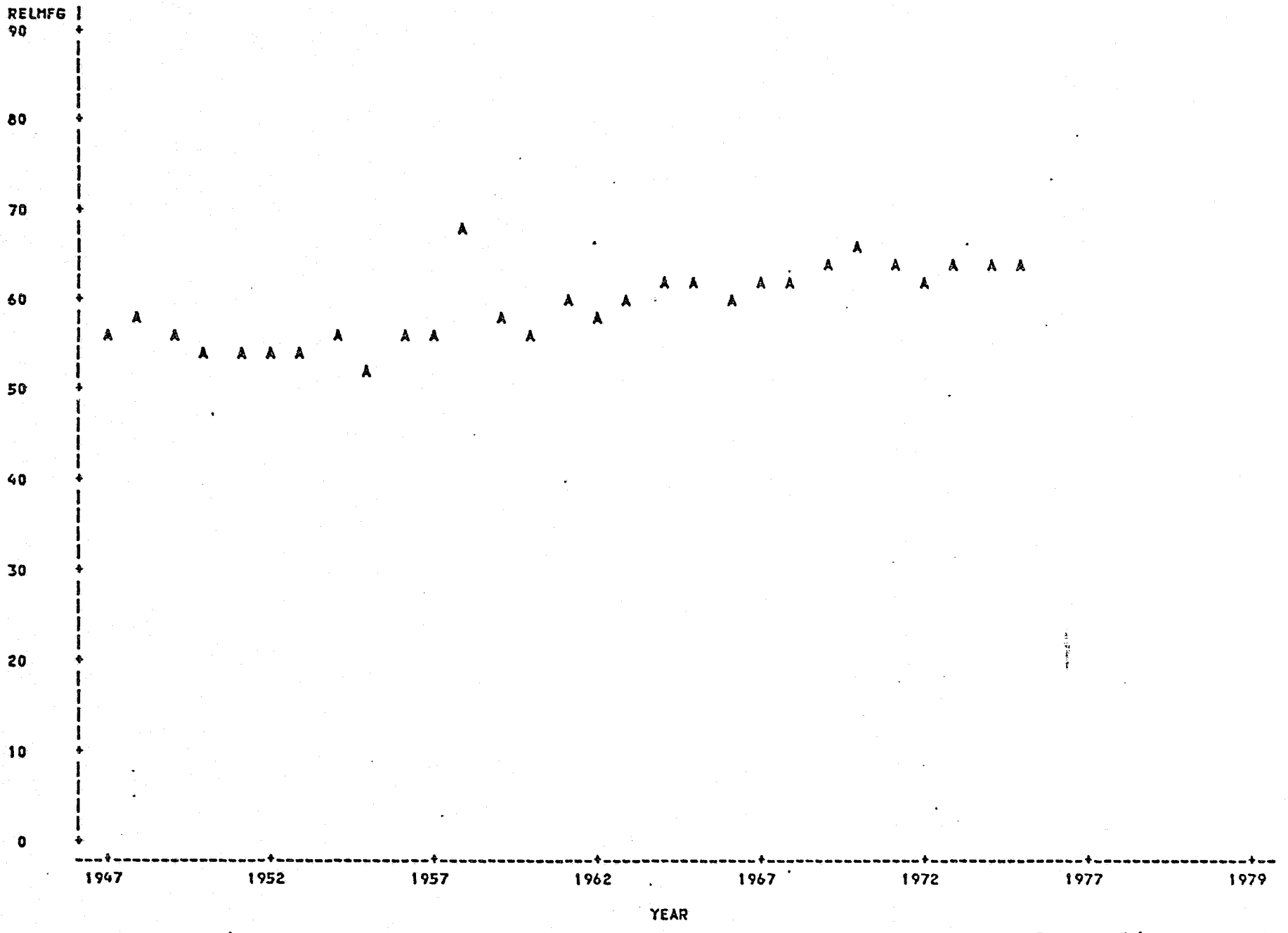
Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

Unfortunately the data on wages that might be compared to police salaries is quite sparse. Information on the average hourly wage in manufacturing is available for Los Angeles only since 1947. A plot of the ratio of police wages (estimated entrance salaries of a police officer) to average weekly earnings of a manufacturing worker is shown in Figure 15. It is apparent that this ratio is quite flat. In Table 41 we present an estimate of the time trend in the ratio of police wages to manufacturing wages (RELMFG), and this confirms the fact that movement in the ratio has been quite small. The estimated annual growth rate has been .006 or about 1/2% per year. More significantly, however, for our purpose is the fact that there does not appear to be any difference in the time trend before and after 1960. Relative wages appear to have increased at exactly the same rates during both periods. If relative wages had increased less rapidly during the later period it would have suggested that the attributes of police work were getting more attractive relative to manufacturing employment during the post 1960 period and that trends in police wages during this period might have been understating the trend in actual labor costs. After all, making the job more attractive, if it is done by the employer - in this case the police department is costly and it is a cost that is hidden from view if one concentrates only on police wages. In this case money wages of police might have increased quite modestly during the 60's and 70's while real labor costs were increased quite dramatically. If this occurred it occurred both in the period before 1960 as well as the period after 1960.

FIGURE 15

RATIO OF MAXIMUM ENTRANCE SALARY TO MANUFACTURING WORKERS WAGE:
LOS ANGELES POLICE DEPARTMENT



Sources: Los Angeles Police Department and
Bureau of Labor Statistics

TABLE 41

ESTIMATED TIME TRENDS IN THE RATIO OF POLICE WAGES TO MANUFACTURING WAGES: 1947-77

	REGRESSION	
VARIABLE	OLSQ I	OLSQ III
CONSTANT	3.8600	3.8800
TIME 1	-	.0086*
	-	(2.0700) **
TIME 2	-	.0050
	-	(1.8000)
TIME	.0060	-
	(6.7000)	-
PERIODSHIFT	-	.0260
	-	(.1700)
R-SQUARE	.6200	.6300
F-STATISTIC	44.8000	14.1000
SAMPLE SIZE	31	31
D.W./RHO.	1.6200	1.6400

Source: Los Angeles Police Department and U.S. Department of Labor Bureau of Labor Statistics

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

Relative wages of police officers appear to have increased at the same modest rate during the immediate post-war period (1947-59) as during the 60's and 70's. The movements in police wages relative to manufacturing wages provide no support for the proposition that relative working conditions of police officers improved more rapidly after 1960 than before 1960. The evidence, in fact, suggests that relative working conditions declined (relative wages increased) over the entire period 1947-1977 and that the rate of decline was about the same before and after 1960.

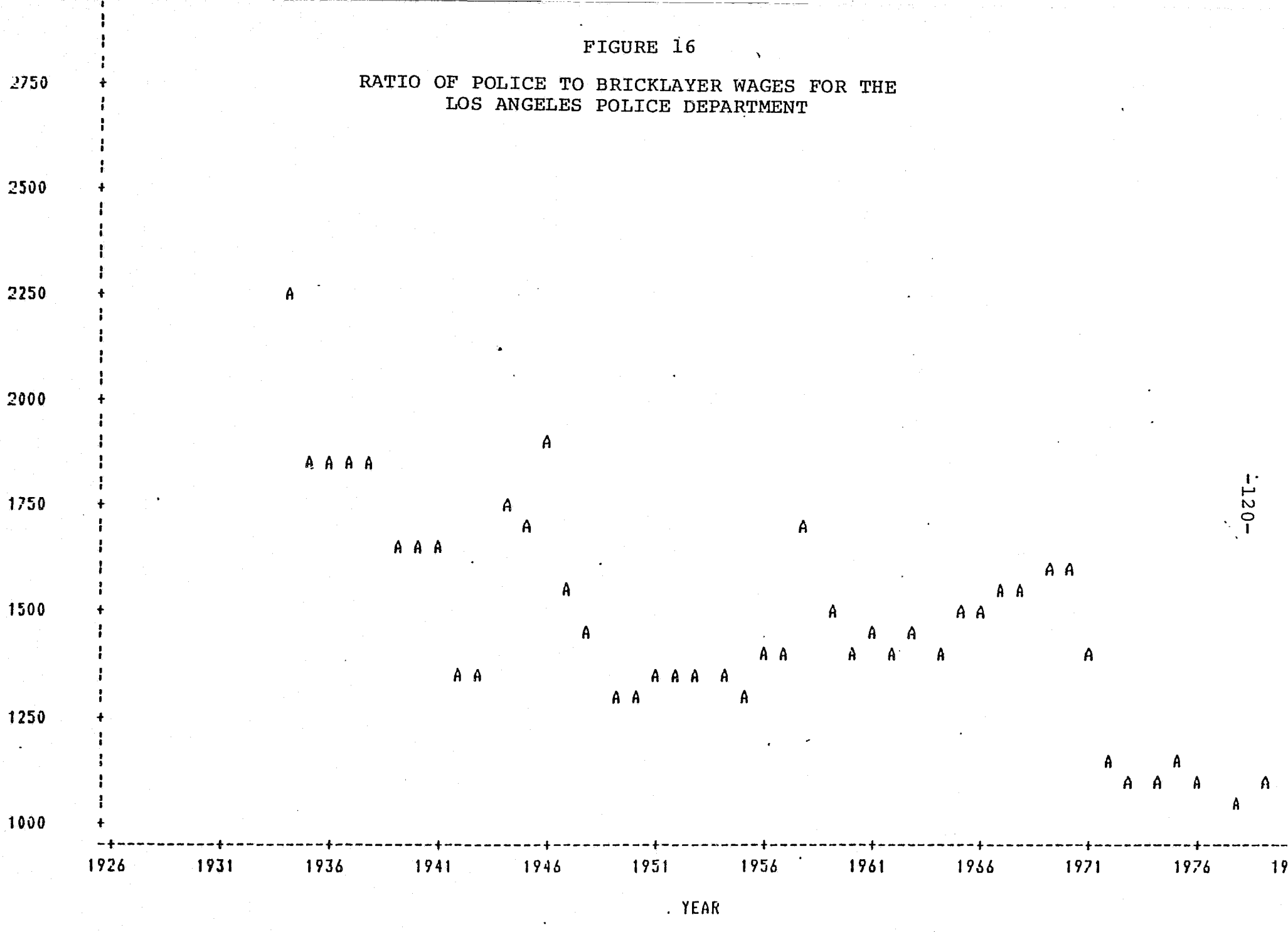
As we noted above, manufacturing wages were not available for the early years of our sample. In fact the only general wage data available for Los Angeles that covers the entire sample period is that on construction trades published by Engineering News Record. We used the wage rates of bricklayers (BRICK) and construction workers (CONSTN) from this source to create a relative wage series that covered most of our sample period (1934-78).

A plot of the ratio of police wages to construction wages is shown in Figure 16. The specific construction wage chosen for this plot is the bricklayers wage.* It is apparent from this plot that police wages behaved quite differently relative to construction wages than they did relative to manufacturing wages. While relative to manufacturing wages police salaries evidence a modest increase, here police salaries show a dramatic decline relative to construction wages.

*For additional data on these wage series see the Appendix.

FIGURE 16

RATIO OF POLICE TO BRICKLAYER WAGES FOR THE LOS ANGELES POLICE DEPARTMENT



Actual estimates of the time trends of police wages relative to construction wages are presented in Table 42. The rate of decline here is 4 to 5 times the rate of increase in police wages relative to manufacturing wages. Here we see rates of decline in relative wages of 2 or 3% and in relation to manufacturing wages we saw rates of increase of about 1/2%. However, interestingly enough from our perspective, the rate of decline in police wages relative to construction wages does not appear to be systematically different between periods. Relative wages declined at about that same rate before as after 1960.

Given the nature of the construction industry however the trends in relative wages may not have the same interpretation in this case as in manufacturing. Because construction is a heavily unionized industry even in Los Angeles, the inference that changes in relative wages reflect changes in relative attractiveness may be suspect. Effective trade unions may, in fact, be able to alter relative wages for any given level of relative attractiveness. Moreover, since much of construction work involves physical effort, shifts in preferences away from such work will lower the relative wage of less physical activities. This lowering of relative wages, of course, represents a real saving for the less physically intensive activities and is not at all the same as the lowering of relative wages that would result from making the activity such as police work less demanding.

On the question of the impact of police labor organizations on police salaries, it is interesting to note that the increasing importance of police labor organizations such as the Los Angeles

TABLE 42

ESTIMATED TIME TRENDS IN THE RATIO OF
POLICE WAGES TO CONSTRUCTION WAGES: 1926-79

	REGRESSION	
VARIABLE	CORC I	CORC II
CONSTANT	-.539	.426
TIME 1	-.024* (-5.810)**	-.038 (-17.400)
TIME 2	-.026 (5.480)	-.033 (-9.960)
PERIODSHIFT	-.087 (.270)	-.301 (-1.430)
DEPENDENT VARIABLE	LBRICK	LCONSTW
R-SQUARE	.970	.990
F-STATISTIC	467.9	1612.1
D.W./RHO.	1.92/.61	1.93/.45

Source: Los Angeles Police Department and Engineering News Record

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

Police Protective League as barganing agents has not, according to the data in Los Angeles, been accompanied by any increase in police wages relative to wages in the heavily unionized sector of the economy. Police wages in Los Angeles have been falling relative to construction workers wages for nearly 50 years and increased activism by the Los Angeles Police Protective League has not basically altered this trend.

The finding that police wages behave quite differently with respect to manufacturing wages than with respect to construction wages is a quite interesting by-product of this analysis. Nevertheless more central to our concern is the fact that in both of these cases one cannot distinguish the behavior of relative wages before and after 1960. There is simply no evidence that the trend in police wages after 1960 has any different interpretation in terms of the trend in underlying labor costs than the trend during earlier periods.

One factor that has, however, been overlooked in all of the discussion above is fringe benefits. The salary and wage data that we have been discussing does not include the value/cost of fringe benefits. If in fact fringe benefits increased substantially more rapidly in the 60's and 70's then in earlier years, using only salary data would bias the results toward finding a time trend in costs during that period that was not apparently explained by labor costs. The time trend in this case would be "soaking up" or proxying for the effect of fringe benefits on

costs.* Once again the data we can muster to test this assertion is far from adequate. In fact for our initial approach to the problem we were forced to use national and quite aggregate data. Specifically, we calculated the ratio of salary supplements to salaries for all government workers, (1929-70) based on data published in Historical Statistics of the United States. The results of our estimates of time trends for this ratio is presented in Table 43. It is apparent from these estimates that the supplement to salary ratio for government employees did not increase any more rapidly during the 1960's than during earlier periods.** In fact, the coefficient on the time trend since 1960 is not statistically significant at conventional levels.

Also shown in Table 43 are the results of using this supplement data to adjust the salary series for police officers. In column II we investigate the effect on estimated time trends in the cost per arrest estimation of using an adjusted salary series, EARN1, instead of DMAXENT or DWAGE1. While, the sample is smaller and significance levels lower, the results are basically unaltered by using EARN1 instead of DMAXENT or DWAGE1. Adjusting police salaries in Los Angeles so that they reflect the average trend in fringe benefits for government employees, does not, where this variable is used to control for labor costs, effect the post 1960 time trend in costs. The

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*Our cost data for Los Angeles excludes pension costs and hence changes in retirement benefits would not cause the time trend in our results to proxy for this element of cost.

**This supplement ratio includes pension costs which are not included in the Los Angeles budget data, see discussion below.

TABLE 43

ESTIMATED TIME TRENDS IN SUPPLEMENTS TO SALARIES AND COSTS PER ARREST

	REGRESSION	
VARIABLE	I	II
CONSTANT	.0120	1.0700
TIME 1	.0010* (4.9200) **	-.0010 (-.2200)
TIME 2	.0010 (1.1100)	.0310 (1.6900)
PERIODSHIFT	.0110	-1.3100 (-1.4900)
LEARN1	(.1700)	.5300 (1.9600)
LPP1	- -	.1860 (.7600)
DEPENDENT VARIABLE	SUPP	LXPAR67
R-SQUARE	.7400	.7200
F-STATISTIC	36.1600	17.1000
SAMPLE SIZE	41	38
RHO.	.54/1.98	.57/2.01
YRS.	1930-70	1933-70

Source: Los Angeles Police Department and Historical Statistics of the United States, 1970

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

growth in fringe benefits at least during the 1960's, does not appear to account for the explosion in costs/arrest experienced during that decade. The time trend in unit costs during the 1960's does not appear to be simply a proxy for a growth in "hidden" labor costs in the form of fringes.

Interesting as this evidence is, it still stops some years short of our sample period and in particular provides too little information in the period of exploding costs, 1960-1979. Essentially the data provide no information on the importance of fringe benefits during the 1970's. Data comparable to that obtained from the Historical Statistics of the United States was not available for more recent years. However, we were able to find data for the Los Angeles Police Department on one major fringe benefit, health insurance. Since the cost data we are using does not include pension costs, ommission of the other major fringe benefit, retirement, does not pose a serious difficulty in this analysis.*

For our purposes it is quite significant that the first year in which health benefit information appears in its Municipal Yearbook for the Los Angeles Police Department is 1968. In that year health benefits represented about a 1/2% of salary expenditure. By 1980 the health benefits had grown to about 5% of salary. Hence in the 70's there is some potential that fringes were an important factor in pushing up costs. We do know, however, that if we use the supplement data in the 60's to

*See Appendix for data on pension costs.

TABLE 44

ESTIMATED TIME TRENDS IN COSTS PER ARREST USING BENEFIT ADJUSTED WAGES FOR THE LOS ANGELES POLICE DEPARTMENT

	REGRESSION	
VARIABLE	CORC I	CORC III
CONSTANT	-9.4200	3.1200
TIME 1	-	-.0030*
	-	(-.3600) **
TIME 2	-	.0280
	-	(2.5600)
TIME	.1040	-
	(9.1500)	-
LPPIX	-	.4630
	-	(2.4900)
LE3	-	.3740
	-	(1.2200)
DEPENDENT VARIABLE	LHRATIO	LXPARXX
R-SQUARE	.7900	.9000
F-STATISTIC	40.7000	74.7000
RHO.	-.34/2.10	.55/2.00
YRS.	1969-81	1933-78

Source: Los Angeles Police Department and Historical Statistics of the United States, 1970

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

"forecast" the 70's and then also account for the growth of health benefits in the 70's these adjustments do not explain the trend in costs after 1960. In Table 44 we present the results of estimating time trends in costs controlling for labor costs by using the variable LE3. This labor cost variable is adjusted for supplements through 1978 by forecasting values for the 70's and is also adjusted for its growth in health benefits during the 70's. While the adjusted variable does not perform as well as its raw salary data, its t-statistic is only 1.23, the inclusion of all of these adjustments does not significantly alter the time trends.* The growth in fringe benefits for police officers, at least as we have been able to measure them, simply does not explain the rise in costs per arrest that we observe after 1960.

All of the evidence that we have been able to bring to bear on this problem suggests that the growth in wages and labor related costs were not the cause of the rapid growth in the real costs of arresting offenders that we observe after 1960. It simply does not appear to be the case that the explosion in the costs of crime control during the past twenty years resulted from an extraordinary increase in the wages and/or benefits received by police officers.

*This is especially interesting in light of the fact that the fringe adjustment includes pension costs, and unit cost data on arrest does not include such costs. Inclusion of pension costs in the wage variable should, if these costs have risen more rapidly in the later period, bias our results against finding stability in the time trends.

IX. A NOTE ON COSTS PER ARREST AND THE SCALE OF OPERATIONS IN THE LOS ANGELES POLICE DEPARTMENT

Up to this point we have been investigating a cost function for crime control that is independent of the level of crime control. In the jargon of the economist, we have been assuming that crime control is characterized by constant costs. That is, we have been ignoring any effect that the scale of operations might have had on unit costs. While the effect scale on costs has been a concern of researchers in this area for some time now, there is no definitive study on the topic. There is no general agreement as to whether there are economies, or for that matter diseconomies, of scale in law enforcement. This is especially true concerning the effects of scale on the cost of operations of a specific department over time: a situation that is particularly relevant to our concerns with the explosion we have observed in crime control costs since 1960 in Los Angeles and other major cities.

Putting aside for a moment the technical question of whether there are generally economies or diseconomies of scale in the production of crime control, it is sufficient for our purposes to inquire whether the growth in the unit costs of law enforcement in Los Angeles, that we have observed since 1960, might be due in part to the change in the scale of operations in the department.

It is, of course, true that much of the growth in arrest levels or scale of operation occurred prior to the explosion in unit costs in the early 1960's. In fact while the number of Part I arrests increased from 32,00 to 48,000 over the period 1960 to

1980, the total number of arrests actually declined over the period. Nevertheless, it is possible that other factors offset scale effects (in this case possibly diseconomies of scale) in one period and not in the other, and a direct investigation of the impact of the scale of operations on unit costs appears to be warranted in this case.

Allowing for the possibility that unit costs are in fact influenced by the scale of operations by including say, the total number of arrests, in the cost equation does raise some problems. Most significantly by including arrests in the cost equation we introduce a familiar simultaneity issue. If, as we asserted in the early sections of this report, the arrest rate and consequently the number of arrests is in part determined by the costs of arrests, then unit costs and scale may be simultaneously determined.

In order to test the impact of the scale of operations on unit costs it is necessary therefore to specify the structure of the cost and arrest functions. At this point we assume that the following variables influence the number of crimes and arrests and not the costs: Population (POP), Density (POPDEN), Area (SQMI) and private sector wages (WGBLD).* Using this structure to estimate an instrument for the scale of operations or arrest level (NARR) and employing two-stage least squares TSLS we estimated the impact of arrest levels on unit costs. The results

*In this formulation we use WGBLD as an indicator of income level. Similar results were obtained using the same indicator (LPCAV) as was employed in the demand for clearance estimation above.

of this estimation are shown in column 1 of Table 45. The same results adjusted for autocorrelation are presented in column 2. In neither case does the scale of operations (LNARR) enter the relationship at anything near conventional levels of significance. Moreover the introduction of the scale variable leaves the time trend results basically unchanged. Even when controlled for the scale factor, costs per arrest evidence a significant time trend in the later part of the period, i.e., since the early 1960's.

In addition to the simultaneous nature of unit costs and scale, there is the possibility discussed above that unit costs and the composition of arrests are also simultaneously determined. That is, while composition or the proportion of Part I arrests (PP1) effects measured unit costs, the underlying cost structure also determines the composition of arrests. The estimates in column 3 allow for this possibility.* Once again, the scale factor fails to enter the relationship at anything close to conventional levels of significance and the relative time trends are unaltered by the inclusion of the scale factor. Unit costs evidence a significant upward time trend only since the early 1960's.

*LPP1 is assumed to be endogenous. Unfortunately, the structure we assume does not permit us to identify the relationship for LPP1.

TABLE 45

ESTIMATED TIME TRENDS IN THE COST PER ARREST AND THE SCALE OF OPERATIONS IN THE LOS ANGELES POLICE DEPARTMENT

	REGRESSION			
VARIABLE	TSLS I	TSCORC II	TSLS III	TSCORC IV
CONSTANT	.464210	.850826	-.922400	1.634450
TIME 1	.003590* (.162990)**	.008120 (.026190)	-.001650 (.023000)	.006820 (.230000)
TIME 2	.039919 (4.715510)	.040293 (3.188290)	.045400 (1.98000)	.039880 (2.95000)
PERIODSHIFT	-1.408370 (-2.345450)	-1.774940 (-1.774940)	-1.471080 (-.880000)	-1.559190 (-1.700000)
LDMAXENT	.731710 (1.671460)	.577930 (1.500720)	.924320 (1.980000)	.664240 (1.800000)
LPP1	.283590 (.811520)	.681992 (1.741830)	-.315680 (-.360000)	.752360 (1.600000)
LNARR	-.081970 (-.135620)	.075988 (.115328)	-.209240 (-.130000)	-.050480 (-.080000)
F-STATISTIC	51.9355	68.5578	35.3691	71.8100
YRS.	1933-79	1934-79	1932-79	1933-79
RHO./D.W.	-	.59979/1.98	-	.61000/1.87

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

Our findings on the effect of the scale of operations on unit costs is straightforward. In the several cases we investigated the scale of operation, at least measured by the total volume of arrest activity, appears to have no effect on unit costs. The explosion in the unit costs of arrests observed in Los Angeles since the early 1960's appears in no way attributable to the change in the level of arrest activity during this period. Whatever is responsible for the "run up" in unit costs during the last 20 years, it is not related to the scale of operations.

We have, of course, only explored a very simple structural model of crime and crime control in this estimation and full test of the sensitivity of our results to changes in specification is yet to be performed.

X. DECLINING ARREST PRODUCTIVITY AND QUALITY OF THE WORK FORCE

In a previous section we examined the evidence on the relationship between labor costs and the costs per arrest in the Los Angeles Police Department. What we found was that neither wage costs nor the costs of fringe benefits can explain the run up in crime control costs that we have observed in the period since 1960. The other side of this finding, of course, is that physical productivity must have been declining during this period. That is, the actual number of arrests per unit of input must have been declining since 1960.

A plot of the ratio of arrests to employees for the LAPD during the period 1926 to 1979 is presented in Figure 17. While there is a great deal of variability in the data, especially in the early part of the period, a persistent decline in the number of arrests per employee is apparent since 1960. Moreover, the decline in arrests/employee does not appear to be restricted to the city of Los Angeles. In Figure 18 we present the ratio of arrests per sworn officer for Dallas during the period 1943 to 1970. Here, decline in productivity apparently began somewhat earlier than Los Angeles but the overall pattern is similiar.

In Table 46 we present our estimates of the time trends in the number of arrests per employee in the Los Angeles Police Department. Several measures of arrests and employees were used in estimating the trends shown in the table. Specifically: PROD1 is the ratio of total arrests to sworn personnel, PROD2 is the ratio of total arrests to total employees; PROD3 is the

FIGURE 17

ARRESTS PER EMPLOYEE FOR THE LOS ANGELES POLICE DEPARTMENT: 1926-79

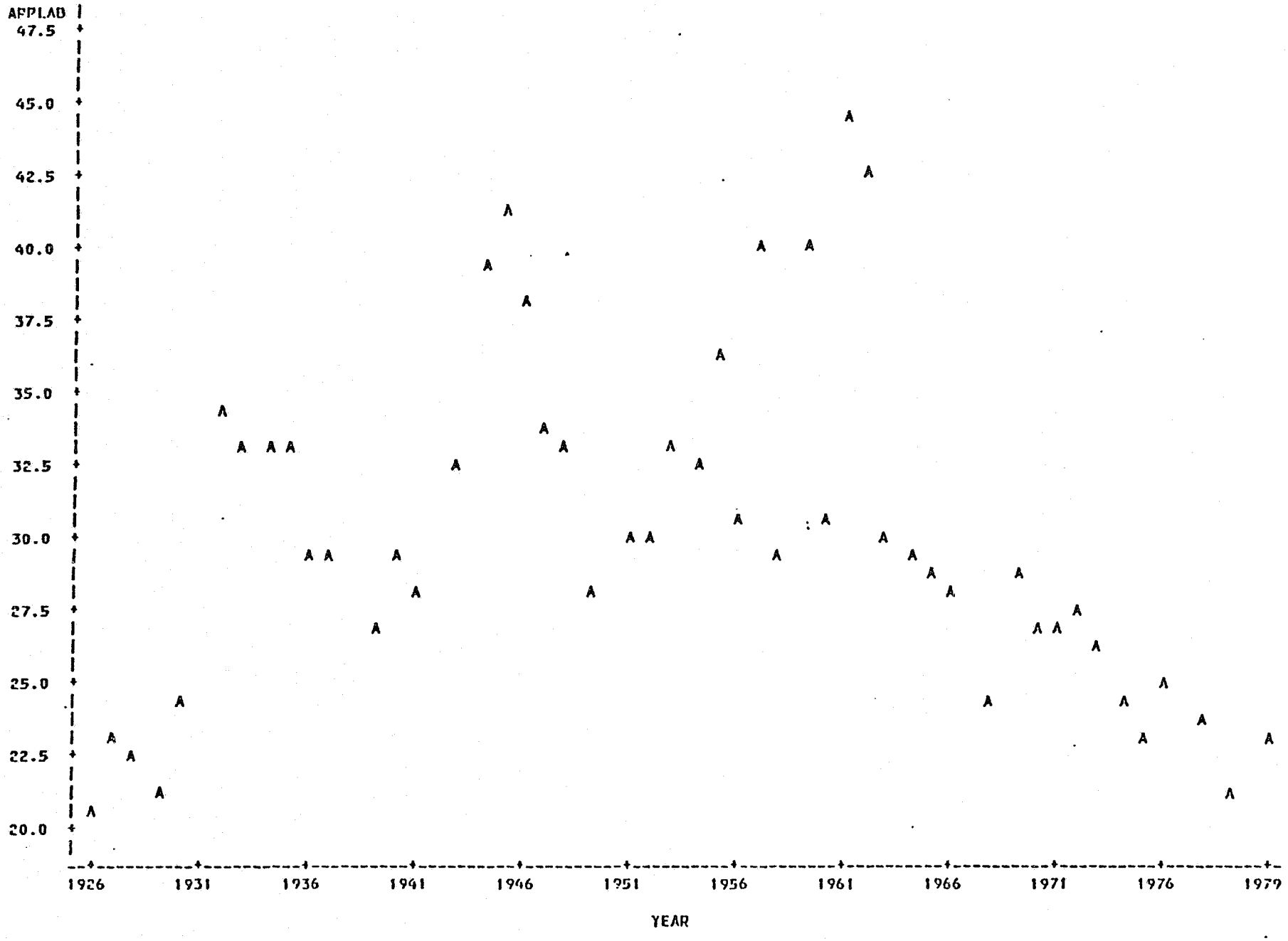

FIGURE 18

NUMBER OF ARRESTS PER SWORN LABOR FOR THE DALLAS POLICE DEPARTMENT

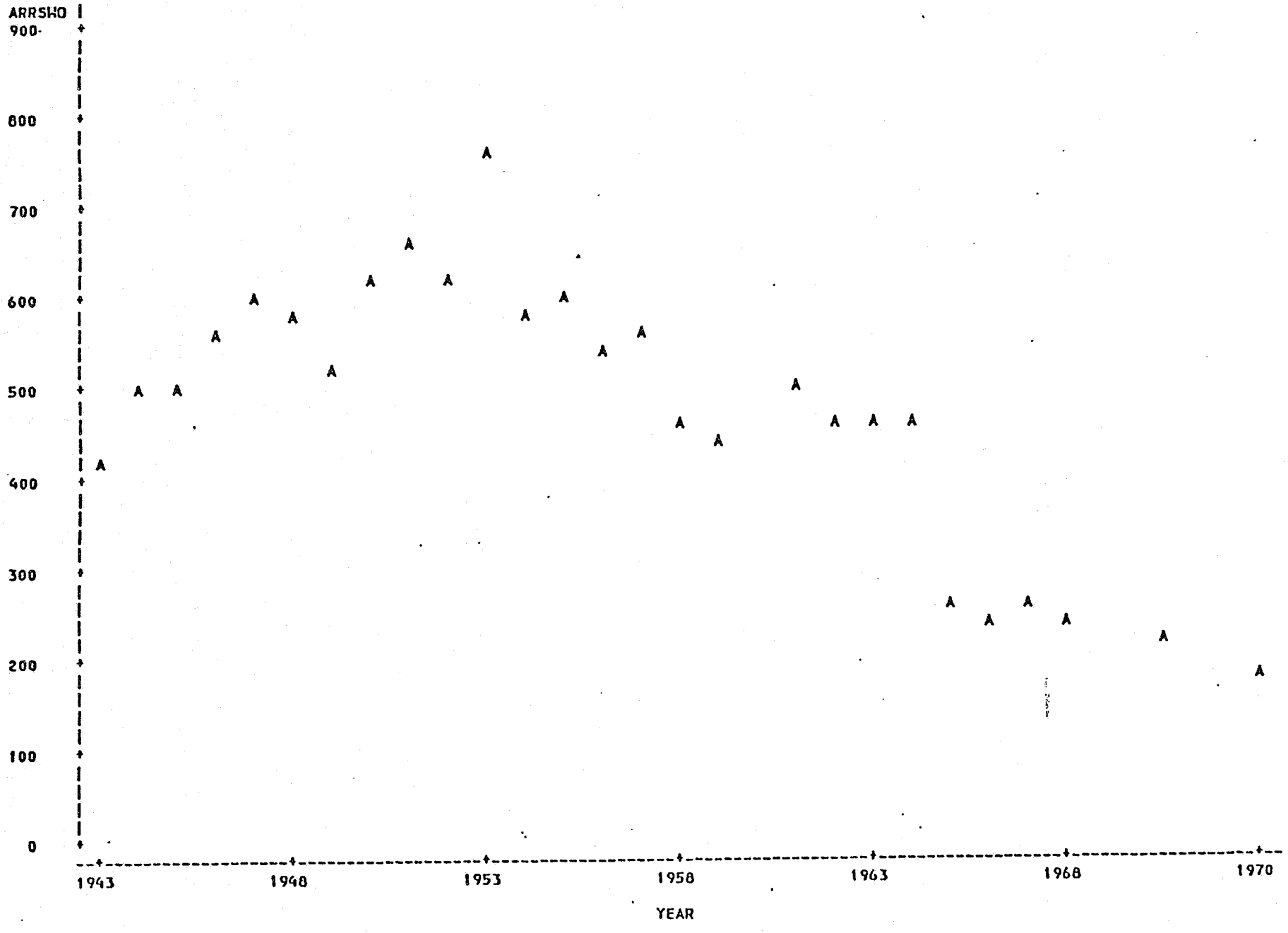

TABLE 46

ESTIMATED TRENDS IN THE NUMBER OF ARRESTS PER EMPLOYEE FOR THE LOS ANGELES POLICE DEPARTMENT: 1933-79

	REGRESSION			
VARIABLE	PROD 1 I	PROD 2 II	PROD 3 III	PROD 4 IV
CONSTANT	3.4500	3.3400	1.5200	1.4100
TIME 1	.0140* (4.0300)**	.0080 (3.2900)	.0040 (1.2300)	.0020 (.5200)
TIME 2	-.0260 (-4.5100)	-.0290 (-5.7300)	-.0130 (-2.0400)	-.0170 (-2.7100)
PERIODSHIFT	1.3100 (5.1000)	1.2400 (5.4300)	.9600 (3.2600)	.8970 (3.1900)
R-SQUARE	.5300	.6300	.5600	.4100
F-STATISTIC	16.0000	25.0000	19.0000	10.0000

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

ratio of Part I arrests to sworn personnel and PROD4 is the ratio of Part I arrests to total employees. One aspect of these time trends that is immediately apparent is the invariance of the pattern in time trends to the type of arrests or type of labor. In all cases the number of arrests per employee rises, albeit significantly in only two cases, in the early period (prior to 1960) and declines subsequently. The decline, we note, is statistically significant in all cases. Arrests per employee, whether the arrests are measured in terms of all arrests or simply Part I arrests or the employees measured in terms of all personnel or simply sworn personnel, evidence a persistent decline only in the period since 1960. Prior to that time arrests per employee were increasing when measured in terms of total arrests and stable when measured in terms of Part I arrests. There is no evidence of any sustained decline during the period prior to 1960.

Perhaps the most significant aspect of the evidence presented in Table 46 is the fact that the decline in arrests per employee was not restricted to decline in what might be termed the non-serious arrests per employee. As the time trends for PROD3 and PROD4 indicate, the Part I arrests per employee as well as the Part I arrests per sworn officer evidence a significant negative trend since 1960. Arrests per employee for the group of crimes composed of homicide, rape, assault, robbery, burglary, larceny and auto theft has declined by over 1%/year since 1960. The decline in arrest productivity has <u>not</u> been restricted to crimes such as public intoxication, prostitution or traffic

violations. While it is true that arrest/employee for these types of crimes have declined at a faster rate than Part I arrests, the decline in productivity has not been restricted to the non-serious crimes. Because of this pattern, the declining arrest productivity that we observe in the Los Angeles Police Department is potentially a very important phenomenon.

The most interesting question here, of course, is what is it that is causing the apparent technological regression in policing: why is it that the arrest productivity of one of the nation's largest police forces has been declining since 1960? Is it simply that the "quality" of police personnel has consistently declined during the past 20 years or so? Perhaps rapid growth during the period diluted the stock of experienced personnel. The only problem with this explanation is that the rate of growth in LAPD employees was greater from 1933 to 1960 (3%/annum) than it was from 1960 to 1979 (2%/annum). Any dilution effect should have been stronger during the early period than during the later period.

Another possible source of compositional change in the force might be a change in the composition of retirees. It could be that during the 60's and 70's there were more early retirements than in previous periods. While we were unable to get data for the period prior to 1960 on average age at retirement and average years of service at retirement, we were able to obtain these for the years since 1960. In column 1 of Table 47 we present the estimated time trend since 1960 in average age at retirement and

TABLE 47

ESTIMATED TIME TRENDS IN THE AVERAGE AGE AND NUMBER OF YEARS OF SERVICE AT RETIREMENT FOR THE LOS ANGELES POLICE DEPARTMENT: 1960-79

	REGRESSION	
VARIABLE	LAGE	LSER
CONSTANT	.3890	2.8900
TIME	.0008* (.4150)**	.0066 (2.1600)
DEPENDENT VARIABLE	LAGE	LSER
R-SQUARE	.0100	.2100
SAMPLE SIZE	20	20
YRS.	1960-79	1960-79

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

in column 2 we present an estimate of the time trend in the average years of service at retirement. As the estimates in Table 46 make clear there is no evidence of an increase in early retirement in that the average age of retirement has not changed at all over the period. In fact, the positive time trend in average years of service at retirement suggests just the opposite. The coefficient on time in the average age at retirement regression is positive but highly insignificant (t-statistc = .42).

While rapid growth and early retirement are unlikely to have adversely affected the composition of the LAPD work force during the period, we have yet to examine the possibility that there was a decline in quality of new recruits since 1960. Relevant data on this topic is difficult to obtain and what indirect evidence we have is confounded by major changes in recruiting practices during the mid 1970's.

We have a consistent series (except for 1973) on the ratio of candidates taking the written exam for a police officer to the number graduating from the academy over the period 1956 to 1979. However, the ratio behaves very erratically during the second half of the 1970's. From 1956 to 1972 the ratio ranges from a low of .05 to a high of .10. During the years 1974-79 the range is .07 to .67 with four years ('75, '76, '77, and '78) substantially above any of the ratios observed in the 56-72 period. Consequently, in order to analyze this data we have divided the series at 1973 and estimated separate time trends from 1956 to 1972 and 1974 to 1979. The results of that

estimation are given in column 1 of Table 48. Although the average ratio of graduates to applicants (selection rate) behaved quite erratically in the period since 1974 and hence the time trend in that period is suspect, there is no overall trend indicating that LAPD was consistently having to go deeper into the applicant pool over the period.* The time trend in the pre '74 period is not statistically significant.

In addition to the overall raw selection rate we also analyzed the specific rejection rate of applicants for what is termed "unsatisfactory background." Here again the series behaves quite badly in the mid to late 70's and we repeat our technique of estimating two time trends. As in the case of the selection rate, we have very little confidence in the estimated time trend for the period since 1974. Nonetheless the estimated time trend for the period from 1956 to 1972 is quite interesting. Here we find that the LAPD actually increased its rejection rate for unsatisfactory background during the late 50's to early 70's. While this may simply reflect the declining quality of the applicant pool, it does not suggest that the police department was significantly lowering its standards for new applicants at least during the period for which we have credible data.

Overall there is nothing in the data on growth rates of employees, characteristics of retirees or "quality" of new recruits that suggests that the quality of the labor force in the

*This, of course, assumes that the process itself is not endogenous. That is, that the rate at which applicants are "transformed" into graduates is presumed not to adjust to the size of the applicant pool.

TABLE 48

ESTIMATED TIME TRENDS IN RATIOS OF POLICE ACADEMY GRADUATES TO APPLICANTS (GRATE) AND REJECTIONS FOR UNSATISFACTORY BACKGROUND TO APPLICANTS (UBK) FOR THE LOS ANGELES POLICE DEPARTMENT: 1956-79

	REGRESSION	
VARIABLE		
CONSTANT	-2.9000	-4.3800
TIME72	.0227* (1.0400)**	.0730 (2.2100)
TIME74	-.0810 (-.7000)	-.1960 (-1.0400)
PERIODSHIFT	3.1600 (1.2200)	6.8500 (1.6100)
DEPENDENT VARIABLE	LGRATE	LUBK
R-SQUARE	.5800	.5900
F-STATISTIC	8.7000	9.2900
SAMPLE SIZE	23	23

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

LAPD was declining during the period since 1960. Now it is true that we have not been able to obtain any direct evidence on the measured quality of the work force but what indicators we do have suggest that it would be more productive to look elsewhere for the causes of the decline in arrest productivity over the past 20 odd years.

XI. RULES PROHIBITING POLICE CONDUCT AND THE COSTS OF CRIME CONTROL

As we have seen the increase in the costs of law enforcement during the past 20 years appears to be due not to an increase in wages but rather to a decline in police productivity. Productivity here defined in terms of arrests per police officer. The important question, of course, is what exactly is responsible for this technological regression. Why is that what appears to be, based on measureable characteristics, "better" quality police officers actually produce less arrests today?* Why have arrests per officer and per employee, including arrests for the most serious crimes, declined over the past 20 years?

One suggestion as to a possible cause of this "technological regression" that is often made in the law enforcement community is that it is due to the growth of court imposed regulation of police activity. For example, in discussing the issue in a recent annual report of the LAPD, the authors make the point that "each new high court restriction...was accompanied by more and more criminal activity."** In Table 49 we reproduce a list of federal and state cases that have been identified by the Los Angeles Police Department as "cases prohibiting police conduct." It is interesting to note that if you locate the initial case prohibiting police conduct according to the LAPD (People

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*The best data we have been able to assemble provides no evidence that there has been a decline in the quality of police officers over the past twenty years or so (see section above).

**LAPD, Annual Report, 1978.

TABLE 49

FEDERAL AND STATE OF CALIFORNIA CASES PROHIBITING POLICE CONDUCT*

CASE	DATE
PEOPLE VS CAHAN	1955
PEOPLE VS BADILLO	1956
PEOPLE VS CARTER	1957
PEOPLE VS GASCON	1959
MAPP VS OHIO	1961
PEOPLE VS BIELICKI	1962
PEOPLE VS FERGUMSON	1963
PEOPLE VS SHELTON	1964
PEOPLE VS VENTRESCA	1965
MIRANDA VS ARIZONA	1966
KATZ VS UNITED STATES	1967
TERRY VS OHIO	1968
CHIMEL VS CALIFORNIA	1969
CHAMBERS VS MARONEY	1970
PEOPLE VS SUPERIOR CT. (KIEFER)	1970
PEOPLE VS MOZZETTI	1971
PEOPLE VS KRIVDA	1971
THEODOR VS SUPERIOR CT.	1972
PEOPLE VS SUPERIOR CT. (SIMON)	1972
LORENZANA VS SUPERIOR CT.	1973
PARSLEY VS SUPERIOR CT.	1973
PEOPLE VS BENNETTO	1974
PEOPLE VS BRISENDINE	1975
PEOPLE VS RAMEY	1976
US VS CHADWICK	1977
PEOPLE VS PETTINGILL	1978
PEOPLE VS JIMINEZ	1978
PEOPLE VS MINJAREC	1979
PEOPLE VS DALTON	1979
PEOPLE VS BARRAZA	1979
PEOPLE VS PACE	1979
PEOPLE VS ZELINSKI	1979
PEOPLE VS TERESINSKI	1980
IN RE DEBORAH C	1980
PEOPLE VS NORTH	1980
PEOPLE VS CHAVEZ	1980

Source: Los Angeles Police Department

vs. Cahan) it occurs during the period when crime rates and unit costs for law enforcement were quite low (see Figures 19 and 20). Likewise, if you take the first Federal case of importance according to the LAPD, Mapp v. Ohio, which is often referred to as the beginning point for the modern exclusionary rule at the federal level, and consider a city outside of California, (Phoenix), this case also occurs prior to the rapid growth in unit costs in that city (see Figure 21).

The underlying hypothesis here is that the onset of rising costs is coincident with the onset of rules prohibiting police conduct and the growth in costs or equivalently the decline in productivity are in fact due to the growth in the importance of rules circumscribing police conduct. Interesting as the data in Figures 19-21 are, they are obviously not a test of this hypothesis. Formal testing of ths hypothesis does, however, pose some interesting problems.

There is the problem of simply measuring the importance or effectiveness of the rules themselves. Unlike for a normal factor of production, there is no natural unit of measurement for rules or court decisions. When dealing with one rule or decision this problem is often handled by using a dummy variable or interrupted time series analysis. However, here we have not a once for all change in the rules but a continuing process of rule making that effects police behavior. The most sophisticated form of what might be termed the "conduct hypothesis" is that the growth in the application of these rules constraining police behavior is what is responsible for the decline in police productivity.

FIGURE 19

HOMICIDE RATE IN LOS ANGELES WITH INDICATOR FOR PEOPLE VS CAHAN

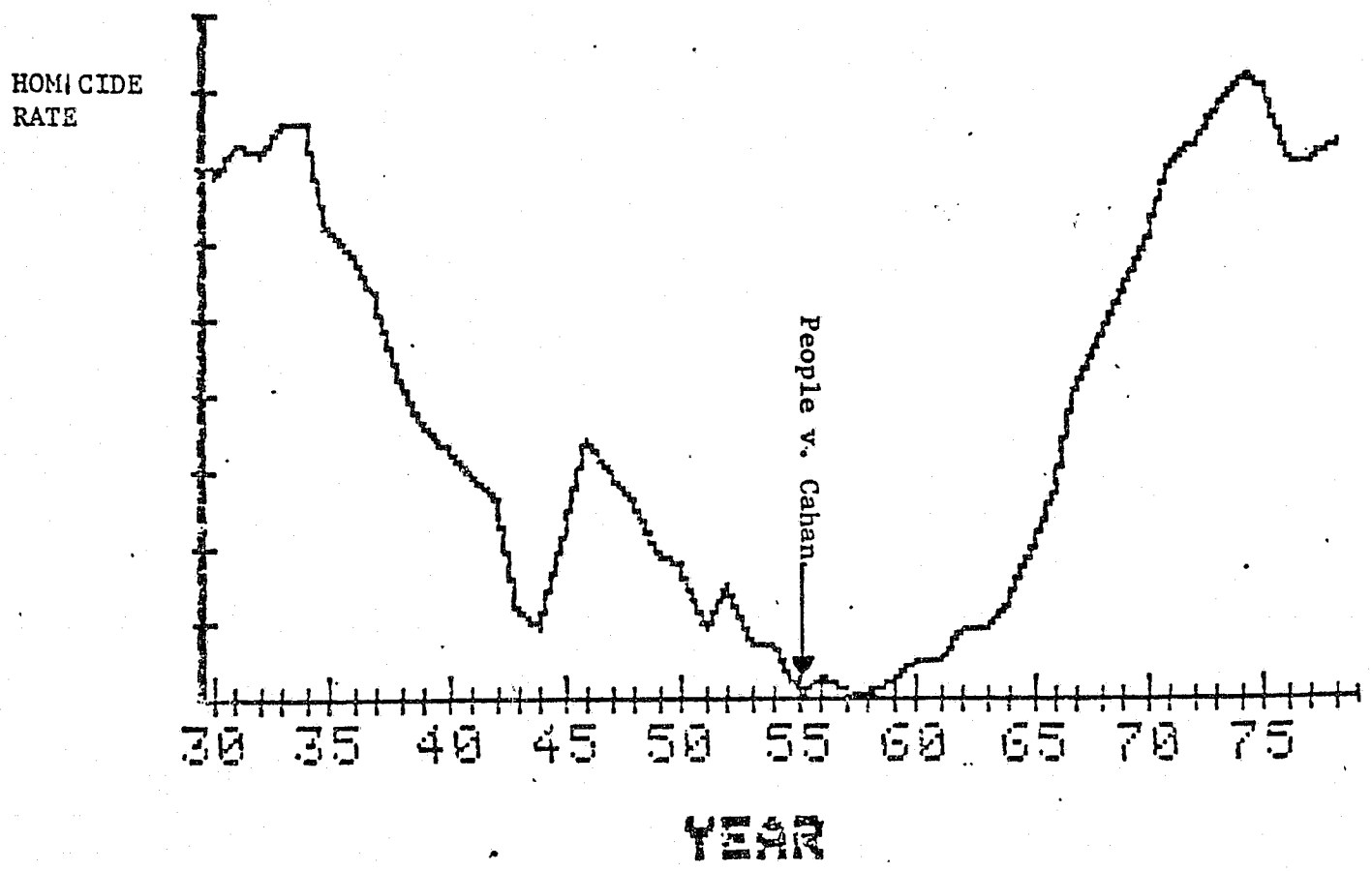


FIGURE 20

REAL EXPENDITURE PER ARREST WITH INDICATOR FOR PEOPLE VS CAHAN: LOS ANGELES POLICE DEPARTMENT

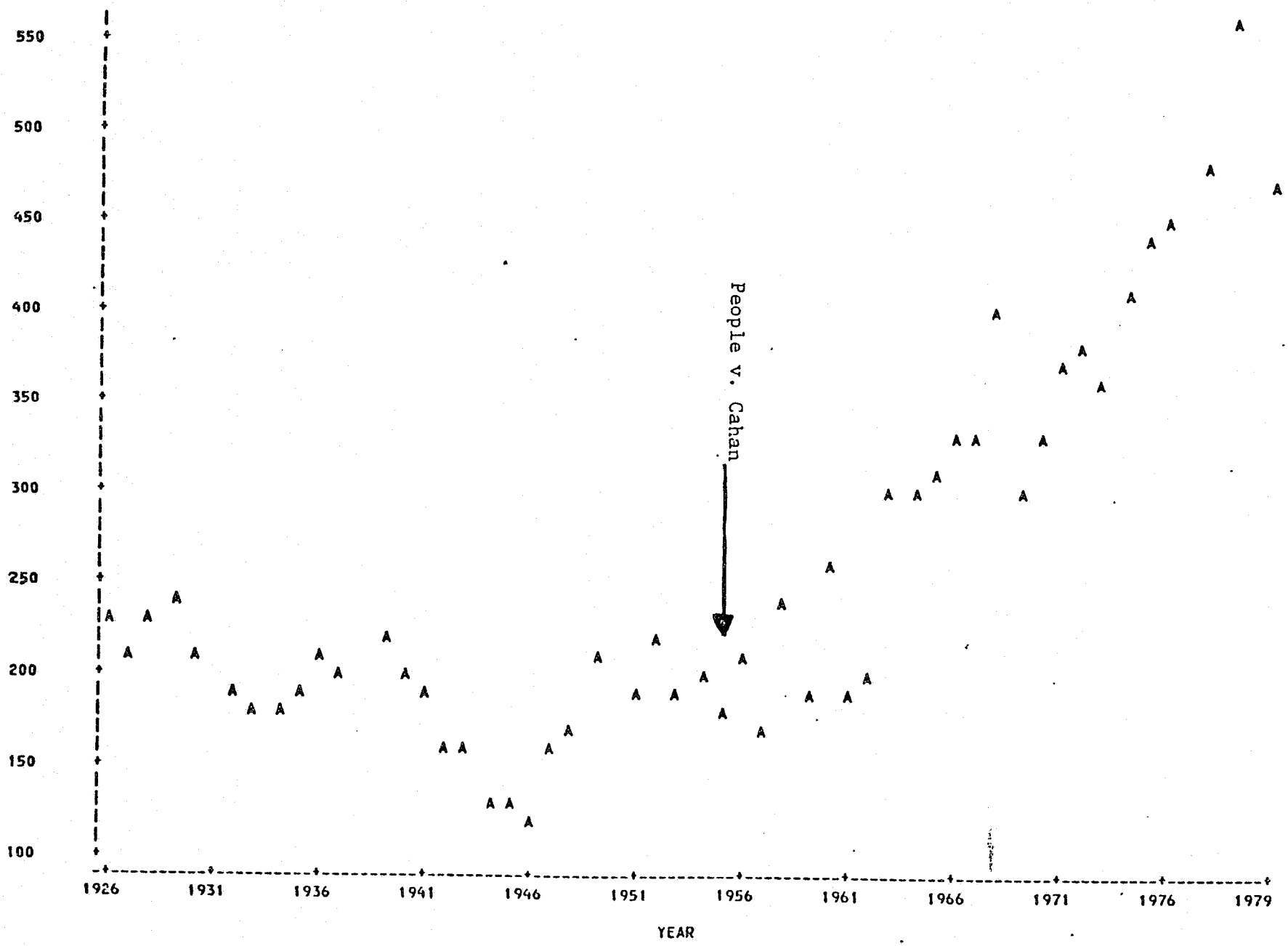
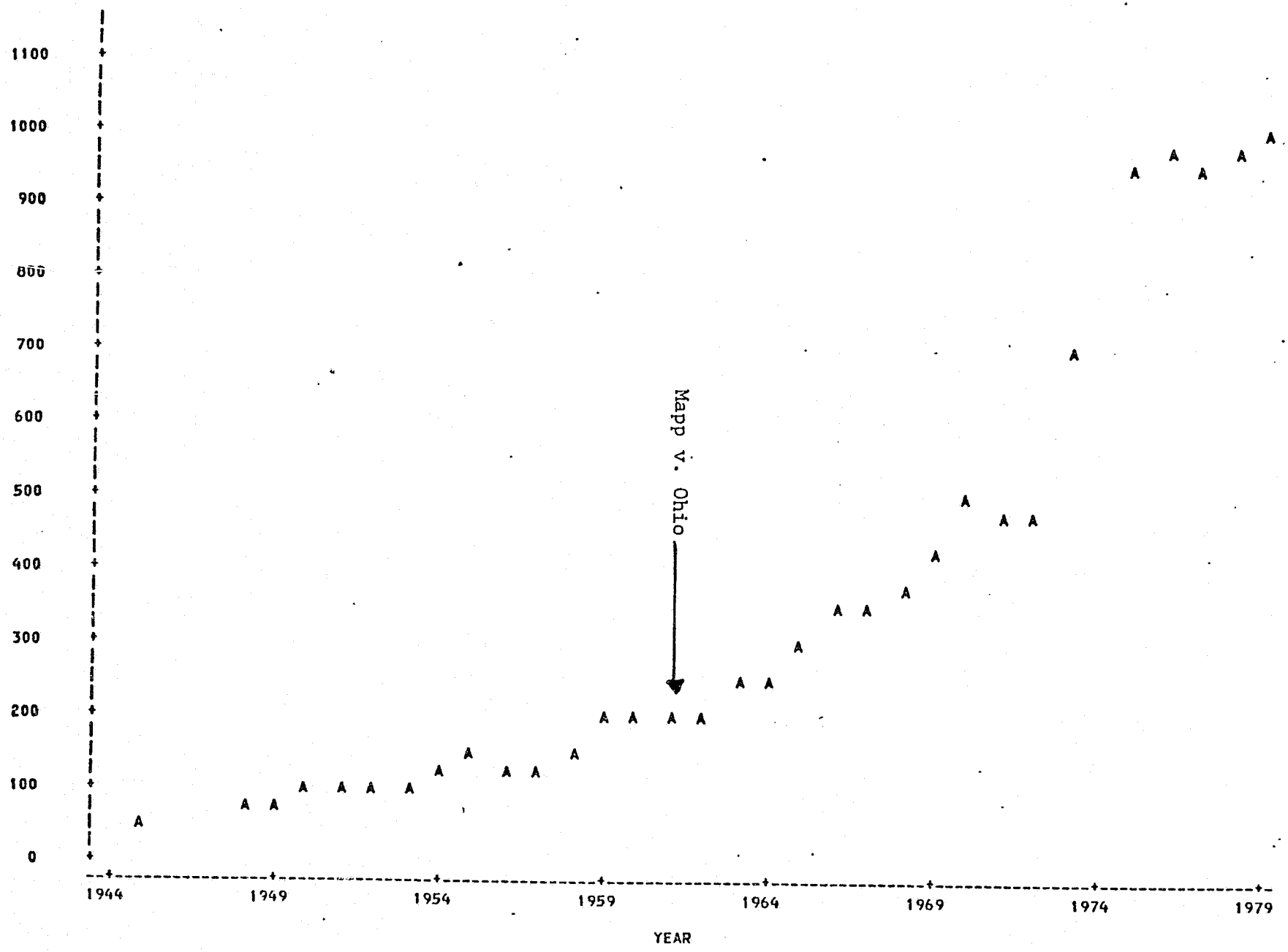


FIGURE 21

REAL EXPENDITURE PER ARREST WITH INDICATOR FOR
MAPP VS OHIO: PHOENIX POLICE DEPARTMENT



Valid arrests have, because of the growing application of these rules, become continually more difficult to make over time. Hence, according to this theory, the level of labor input required to make an arrest has been growing over time as police departments attempt to deal with the growing stringency of the rules governing their behavior. It is, as we noted above, the very continuity of this process and in a sense sophistication of the hypothesis, that makes measurement difficult.

Our initial approach to measuring the degree of application and constraint inherent in the decisions listed in Table 49 involved constructing a variable, PREC1, that is essentially a count of how frequently each of the decisions in Table 49 was cited in subsequent cases. Hence our index of rules prohibiting conduct, PREC1, grows over time not only because of new rules but also because old rules continue to be cited and applied.* Weak as this indicator may be it does provide one solution to the measurement problem.

In Table 50 the results of including the index of court decisions, PREC1, in the estimation are presented in column 1. The collinearity between TIME2, which is the time trend since 1960, and the "conduct" index, PREC1, is obvious. Given the near time trend nature of our index of rules prohibiting police conduct, PREC1, it does not appear possible to isolate the impact of PREC1 on unit costs. Nevertheless, the very collinearity that prevents independent estimates of TIME2 and PREC1 is intriguing.

*The estimated annual rate of growth in our index (PREC1) from 1955 to 1979 is approximately 12%.

TABLE 50

ESTIMATED TIME TRENDS IN THE COST PER ARREST AND RULES PROHIBITING POLICE CONDUCT FOR THE LOS ANGELES POLICE DEPARTMENT

	REGRESSION	
VARIABLE	OLSQ IV	OLSQ V
CONSTANT	.788	-.686
TIME 1	.003* (.460)**	-.003 (-.470)
TIME 2	.035 (.930)	.034 (4.320)
PERIODSHIFT	-1.475 (-1.180)	-1.109 (-2.650)
LDMAXENT	.809 (2.530)	.755 (1.990)
LPP1	.395 (1.790)	.225 (.890)
EXR	- -	-.0003 (-.002)
FEXR	- -	-.185 (-1.370)
PREC1	.002 (.080)	- -
R-SQUARE	.880	.880
F-STATISTIC	44.860	39.140
YRS.	1935-78	1935-78

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

The fact that an index of the application of rules prohibiting police conduct is collinear enough with the time trend since 1960 to prevent independent estimates of either variable is quite suggestive.* One cannot rule out the possibility that the time trend is in fact picking up the growing application and importance of rules prohibiting police conduct. The growth in unit costs since 1960 may, in fact, be basically attributable for this phenomenon.

Also reported in Table 50 is an attempt to use dummy variables to analyze the "conduct problem." Here we use two dummy variables: one for the first state (California) decision on the exclusionary rule (EXR) and another for the first federal decision on the exclusionary rule (FEXR).** Neither of these shift variables produce interesting or significant results.

Another approach to measuring the impact of court decisions on police behavior is to analyze the effect of defense expenditures on police costs. Using a measure of resources devoted to defending arrestees as an indicator of the extent of effective rules constraining police activity has the advantage that it has a natural unit of measurement (dollars) and in some sense reflects the actual implementation of these rules in court. However, it is not a pure measure of the rules prohibiting police

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*Note that the significance level of TIME2 drops dramatically when the variable PREC1 is introduced into the regression.

**For California the relevant case was People vs. Cahan (1955) and in the federal courts it was Mapp vs. Ohio (1961). Both variables are 1 in the years since the relevant decision and zero otherwise.

behavior but rather an indicator of this phenomenon as well as a direct measure of rulings, e.g. Gideon, requiring the provision of attorneys for defendents during the same period. There is, of course, reason to suspect that it is the latter effect that dominates the series.

In Los Angeles the system for providing defense support for arrestees changed quite dramatically over the period covered by this study. However, more problematic is the fact that we do not have comparable data on public defense expenditures per arrestee for the period between 1957 and 1965. Hence we have had to restrict our analysis to years outside this interval. In column 1 of Table 51 we present a baseline estimate of time trends using this restricted sample. In this estimation TIME56 is the period before 1957 and TIME66 is the period after 1966. As in the case when the entire sample is available, the early years are characterized by no trend in unit costs while the later period evidences a strong trend in real unit costs.

Introducing public defense expenditures per arrestee leaves the basic structure in terms of time trends unaltered. While defense expenditures enter the regression significantly and with the expected sign there remains a strong time trend in unit costs during the second part of the period. Essentially the estimates of the time trend is invariant to the inclusion of the defense variable. While increasing levels of expenditures devoted to defending arrestees raise costs, every 10% increase in such expenditures appears to increase unit law enforcement costs by

TABLE 51

ESTIMATED IMPACT OF DEFENSE EXPENDITURES
PER ARRESTEE ON COSTS PER ARREST FOR
THE LOS ANGELES POLICE DEPARTMENT

	REGRESSION	
VARIABLE	I	II
CONSTANT	-.241580	-.406490
TIME 1	.001750* (-.339820)**	.002017 (-.331170)
TIME 2	.034230 (2.814330)	.033015 (1.758220)
PERIODSHIFT	-1.185390 (-1.927120)	-1.178390 (-1.868900)
LDEFEN	- -	.011630 (8.085620)
LPP1	.047366 (.194325)	.046553 (.187769)
LDMAXENT	.655004 (1.822200)	.675449 (1.547500)
LNARR	- -	- -
R-SQUARE	.879440	.879470
F-STATISTIC	45.228000	36.484300
YRS.	1933-56 1967-79	1933-56 1967-79

Source: Los Angeles Police Department, Annual Budgets, and County and City of Los Angeles

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

about 1/10%, such increases do not appear to explain the growth in unit costs we have witnessed since the early 60's.

At this point what we have is the possibility that court decisions regulating police behavior are instrumental in causing the growth in the costs of law enforcement. There is some indication that this is the case, but we have not yet adequately tested this hypothesis. Our index of court activity concerning rules prohibiting police conduct evidences a very strong time trend since the late 1950's. In fact, we were unable to simultaneously estimate coefficients on both the time trend since 1960 and a variable that measured court activity concerned with rules prohibiting police conduct (PREC1).

We were able to estimate the impact of defense expenditure per arrestee on the costs of law enforcement. Although these expenditures are a statistically significant determinant of such costs they do not appear to explain the post 1960 trend in the unit cost of enforcement. Moreover, it is not clear that the trend in such expenditures is determined primarily by changes in rules prohibiting police conduct. State and federal court decisions mandating representation in criminal cases and not the implementation of rules prohibiting police conduct may have been the major determinant of the growth in public expenditures per arrestee. Interesting as the results concerning expenditures per arrestee are, the variable itself does yield a clear test of the hypothesis that the increase in the degree of police regulation by the courts is the causal factor in the post 1960 growth of costs in law enforcement.

XII. THE TRENDS IN COSTS OF IMPRISONMENT: AN ALL TO FAMILAR STORY

The discussion of time trends in crime control costs to this point has been restricted to law enforcement costs. One of the primary reasons for this was the availability of relevant historical information on this activity, especially from the Los Angeles Police Department. It is, however, important to our understanding of both the generality and underlying causes of the trends in law enforcement costs, to investigate, at least briefly, the pattern of costs in other crime control activities. Imprisonment costs are a prime candidate for such an investigation and it is to this area that we now turn our attention.

We selected for analysis the cost per inmate at the Arizona State Prison (ASP). This data was chosen not because historical data was unavailable for federal prisons or for other states, (there is adequate historical information available from the Bureau of Justice Statistics), but rather because by concentrating on a single institution we avoid a number of complicating factors. This is especially true because we are investigating historical trends on the past 50+ years. Restricting our attention to a single maximum security facility allows us to concentrate our efforts on measuring the increase in costs of a "standard" year of imprisonment. In Table 52 we present the average annual cost per inmate at the Arizona State Prison (ASP) in constant dollars from 1920 to 1981.*

*The data used to derive these unit costs exlude all capital charges and all costs are expressed in 1983 dollars.

TABLE 52

INFLATION ADJUSTED COST PER INMATE AT THE ARIZONA STATE PRISON: 1920-81

Year	Cost	Time	Cost
1920	2383.55	1951	2386.84
1921	2190.69	1952	2456.64
1922	2566.98	1953	2491.78
1923	1879.54	1954	2766.94
1924	2069.93	1955	2936.84
1925	2173.51	1956	2967.64
1926	1857.61	1957	2868.12
1927	1899.12	1958	2699.19
1928	1725.49	1959	2798.11
1929	1913.30	1960	2940.12
1930	1710.13	1961	3147.76
1931	1861.94	1962	3254.49
1932	1936.04	1963	3429.69
1933	2141.70	1964	3927.07
1934	2154.86	1965	4146.21
1935	2080.46	1966	4455.55
1936	2016.87	1967	4491.06
1937	1673.44	1968	4429.23
1938	1626.69	1969	4754.16
1939	1660.28	1970	7100.08
1940	1760.60	1971	8373.18
1941	1664.61	1972	9207.23
1942	1714.55	1973	8857.77
1943	1691.40	1974	7031.04
1944	1652.80	1975	9357.39
1945	1655.66	1976	9639.86
1946	1527.53	1977	12038.22
1947	1374.90	1978	14339.05
1948	2695.60	1979	15092.77
1949	2489.76	1980	14530.64
1950	2602.03	1981	13848.52

Source: Department of Corrections, State of Arizona

Casual inspection of Table 52 reveals a pattern in imprisonment costs that is remarkably similiar to the historical pattern of costs in law enforcement. What we observe is little or no trend in real unit costs until 1960 or so and then a rapid escalation of costs subsequent to that period. This is made more precise in Table 53. Here we estimate time trends in the growth of per inmate costs at ASP for various sub-periods between 1920 and 1981. What we find is that there is very little growth in cost per inmate prior to 1960. The estimated growth in per capita costs was about 1% per annum from 1920 to 1960 and there were periods like 1920 to 1929 when there was actually a significant annual decline in the costs per inmate. Since 1960, however, the annual growth rate has been at an historically high level of between 5 and 6% per annum. Just as in the case of unit costs in law enforcement, the period since 1960 stands out as a time of explosive growth in costs. Whatever factors are responsible for the escalation of costs in law enforcement appear to also be at work in other areas of crime control as well.

In considering the argument that imprisonment costs have risen in real terms because of the labor intensive nature of the activity, it is instructive to consider the data in Table 54. Here we calculate the ratio of cost/inmate to estimated hourly manufacturing wages from 1920 to 1980. While the ratio fell almost continuously between 1920 and 1960, it has risen almost continuously since that time. In fact in 1980 the ratio was almost 5 times the 1960 ratio. That is, the annual costs of

TABLE 53

ESTIMATED TIME TRENDS IN THE INFLATION ADJUSTED COST PER INMATE AT THE ARIZONA STATE PRISON: 1920 - 1981

Time Period	Estimated Annual Growth Rate (t - statistic)
1920-1981	.03 (11.78)
1920-1929	-.03 (-3.30)
1930-1939	-.03* (-.99)
1940-1949	.04* (1.29)
1950-1959	.01* (1.44)
1960-1969	.05 (5.49)
1970-1981	.06 (4.47)
1920-1959	.01 (3.02)

* Not statistically significant at the .05 level.

Source: Department of Corrections, State of Arizona

TABLE 54

RATIO OF COST PER INMATE TO AVERAGE HOURLY EARNINGS OF A MANUFACTURING WORKER IN ARIZONA: 1920 - 1981

Year	Cost/Wage	Year	Cost/ Wage
1920	712.32	1951	357.92
1921	632.67	1952	357.05
1922	735.36	1953	347.14
1923	513.48	1954	379.92
1924	542.01	1955	385.72
1925	585.32	1956	378.57
1926	505.58	1957	361.61
1927	506.77	1958	340.77
1928	445.76	1959	344.24
1929	492.22	1960	357.30
1930	441.12	1961	377.67
1931	471.28	1962	384.55
1932	508.83	1963	399.83
1933	540.51	1964	452.49
1934	468.37	1965	472.65
1935	449.51	1966	502.99
1936	436.55	1967	503.03
1937	335.58	1968	487.68
1938	319.57	1969	522.24
1939	318.93	1970	787.00
1940	327.87	1971	914.20
1941	294.57	1972	976.35
1942	287.32	1973	934.96
1943	268.38	1974	764.57
1944	253.36	1975	1017.50
1945	259.11	1976	1029.44
1946	246.00	1977	1262.09
1947	224.37	1978	1495.15
1948	435.85	1979	1620.53
1949	385.42	1980	1689.07
1950	390.48		

Source: Department of Corrections, State of Arizona

TABLE 55

RATIO OF COSTS PER INMATE AT THE ARIZONA STATE PRISON TO PER CAPITA INCOME IN ARIZONA: 1929 - 1981

Year	Cost	Year	Cost
1929	0.55	1955	0.45
1930	0.55	1956	0.44
1931	0.66	1957	0.43
1932	0.82	1958	0.42
1933	0.89	1959	0.42
1934	0.79	1960	0.43
1935	0.68	1961	0.46
1936	0.60	1962	0.46
1937	0.48	1963	0.49
1938	0.48	1964	0.54
1939	0.47	1965	0.55
1940	0.49	1966	0.57
1941	0.39	1967	0.56
1942	0.31	1968	0.51
1943	0.29	1969	0.52
1944	0.28	1970	0.74
1945	0.27	1971	0.85
1946	0.27	1972	0.89
1947	0.26	1973	0.83
1948	0.49	1974	0.68
1949	0.46	1975	0.96
1950	0.46	1976	0.96
1951	0.39	1977	1.17
1952	0.38	1978	1.32
1953	0.39	1979	1.36
1954	0.44	1980	1.35

Source: Department of Corrections, State of Arizona

TABLE 56

ESTIMATED TIME TRENDS IN THE RATIO OF COST PER INMATE TO PER CAPITA PERSONAL INCOME: 1930 - 1981

Time Period	Estimated Annual Hourly Rate (t - statistic)
1930-1981	.04 (2.09)
1930-1939	-.01 (2.49)
1940-1949	.08* (1.13)
1950-1959	.01* (.62)
1960-1969	-.01* (.59)
1970-1981	.06 (4.6)
1930-1960	.003* (.21)

* Estimate is not statistically significant at the 05 level.

Source: Department of Corrections, State of Arizona

incarcerating one inmate at ASP grew 5 times as fast as average wage rates between 1960 and 1980.

Considered in terms of per capita income the situation is much the same. As is apparent from Tables 55 and 56, cost per inmate after growing no more rapidly and perhaps less rapidly than per capita income from 1929 to 1960, grew substantially more rapidly than income between 1960 and 1980. From 1960 to 1980 the costs of incarcerating an inmate grew about 3 times as fast as per capita income. Clearly the explosion of costs of law enforcement that we observed and analyzed in this report is not an isolated occurance in the criminal justice system. Imprisonment costs appear to follow precisely the same pattern.

XIII. CONCLUDING COMMENTS

In the various sections of this report, we have reviewed the rise and fall in public order, the connection of this phenomenon to the historical trends in crime control and the relationship between the pattern in crime control over the period and the underlying structure of crime control costs. We showed, at least for the city of Los Angeles, that arrest or clearance rates appear to obey the "law of demand". We have shown, as have other investigators, that increases in the costs of arrests reduce the demand for arrests in much the same way that recent increases in gasoline prices have reduced the demand for gasoline.

Is this, however, the entire story? Has the mundane simply been masquerading as the intriguing? Has the dramatic rise in crime rates since 1960 been a result not of any breakdown or least major shift in the structure of society, but rather simply a result of a substantial increase in the costs of apprehending and punishing criminals? While there is, from our perspective, much to recommend this view, it is, as most non-economists will claim, somewhat too economical.

There is, even from the economist's perspective, the rather bothersome question of why this particular historical pattern in costs. What accounts for the take off in the costs of arrest after 1960? At this point, we simply do not know. While we do know that the explosion in costs, at least for the Los Angeles Police Department, is not due to spiraling wage costs, we have not been able to satisfactorily isolate the factors responsible for the cost explosion.

It may very well be that the increase in the costs of enforcement and punishment that we observe reflect more fundamental shifts in the structure of contemporary society. Certainly, the most intriguing results we have on the causes of the explosion in costs of law enforcement point in this direction. If in fact, court imposed restraints on behavior turn out to be the cause of the "run up" in police costs and court decisions on related issues prove to be the missing link in the puzzle of rising prison costs, then increasing crime control costs may turn out to be an explanation of the explosion in crime rates in only the most superficial terms. The rise in costs of crime control that we observed may simply reflect changing political values towards crime control and the reaction to these increases in cost may be only the "tip of the iceberg". Of course, before we know whether this is the case, we need to know much more about the basic causes of the shift in crime control costs. Hence, the proverbial recommendation for more research; in this case, research on the determinants of the cost of crime control.

Moreover, whether or not the pattern in costs reflects political values or increasing scarcity of the factors necessary for crime control, it is not clear how much of the decline in deterrent levels can be accounted for by the movements in costs. It is quite possible that not only have the costs of crime control risen over the past several decades, but so has the population's tolerance for crime. In the jargon of the economist, there may have been a decline in the public demand for law enforcement. This is an area that requires substantial investigation. Why of course the tolerance for crime has increased; if it has, is itself not a

trivial problem from an economic perspective. What needs doing in this area is clear. First, we need a rigorous econometric investigation of the topic designed to provide an estimate of how much of the decline in crime control during the past several decades can be attributed to the rise in the relative cost of crime control. Second, we need to investigate, in the same study, whether there has been an apparent shift in the willingness to pay for crime control over this same period. If there has, then we need to push the analysis one step further and inquire about why the political process produced this result.

Finally, and perhaps of most general concern, is the partial nature of the existing historical deterrence argument itself. The degradation in enforcement levels and sanctions, whatever their origins, do not account for all of the recent rise in crime rates. Precise estimates of the relative explanatory power of the deterrent variables are not readily available for the United States, and this is an area of intense need. As in the case of assessing the impact of changes in costs, we need to encourage a substantial research effort designed to ascertain how much of the rise in crime during the past several decades is due to the decline in crime control.

In any case, Wolpin's (1978) estimates for England and Wales are instructive. Wolpin (1978) finds that, for the period 1954 to 1967, decreases in deterrent variables account for only about half of the rise in the overall offense rates in England and Wales. By many accounts, we in the United States also appear to have experienced a secular drift upward in the propensity to commit crime. Neither demographics nor decreases in the level of enforcement

and/or punishment can fully account for the explosion in crime rates we have experienced since the early 1960's. Apparently, we have become a more crime prone society. Some scholars have suggested that the reason for this is quite fundamental and appears to go to the very foundation of our society. It is their contention that we are a more crime prone society today basically because families in the post-war period have been doing a less "good" job of raising their children than pre-war families. The assertion is made that during the post-war period there has been a substantial decline in the production of "good" children.

What is meant by "good" children? Basically, by "good" most observers apparently mean a child well indoctrinated with principles such as honesty, truthfulness, trustworthiness, dependability, etc. The argument continues that children growing up without adequate indoctrination in these principles will find coercion a relatively attractive method of satisfying their desires. Not only will they have little reluctance to using coercion, they are also likely to find their legitimate options quite unattractive, and they are unattractive basically for the same reason they find coercion an acceptable method of obtaining their objectives. They are adults whose human capital was not adequately developed when they were children. It is not simply that they are uneducated or untrained, but rather it is that they find education and training difficult and frustrating. They find it so, in part, because their families did not practice adequate indoctrination and training.

Why families in the post-war period may have become less interested in producing "good" children is, however, really the

crucial question. Addressing it brings us full circle. Why is it that families have found it in their interest to invest less in training their offspring in recent years? Is it perhaps that the costs of not doing so were less in the post-war period than they had been in the past? This question forces us to confront a basic question in political economy. In the crime area, we are led to inquire whether there is a connection between the post-war trends in incentives to raise children and the fact that criminals have gained in the political process during the past several decades.

Obviously, the political economy of deterrence has yet to be written. It is clear that one of the most intellectually challenging problems in this area is to provide a consistent explanation of why it appears that the incentive to train children has changed over the post-war period and why criminals as a group have been made better off relative to non-criminal taxpayers during the past several decades. Perhaps, by understanding these phenomena, we can begin to understand why it is that the United States is a much more dangerous place today than it was twenty years ago.

APPENDIX I

FIGURES A - K

Figure A: Real Expenditure Per Arrest for the Milwaukee Police Department from 1930-79 (Breaks at 1956 and 1963)

Figure B: Real Expenditure Per Arrest for the Kansas City Police Department from 1959-79

Figure C: Real Expenditure Per Arrest for the Dallas Police Department from 1954-79

Figure D: Real Expenditure Per Arrest for the St. Louis Police Department from 1946-79

Figure E: Homicide Clearance Rates for the Los Angeles Police Department from 1926-79

Figure F: Rape Clearance Rates for the Los Angeles Police Department from 1926-79

Figure G: Robbery Clearance Rates for the Los Angeles Police Department from 1926-79

Figure H: Burglary Clearance Rates for the Los Angeles Police Department from 1926-79

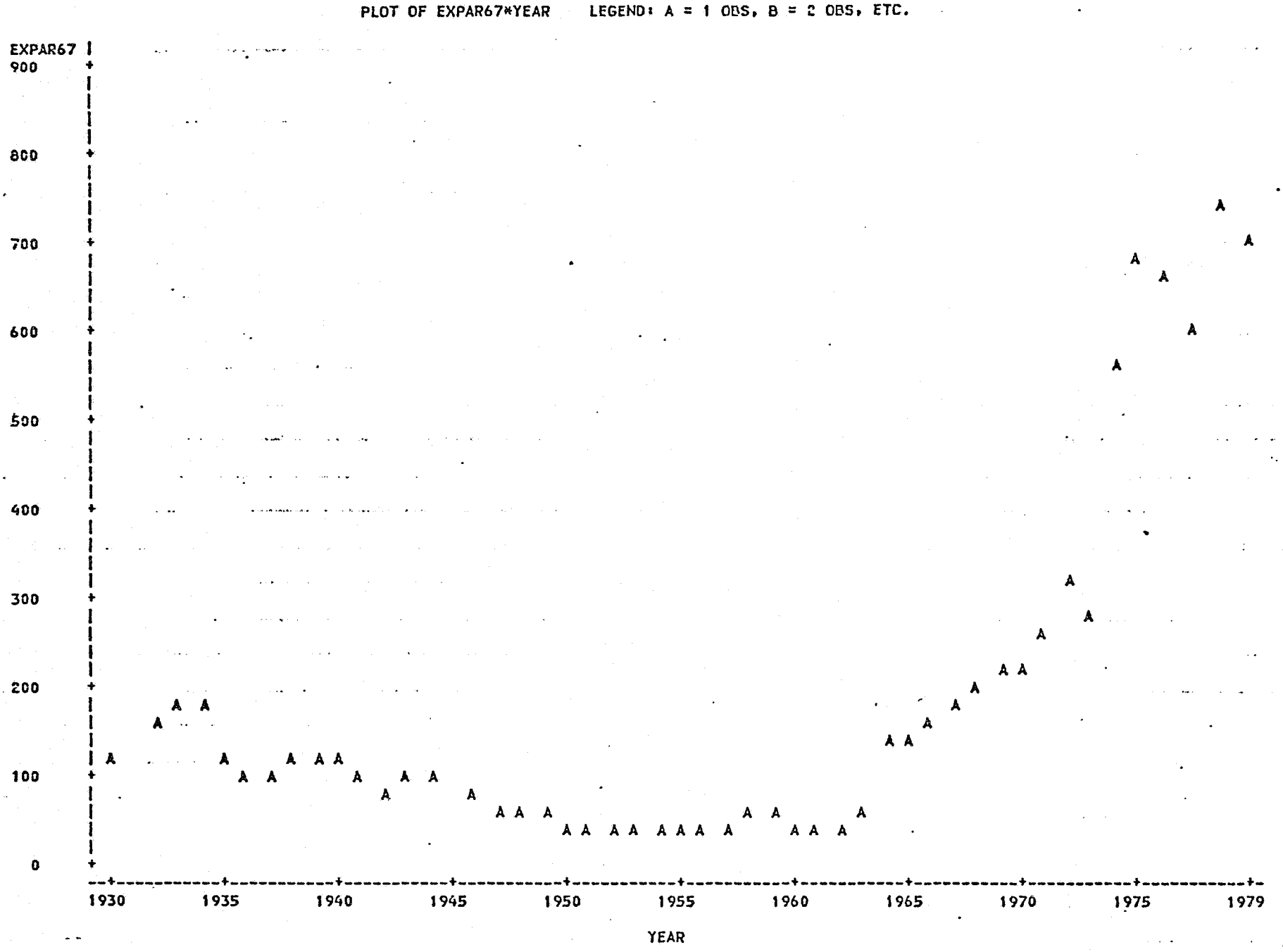
Figure I: Larceny Clearance Rates for the Los Angeles Police Department from 1926-79

Figure J: Auto Theft Clearance Rates for the Los Angeles Police Department from 1926-79

Figure K: Ratio of Police Salaries to Construction Wages for the Los Angeles Police Department from 1926-79

FIGURE A

REAL EXPENDITURE PER ARREST FOR THE MILWAUKEE POLICE DEPARTMENT FROM 1930-79
(BREAKS AT 1956 AND 1963)



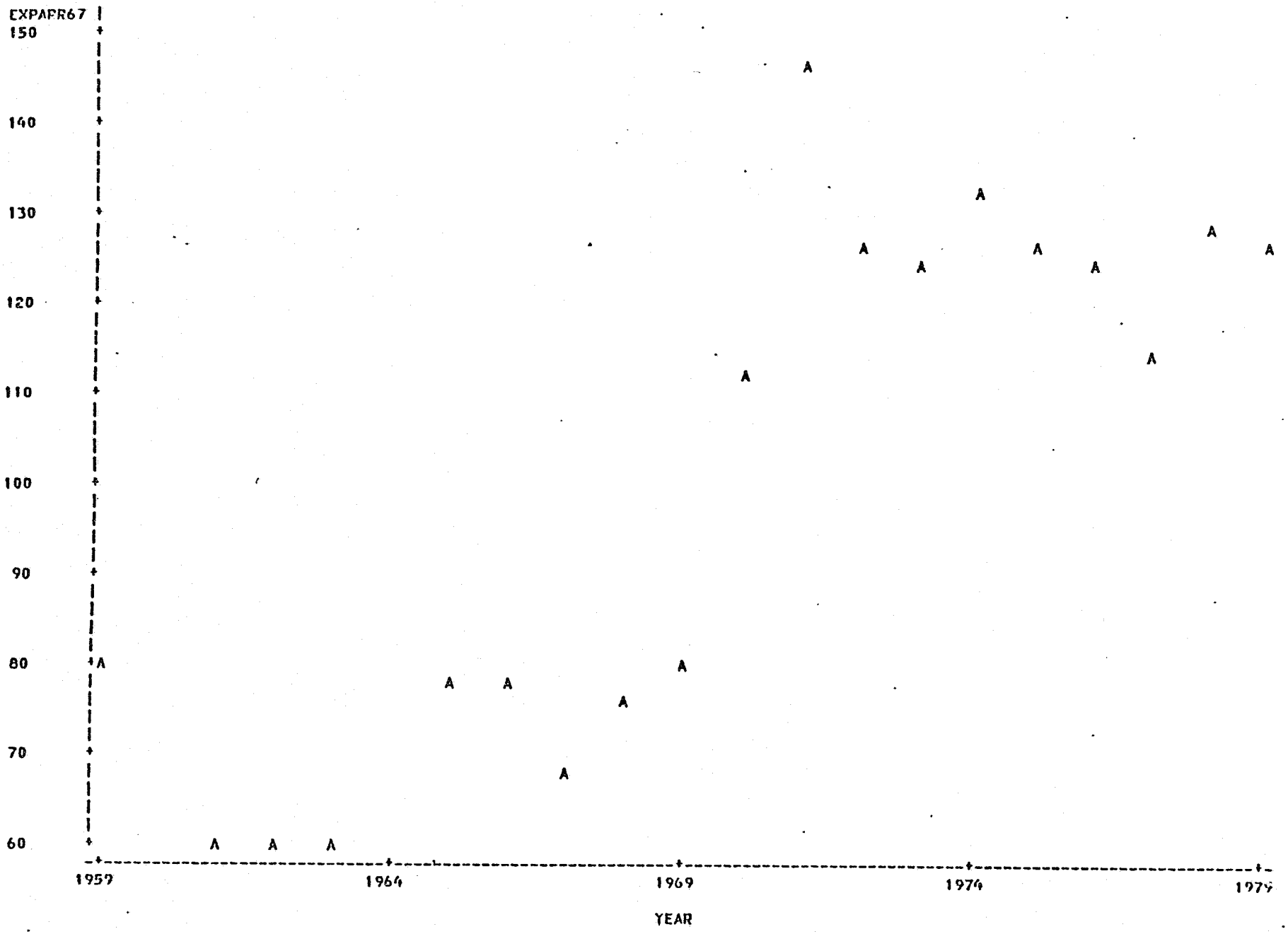
NOTE: 2 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE B

REAL EXPENDITURE PER ARREST FOR THE KANSAS CITY POLICE DEPARTMENT FROM 1959-79

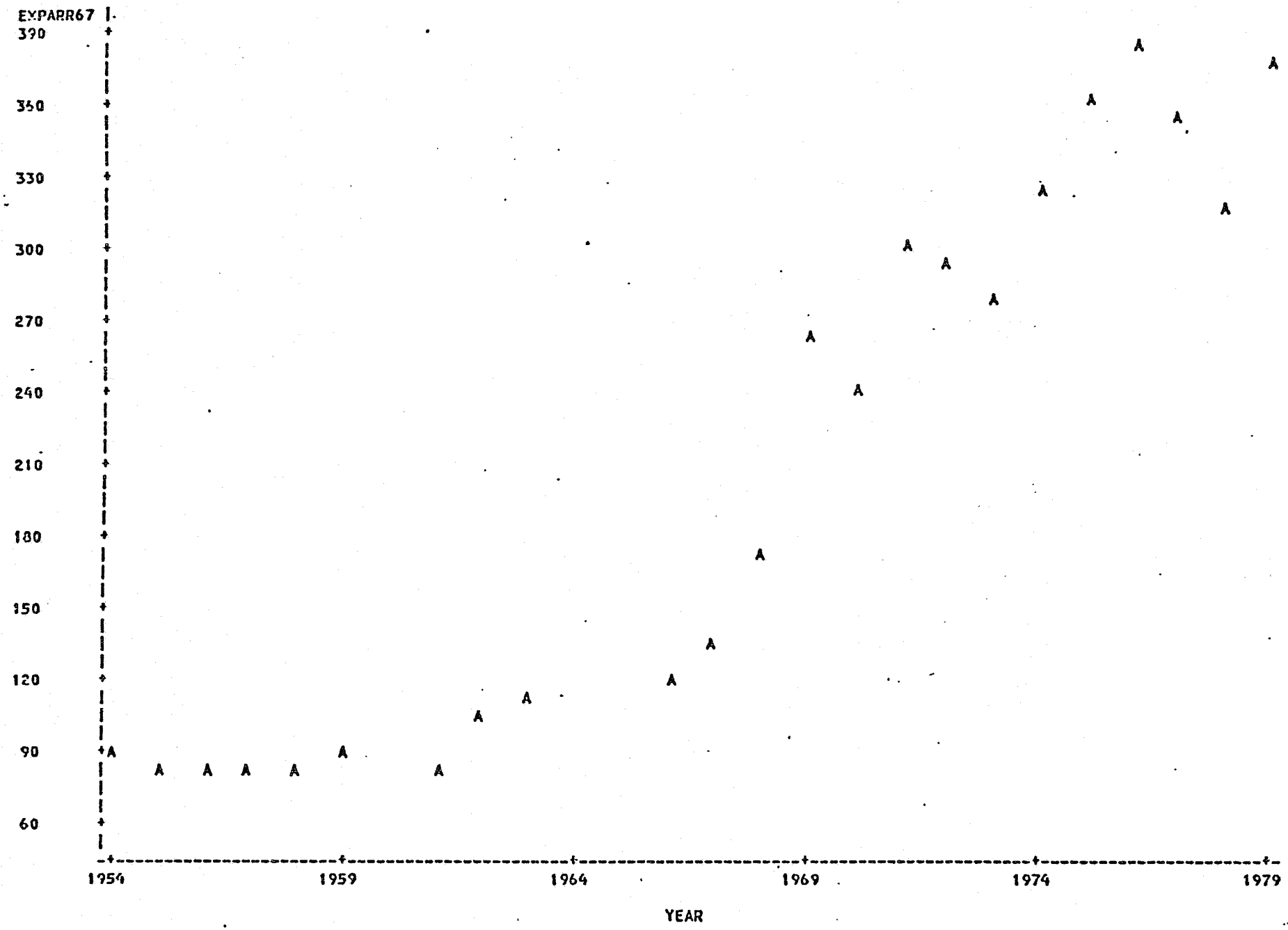
STATISTICAL ANALYSIS SYSTEM

PLOT OF EXPARR67*YEAR LEGEND: A = 1 OBS, B = 2 OBS, ETC.



NOTE: 2 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

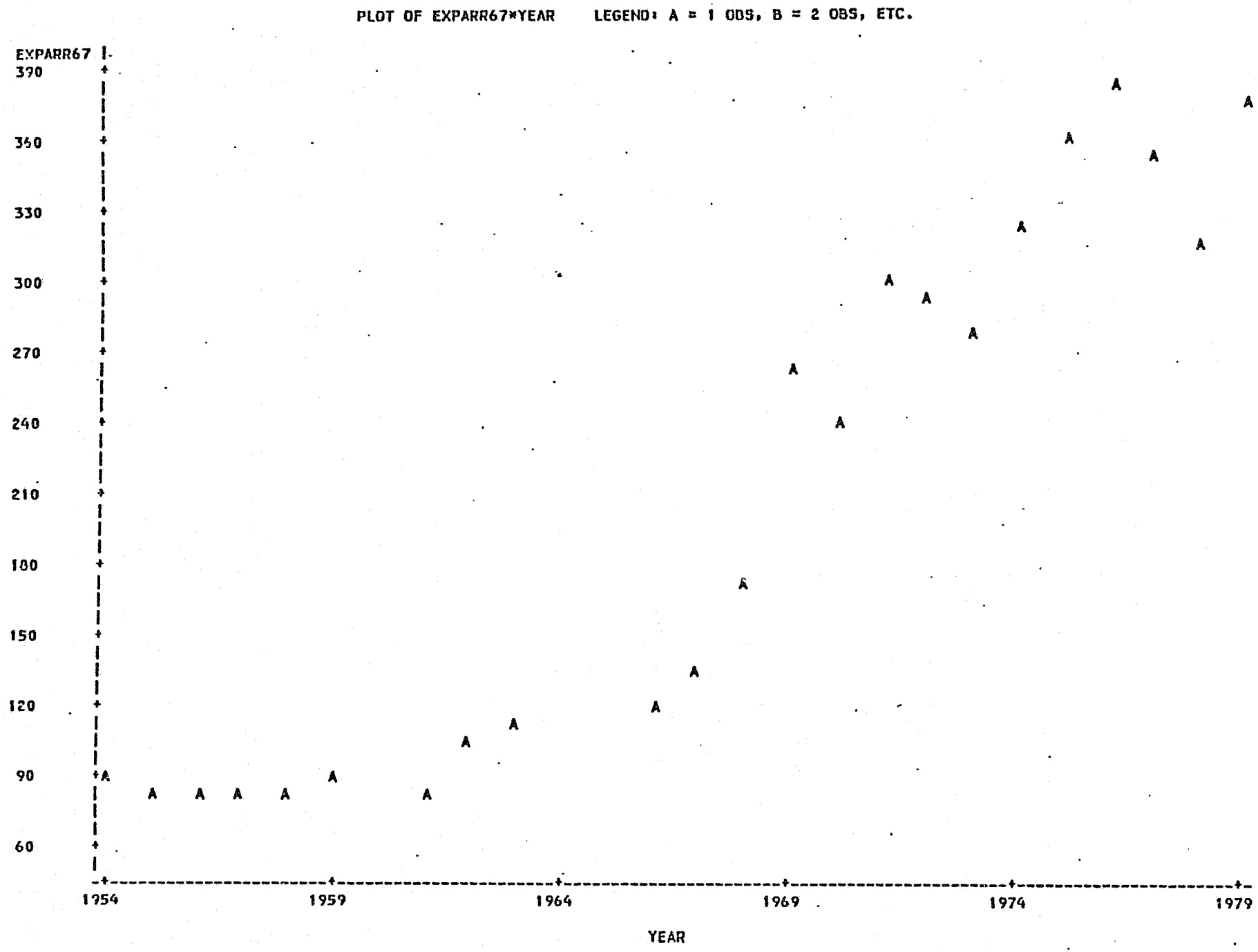
REAL EXPENDITURE PER ARREST FOR THE DALLAS POLICE DEPARTMENT FROM 1954-79



NOTE: 14 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE D

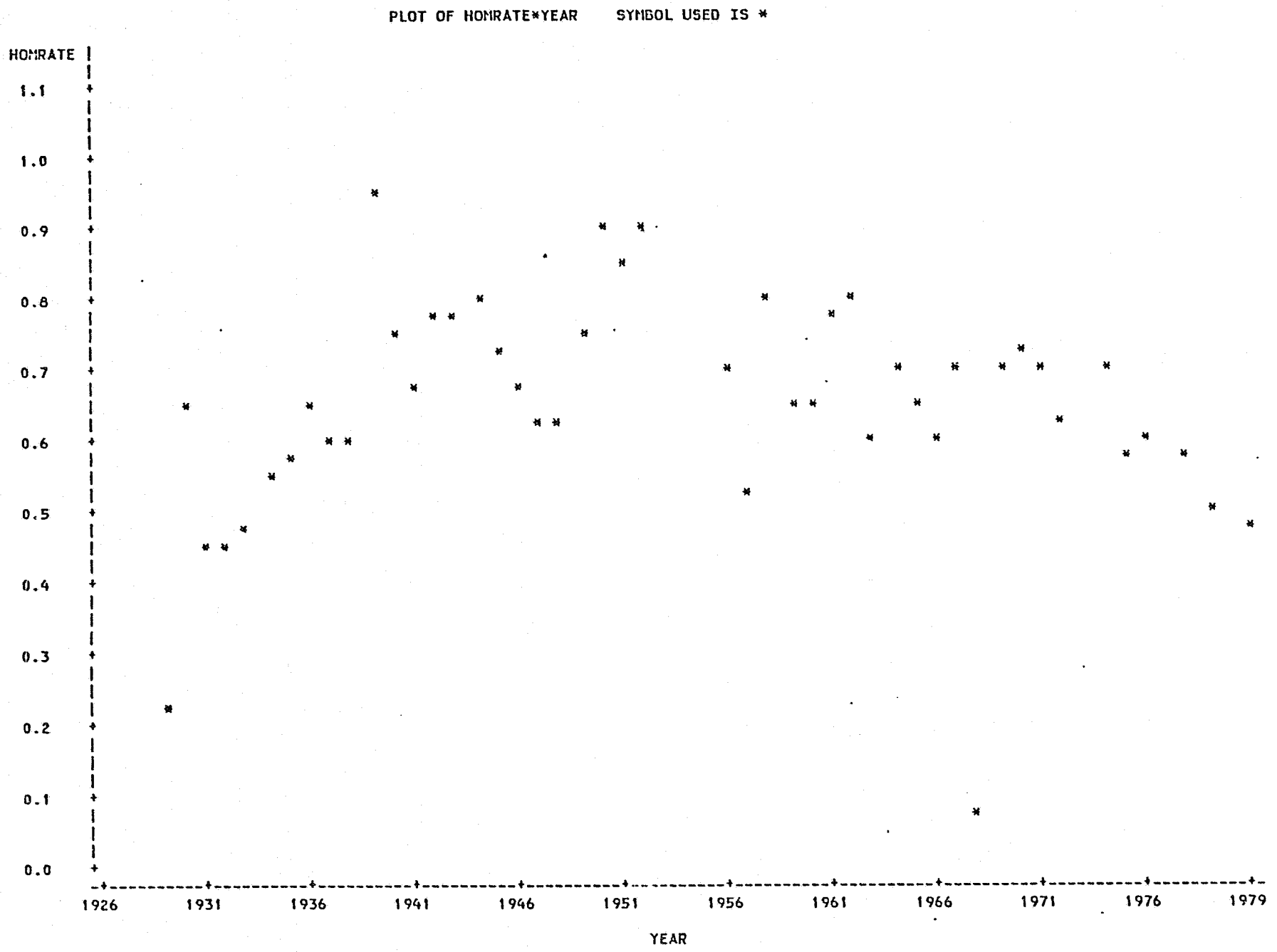
REAL EXPENDITURE PER ARREST FOR THE ST. LOUIS POLICE DEPARTMENT FROM 1946-79



NOTE: 18 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE E

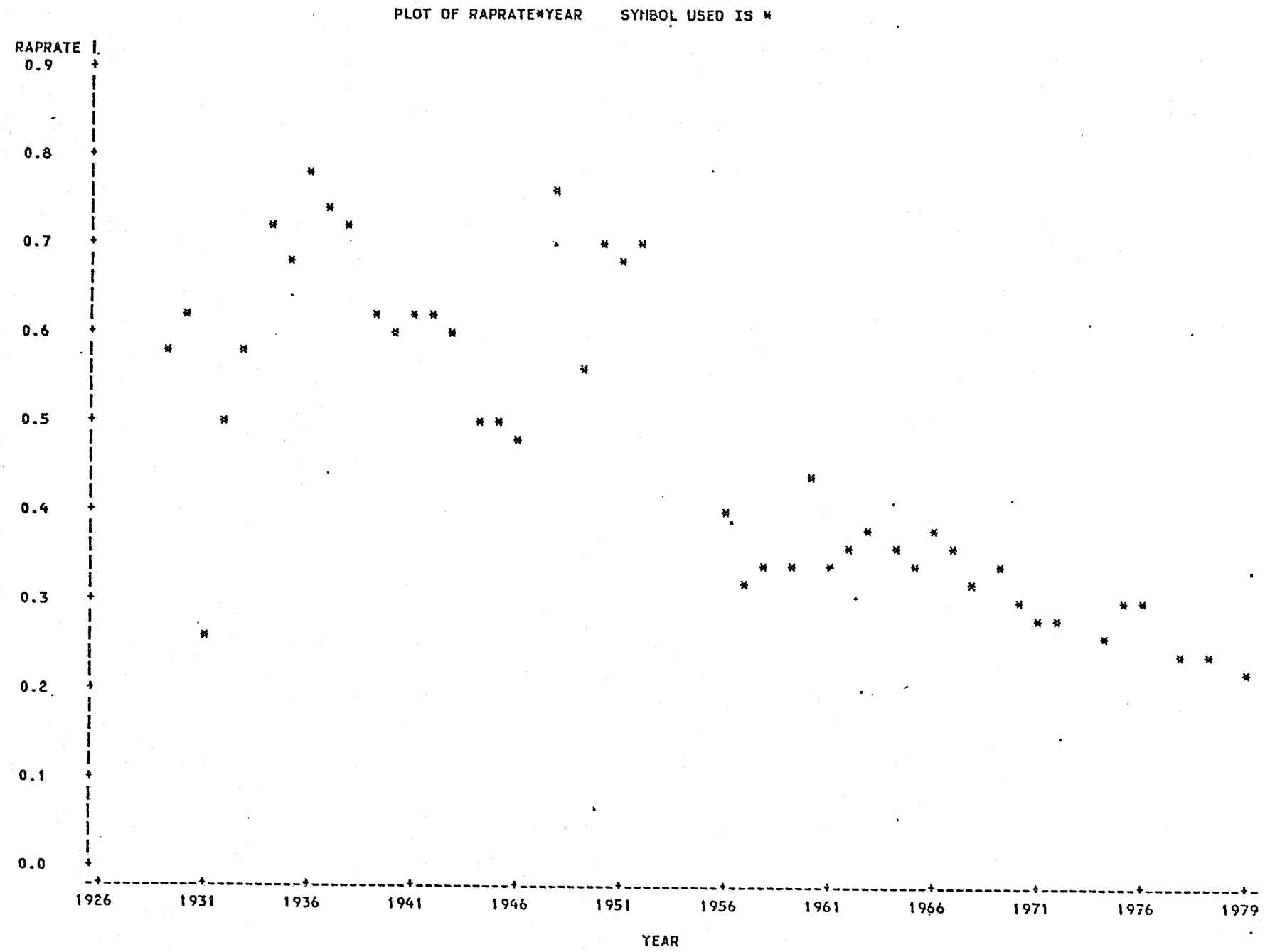
HOMICIDE CLEARANCE RATES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 19 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE F

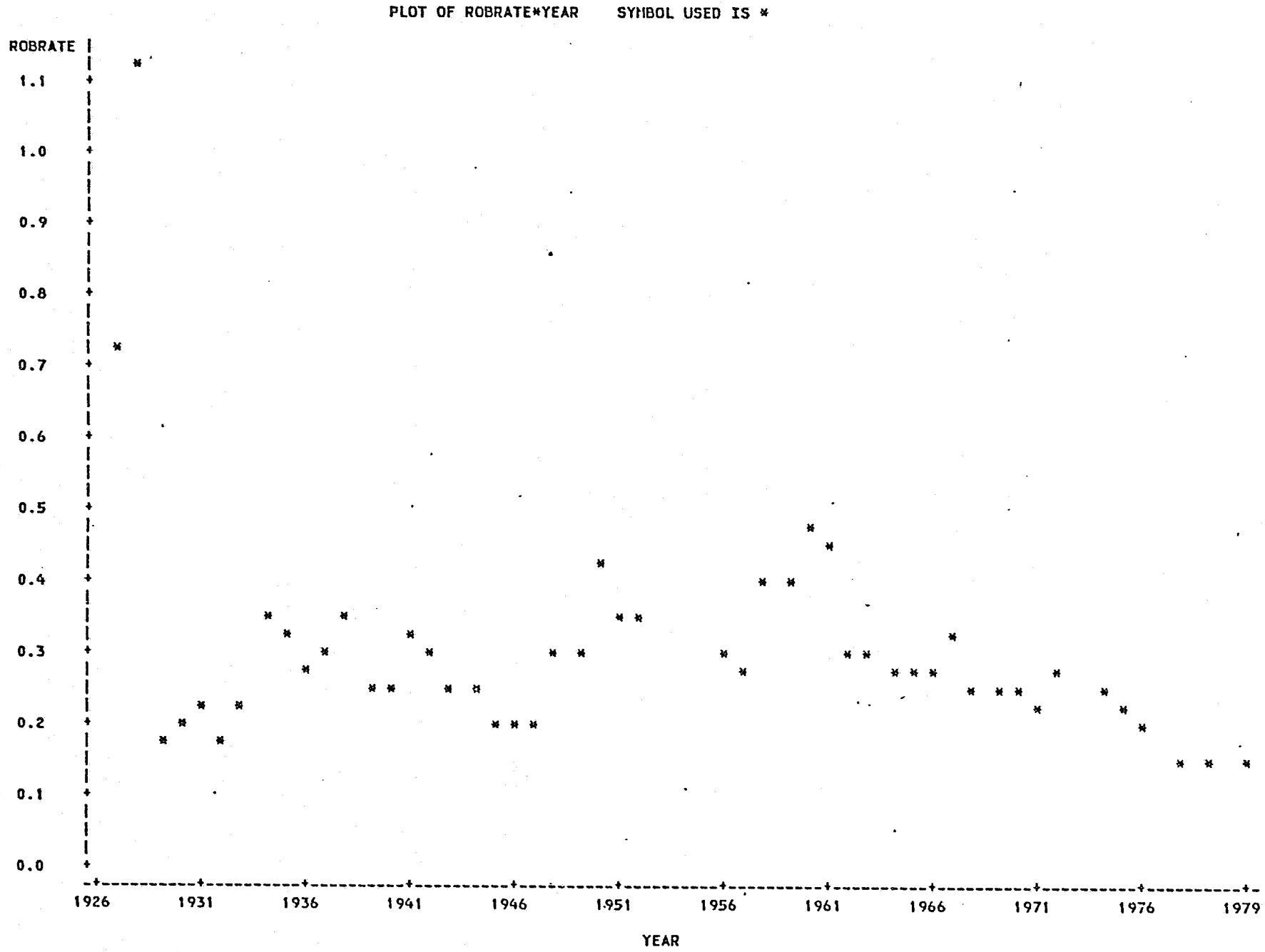
RAPE CLEARANCE RATES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 20 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE G

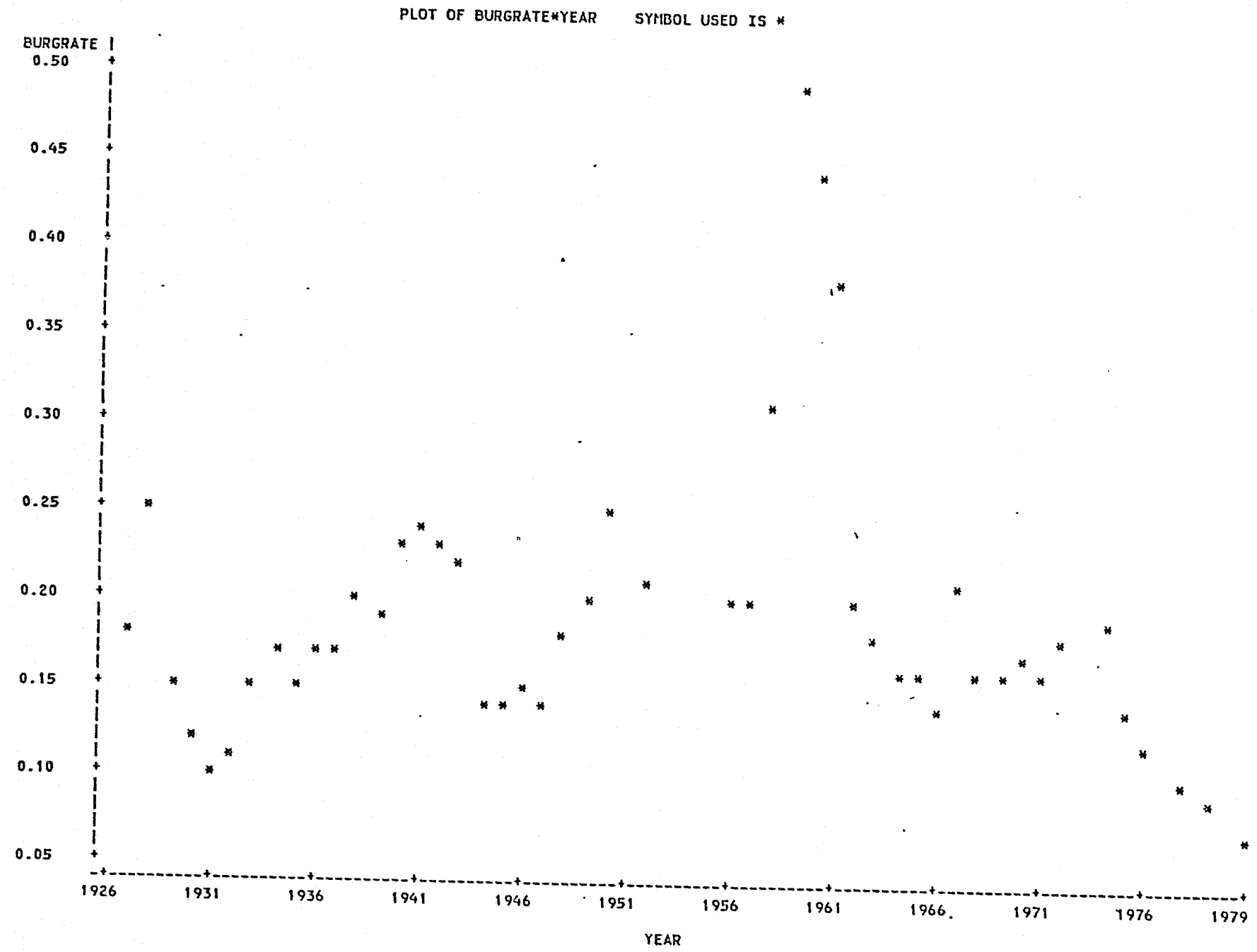
ROBBERY CLEARANCE RATES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 17 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE H

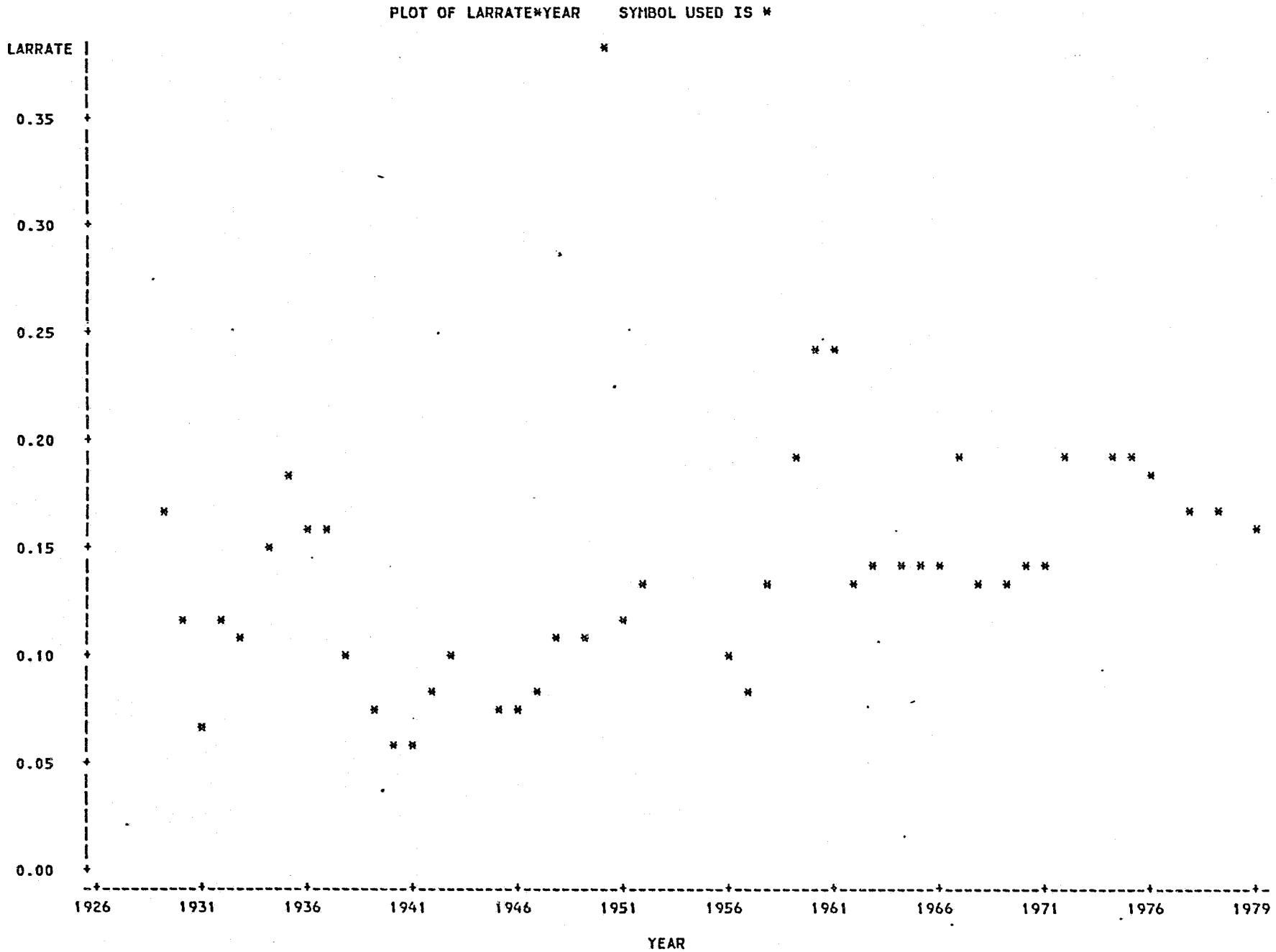
BURGLARY CLEARANCE RATES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 18 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE 1

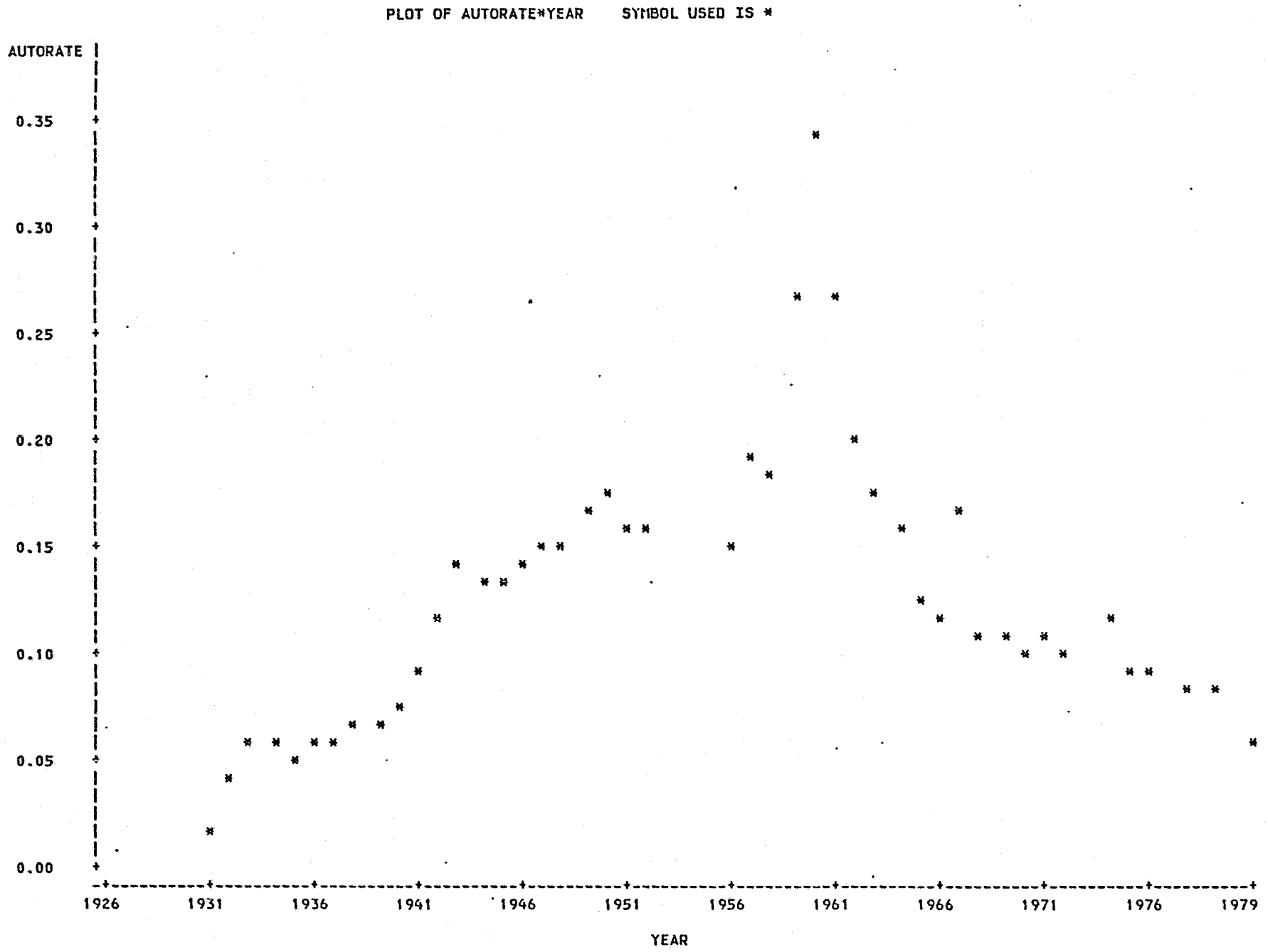
LARCENY CLEARANCE RATES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 20 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE J

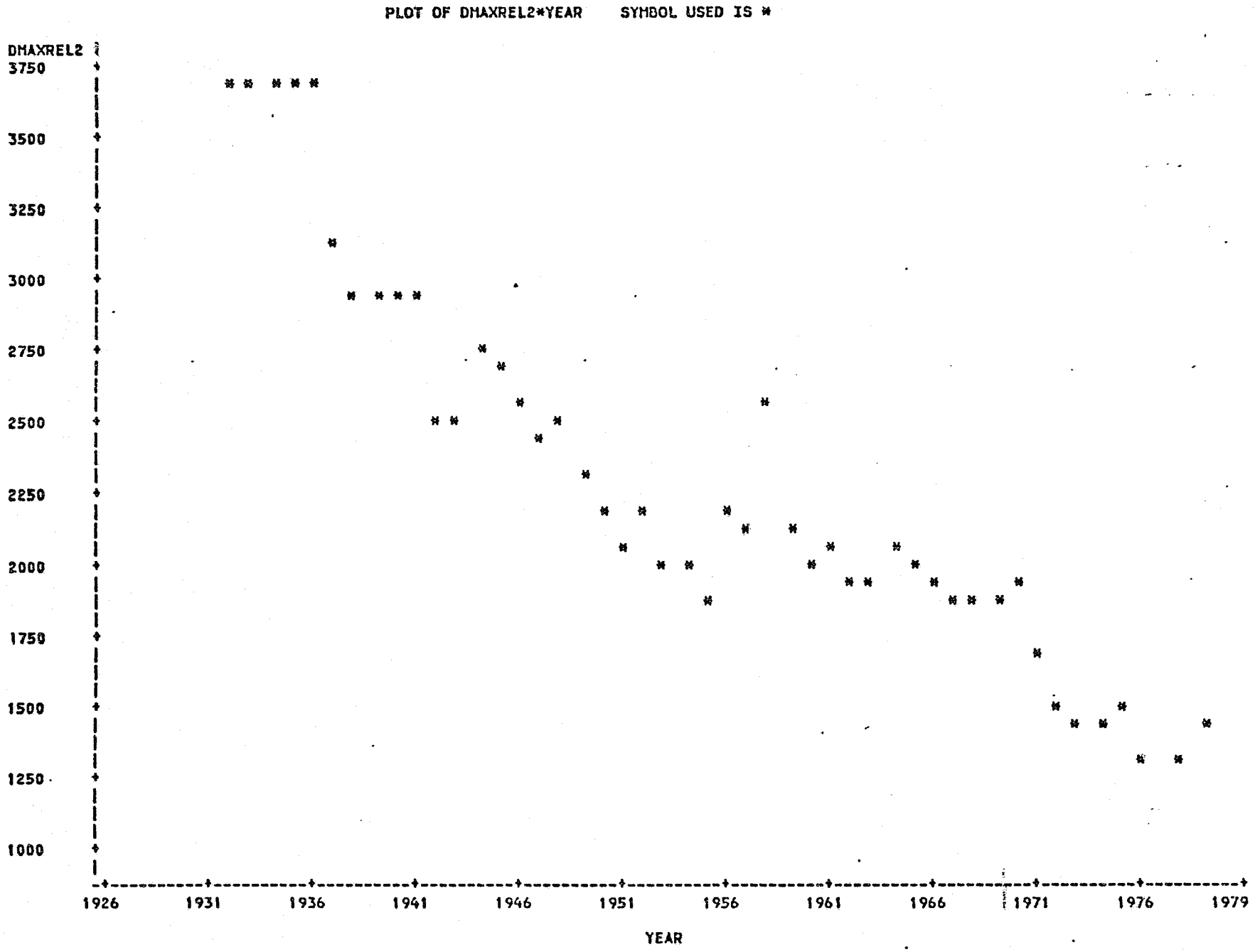
AUTO THEFT CLEARANCE RATES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 21 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

FIGURE K

RATIO OF POLICE SALARIES TO CONSTRUCTION WAGES FOR THE LOS ANGELES POLICE DEPARTMENT FROM 1926-79



NOTE: 6 OBS HAD MISSING VALUES OR WERE OUT OF RANGE

APPENDIX II

THE COSTS OF CRIME CONTROL, THE LEVEL OF CRIME, AND THE SIMULTANEITY PROBLEM

To examine the problem introduced by simultaneity, consider the following simple system of equations:

$$C = \alpha_1 + \beta_1 A + \beta_2 Z \quad (1)$$

$$A = \alpha_2 + \beta_3 C + \beta_4 P + \beta_5 X \quad (2)$$

where C is the crime rate, A is the arrest rate or crime control level, P is the price or cost of crime control, Z represents factors other than enforcement that influence crime rates, and X represents factors other than costs and the crime level that determine the arrest rate. As this simple system illustrates, if increases in the level of crime depress the level of crime control ($\beta_3 < 0$), then predicting the impact of increases in costs on the crime rate will require more information than the simple fact that the demand for crime control obeys the "law of demand" ($\beta_4 < 0$).

If, as some observiers claim, increases in the level of crime, C, "overwhelm" or crowd the criminal justice system so that an increase in the crime rate actually decreases the level of crime control, the fact that increases in the costs of crime control lead to a reduction in the desired level of crime control will be insufficient to predict the impact of such changes in costs on the actual level of crime. Knowledge concerning the trends in the cost of crime control will not, under these circumstances, be sufficient, even if all other factors are constant, to make inferences about trends in crime rates.

If crime and crime control are simultaneously determined, then for us to make the assertion that the increases or decreases in the cost of crime control will be associated with decreases or increases in the level of crime, we need, at the very least, to have knowledge concerning the following reduced form equation:

$$C = \alpha_3 + \frac{\beta_1\beta_4}{(1 - \beta_1\beta_3)} P + \frac{\beta_1\beta_5}{(1 - \beta_1\beta_3)} X + \frac{\beta_2}{(1 - \beta_1\beta_3)} Z \qquad (2A)$$

Assuming that increases in the arrest rate or the level of crime control reduce the level of crime ($\beta_1 < 0$) and that the demand for crime control behaves in the same manner as the demand for other commodities ($\beta_4 < 0$), then what is required to translate changes in costs and into changes in the level of crime is the sign of the denominator in 2A or $(1 - \beta_1\beta_3)$. Clearly, if increases in the crime rate increased the arrest rate ($\beta_3 < 0$), as Ehrlich (1977) suggested may be the predominant influence of crime on crime control, then the problem would be solved.* However, if we accept Nagin's (1978) "crowding" hypothesis ($\beta_3 < 0$), the situation is not so straightforward. In this case, we require relative magnitude information in order to derive the sign of the denominator in 2A. Essentially, we need to know if, on balance, an increase in the arrest rate decreases or increases the crime rate, i.e. if

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*Specifically, according to Ehrlich (1972, p. 304): "While 'crowding effects' might be expected in the short run due to adjustment costs, it is rather unlikely that such effects would dominate the association between crime and law enforcement instruments persistently and, in particular, the association reflected in cross-sectional data. Indeed, evidence developed in my cross-sectional work indicates a strong positive association between the frequency of offenses and expenditures on police activity across different states."

$(1 - \beta_1\beta_3) \gtrless 0$. Only if an increase in the arrest rate leads on balance to a decrease in the crime rate, will we be able to infer that an increase in the costs of crime control will lead to an increase in the crime rate.

Below we present the value of $(1 - \beta_1\beta_3)$ implied by the estimates of the coefficients β_1 and β_3 in a number of the most comprehensive econometric studies of deterrence performed to date.*

Author(s)	Implied Value of $1-(\beta_1\beta_3)$
Ehrlich (1972)	.10
Votey and Phillips (1975)	.02 to .39
Wolpin (1978)	.76

The results of all of these deterrence studies suggest that the denominator in 2A is in fact positive. While we have not been able to actually perform the appropriate tests of statistical significance on the values of $(1 - \beta_1\beta_3)$ above, it does appear as if one can make inferences about changes in the level of crime from changes in the costs of crime control.

In addition to the implications of the deterrence studies cited above we do have some limited direct information on the relevant reduced form coefficient in 2A. If we solve the structural equations in 1 and 2 for the level of crime control instead of the crime level we obtain:

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*These studies were chosen both because they are comprehensive and because they appear to be the most frequently referenced econometric studies of the criminal justice system.

$$A = \alpha_4 + \frac{\beta_4}{(1 - \beta_1\beta_3)} P + \frac{\beta_5}{(1 - \beta_1\beta_3)} X + \frac{\beta_3\beta_2}{(1 - \beta_1\beta_3)} Z \qquad (1A)$$

Obviously, the denominator is the same in this equation as it is in Equation 2A. Moreover, we have some direct information on the coefficients in Equation 1A.

Specifically, in Block (1981) we estimated the equation:

$$S + \alpha^5 + \beta \text{ SALARY} + \gamma \text{ PCAPINC},$$

where S was the solution rate for theft, SALARY was the maximum starting salary for a police officer, and PCAPINC was per capita income.* The estimation was performed for a random sample of approximately 50 SMSAs in 1971.** The actual equation resulting from that estimation was:

$$S = 15363 - \underset{(-2.06)}{.00003 \text{ SALARY}} - \underset{(-1.19)}{.00002 \text{ PCAPINC}} \qquad (3)$$

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*Solution Rates are for 1970 and were derived from data supplied by the Federal Bureau of Investigation. See: Center for Econometric Studies of the Justice System, Hoover Institution. Revised SMSA Data Set 12-14-78. A Per Capita Income is for 1969 and was obtained from: U.S. Department of Commerce, Survey of Current Business, April, 1929, pp. 25-29.

**The SMSA's included in the actual estimation were: Abilene, Albany (GA), Albuquerque, Ann Arbor, Augusta/Richmond, Austin, Baltimore, Baton Rouge, Beaumont, Billings, Boise, Bloomington/McLean, Bridgeport, Brownsville, Bryan/Brazos (TX), Buffalo, Cedar Rapids, Charlotte, Colorado Springs, Columbus (GA), Columbus (OH), Corpus Christi, Decatur/Macon (IL), Dubuque, Duluth, El Paso, Flint, Fort Lauderdale, Grand Rapids, Hartford, Honolulu, Houston, Jacksonville, Lansing, Memphis, Miami, Milwaukee, Newark, New York, Omaha, Orange/Orlando (FL), Phoenix, Seattle, Shreveport, Spokane, Springfield, Toledo, Tucson, Washington, Wichita, Wichita Falls.

and the R^2 = .29.* Assuming the variable SALARY proxies for the cost of crime control, the results in Equation 3 suggest that changes in the level of costs are directly translatable into changes in the level of crime.

*The coefficient divided by its standard error appears below each coefficient.

APPENDIX III

A NOTE ON PRIOR STUDIES OF CRIME CONTROL COSTS

While there have been a number of very sophisticated studies of productivity and cost functions for police departments performed in recent years, it is not clear that these studies addressed all of the important issues in the area.* In fact, many of these productivity and cost studies appear to have proceeded without addressing any specific problem in the cost of crime control. This point is perhaps best illustrated by reviewing two of the most technically competent and sophisticated studies in the area.

The two studies are Heineke's (1977) "An Econometric Investigation of Production Cost Functions for Law Enforcement", and Phillips' (1978) "Factor Demands in the Provision of Public Safety." Both of these are extremely technical papers. For example, according to Heineke, one of the important aspects of his paper is that it involved the modelling and estimation of "the structure of production for a multiple output-multiple input firm in a manner which places few restrictions on first and second order parameters of the underlying structure." (Heineke, 1977, p. 1). Heineke's (1977) and Phillips' (1978) papers are often cited as "state of the art" examinations of the cost structure of police departments.

The immediate objectives of Heineke's work were to provide both a basic understanding of the "technology" underlying police production and a marginal cost function for various crime control outputs. The larger question being addressed was the provision of information necessary for the efficient allocations of public

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*Heineke (1977) and Phillips (1978).

resources. Heineke's (1977) study produces results on two levels. In terms of overall structure, Heineke (1977) found that, according to his tests, police departments did not minimize costs.* On a more mundane level, the study also provided an estimate of the marginal costs of an arrest for several types of crimes (crimes against the person, motor vehicle theft, burglary, robbery, and larcenies).**

In discussing the most interesting result to come out of this research effort, i.e., that police departments do not minimize costs, Darrough and Heineke (1978) make no attempt to collaborate this finding with other evidence. The result suggesting the absence of cost minimization is genereatd by a powerful, but entirely formal test of the specific data used to estimate the cost function and is less than a convincing general finding because of lack of collaborating evidence. Methodologically, Heineke (1977) was and is unexceptionable. However, it was never clear that the Heineke (1977), or Darrough and Heineke (1978) addressed issues of any substantial practical importance in crime control. There is no discussion in Heineke (1977) or in Darrough and Heineke (1978) about any implications of their finding of non-cost

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*This result is actually reported in Darrough and Heineke (1978). Specifically, the authors state that: "at least in our sample, the decisions of police administrators seem to be inconsistent with cost minimization." The opposite result concerning cost minimization was reported in Heineke (1977) but we understand that this resulted from an error in calculation that was remedied in Darrough and Heineke (1978).

**Of course given the structure of the model, these results are somewhat less informative than they appear. Specifically, the estimation is accomplished by assuming value maximization and restricting the value of the marginal cost of all arrests except crimes against the person. See Darrough and Heineke (1978, pp. 273-276).

minimization except the strictly formal problem this poses for the interpretation of their cost function. Moreover, while the finding is termed "of particular interest" in the summary, it appears to be disavowed in the text.* All of the parameter estimates presented by Heineke (1977) and Darrough and Heineke (1978) in the text, are based on a model that assumes cost minimization. Finally, the other interesting general finding in this paper, i.e., the rejection of constant returns to scale, appears to the authors to have no implications other than the "inappropriateness of maintaining a Cobb-Douglas production structure in studies of law enforcement . . ." The authors simply do not connect their findings to any important observable phenomena in crime control.

The study by Phillips, "Factor Demands in the Provision of Public Safety", suffers from somewhat the same shortcomings as the work by Heineke (1977) and Darrough and Heineke (1978). However, in Phillips' (1978) case, the problem is much less severe. Phillips (1978), like Heineke (1977), uses a very sophisticated approach to representing the input-output relationship in the production of safety. The device used by Phillips (1978) is an "implicitly additive indirect production function." This was chosen according to Phillips because "its properties are general enough to allow for different elasticities of substitution between factors and for non-homotheticity and yet requires the estimation of fewer parameters than the more general translog or generalized Leontief functions." Phillips (1978) like Darrough and Heineke (1978) finds that police departments are inefficient. Once again, this

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*Darrough and Heineke (1978, pp. 288-290).

we are provided with somewhat more institutional detail. Feather-bedding or "over-uniforming" are suggested as the source of inefficiency in the police departments analyzed by Phillips.

The findings by Phillips (1978) are potentially very important, yet here as in Darrough and Heineke (1978) the author provides very little collaboration for his results. The implications of the type of inefficiency suggested by Phillips are not really addressed in the paper. While this is really quite an interesting paper, it fails to convince the reader that the problem is important. Unfortunately, the methodological points in Phillips' (1978) paper overshadow the empirical findings. Again, here as in Heineke (1977), the author fails to convince us that his work is helpful in understanding an important problem in crime control.

The specific findings of the present study on the costs of crime control will not make the Heineke (1977) and Darrough and Heineke (1978) studies more relevant or the implication of the Phillips (1978) study more transparent. However, the knowledge gained from the present undertaking should make future studies of the costs of crime control more valuable to policymakers. One of the primary objectives of this study is to provide perspective and specifically, to enumerate some of the "facts" concerning the costs of crime control that require explanation; facts that any theory of cost determination should help us understand.

APPENDIX IV

TABLES I AND II

Table I: Estimated Time Trends in the Cost Per Arrest for the Los Angeles Police Department with Adjustment for World War II

Table II: Estimated Time Trends in the Ratio of Average Pension (AVPEN) to Maximum Entrance Salary for the Los Angeles Police Department: 1931-79

TABLE I

ESTIMATED TIME TRENDS IN THE COST PER ARREST FOR THE LOS ANGELES POLICE DEPARTMENT WITH ADJUSTMENT FOR WORLD WAR II

	REGRESSION
VARIABLE	
CONSTANT	1.7967
TIME 1	-.0125* (-3.2200)**
TIME 2	.0778 (15.8800)
PERIODSHIFT	-2.5050 (-12.0800)
WORLD WAR II	-.0654 (-.7800)
R-SQUARE	.9300
F-STATISTIC	1932-79
YRS	140.75

Source:

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

TABLE II

ESTIMATED TIME TRENDS IN THE RATIO OF AVERAGE PENSION (AVPEN) TO MAXIMUM ENTRANCE SALARY FOR THE LOS ANGELES POLICE DEPARTMENT: 1931-79

	REGRESSION
VARIABLE	I
CONSTANT	4.633490
TIME 1	.011911* (4.578700)**
TIME 2	.063029 (13.867100)
PERIODSHIFT	-1.206220 (-5.700230)
DEPENDENT VARIABLE	LAVPEN
R-SQUARE	.975710
F-STATISTIC	602.558
SAMPLE SIZE	49

Source: Los Angeles Police Department

Notes:
* Estimated Coefficient
** Estimated Coefficient/Standard Error

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