The Effect of Educational Expenditures on Crime & Juvenile Arrest Rates in Michigan Cities

Plan "B" Thesis

by

Greg F. Orlofsky

Submitted to

Michigan State University

in partial fulfillment of the
requirements for the degree of

Master in Urban & Regional Planning – Urban Studies

Spring 1998

ACKNOWLEDGMENTS

I wish to extend my gratitude to the following groups and individuals for their assistance in compiling and analyzing the necessary data: Greg Winter; Christina Dejong, Ph.D.; Glenda Rader, Michigan Department of Education, Office of Administrative Services; Bernadette Scarborough, Michigan Department of State Police, Central Records Division (Uniform Crime Reporting); and the Michigan Information Center.

Special thanks to Zenia Kotval, AICP, Ph.D. and James Mertes, Ph.D. for their help in preparing this document. And finally, I wish to express my sincerest appreciation to my friends and family for their continuing support.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

In 1994 the Michigan legislature passed "Proposal A" which abolished property taxes as the primary source of funding for public education and raised the State Sales Tax by 2%. The change in the tax structure means that all consumers are now contributing to the generation of funds for public education. The purpose of this paper was to discover whether or not communities, in general, benefit from increased levels of spending on local education through a reduction in crime and juvenile arrest rates.

It has been argued that changes in educational spending per student is not an adequate means of measuring student performance and that testing scores (i.e. ACT, SAT, etc.) would be better indicators, however, for the purpose of this paper, spending per student is the appropriate variable, as student performance is not in question. Previous efforts to show linkages between crime and education have been fairly unsuccessful, still, no attempts have been made to link the actual amount of spending on education to crime. The unit of analysis in past studies seems to have always been the individual, rather than the community. Moreover, recent studies do imply that education increases the productivity of workers and that productivity can, in turn, lead to a reduction in crime.

Data for the study was obtained from the Michigan Department of Education and Michigan Department of State Police. Crime/juvenile arrest variables were adjusted using population estimates to develop rates. Expenditure data was adjusted for inflation. There were five variables used in the study. Current Operating Expenditures per Pupil was the independent variable. Index Crime Rate, Non-Index Crime Rate, Total Crime Rate and Juvenile Arrest Rate represented the dependent variables.

Scatterplots accompanied by a fit-line provided a visual indication as to whether or not these variables were, in fact, related. These inferences were confirmed using statistical analysis (i.e. Pearson's correlation coefficient r and a t-test). The level of significance for the null hypothesis to be rejected was < .05 (95% confident that there was not a Type I error). Analysis for those correlations found to be statistically significant, proceeded further with regressions to determine the extent of the relationship between the two variables (coefficient of determination r^2) and the regression equation to see exactly how crime rates vary with increases in operating expenditures.

The results seemed to indicate that communities with large amounts of expenditures are just as susceptible to crime and juvenile arrests as are communities with relatively low expenditures on education. Comparing % change in expenditures with % change in crime/juvenile arrest rates also produced insignificant results. When a "five-year lag" was incorporated into expenditures there appeared to be a clear relationship between the two variables. Although, still statistically insignificant, the likelihood of a Type I error had fell considerably. Finally, when a "ten-year lag' was incorporated there were three statistically significant correlations between % change in current operating expenditures and % change in the index crime rate, non-index crime

rate and total crime rate. This implies that there is a relationship between educational expenditures and crime/juvenile arrest rates, but only in the long term.

There was no relationship between changes in the juvenile arrest rate and expenditures, even with regard to the longest lagged correlation. This was attributed to the fact that increased expenditures help students to form a more law-abiding community when they are older. After all, juveniles, would cease to be juveniles after ten years. The fact that there was no relationship in the non-lagged correlations would seem to indicate that a community doesn't benefit from increased expenditures on education until juveniles have grown and become part of the adult community.

Changes in the Non-Index Crime Rate appears to be affected most by changes in expenditures, followed by the Total Crime Rate and finally the Index Crime Rate. The coefficient of determination (r^2) for the Non-Index Crime Rate was 16.6% (i.e. explained variation). While this may not seem significant, the goal here was not to "explain" crime rates. The purpose was to determine whether or not, educational expenditures alone can have any impact on crime rates. The results from the regressions indicate that there is, in fact, a relationship between the two.

Whether the relationship between the variables found to be related is truly a causal one may remain suspect. Since the unit of observation had to be consistent for the study, the sample was in effect, non-random. It may be inappropriate to generalize the findings of this study to cities that did not meet the criteria for the sample. Nonetheless, the very fact that a relationship was found to exist between the variables, even if only in lagged correlations, serves as a step in the right direction with regard to showing the way in which public education is, in fact, a benefit to all.

I. Introduction

Traditionally, local property owners have contributed the most revenue to public education. In 1994 the Michigan legislature passed "Proposal A" which abolished property taxes as the primary source of funding for public education instead raised the State Sales Tax by 2%. This was done to equalize both the amount of revenue that is going to each of the school systems in the State and the way in which revenue is generated (provide property tax relief and make revenue generation more equitable). With the addition of the 2% increase in the Sales Tax, which goes towards the public schools, all consumers are in effect contributing to the generation of funds for public education. While education has, for the most part, stayed out of the planning arena, this Legislative act has implications for not only students and parents, but for the rest of the community as well.

The purpose of education, as most see it, is to provide children with an adequate knowledge base so that they may become willfully employed. It seems safe to assume that the benefits parents derive in paying for the school system is that their children are educated. Very often non-parent property tax-payers contend that they derive no benefit from having other people's children educated and therefore should not be held responsible for funding schools. With the introduction of Proposal A, all members of the community are now contributing, to a certain extent, revenue for the public school system. It is my contention that there does exist a benefit to the community from public education.

II. Purpose

The purpose of the paper is to discover whether or not communities, in general, benefit from increased levels of spending on local education through a reduction in crime and juvenile arrest rates. Crime data will be correlated with figures on educational expenditures to determine which, if any, are correlated with one another, if the relationship is positive or negative, and finally which indicator is most affected by changes in spending per pupil. For those variables that do exhibit a correlation, regressions will be run to determine to what extent they are related and their regression equation.

There are many implications for this research. If, for instance, education is found to contribute to the rest of the community through a reduction in crime rates, then equity issues about the way in which school's are funded (i.e. whether there should be less of a reliance on property owners) could be addressed by future legislation. Although the focus here is the benefit to a community from public education, if there is in fact a relationship between expenditures and crime rates, that variable could be used in modeling crime rates for multiple regressions.

III. Methodology

The study began with a more in-depth investigation into "Proposal A" followed by a review of existing literature to demonstrate the linkages between education, the community and crime. Next, data on school expenditures, crimes and juvenile arrests were collected from various state agencies. Once compiled, crime data was adjusted using population estimates so that "rates" could be developed. Educational expenditures data was also adjusted to reflect inflation. Finally, the data was aggregated into five-year time periods so that "lags" could be incorporated into the study.

Analysis of the data began with correlations between crime/juvenile arrest rates and inflation adjusted expenditures. The following general hypotheses were tested:

H_0: The crime/juvenile arrest variable (independent) and the variable on educational expenditures (dependent) are INDEPENDENT events (crime/juvenile arrests do not depend on the educational expenditures).

H_A: The crime/juvenile arrest variable (independent) and the variable on educational expenditures (dependent) are INDEPENDENT events (crime/juvenile arrests do depend on the educational expenditures).

Hypotheses were "non-directional" to account for the possibility of a positive relationship between the variables.

Scatterplots accompanied by a fit-line provided a visual indication as to whether or not the variables were, in fact, related. These inferences were confirmed using statistical analysis (i.e. Pearson's correlation coefficient r and a t-test). The level of significance for the null hypothesis to be rejected was $< .05$ (95% confident that there was not a Type I error).

Analysis for those correlations found to be statistically significant, proceeded further with regressions to determine the extent of the relationship between the two variables (coefficient of determination r^2) and the regression equation to see exactly how crime rates vary with increases in operating expenditures. The final section suggests directions for future research.

The methodology and remaining sections of the paper are then ordered as follows:

"Proposal A"

↓

Education, the Community and Crime

↓

Data Collection

↓

Data Adjustment

↓

Correlations
(discussion)

↓

Regressions
(discussion)

↓

Conclusions
(future research)

IV. Background on "Proposal A"

Prior to 1973, Michigan used a "Minimum Foundation Approach" in which the State guaranteed a per pupil cost to local school districts which depended upon the local districts levying the state-determined tax rate. The State paid the difference between what was generated under this tax rate and the guaranteed per-pupil cost. If they levied less that the State tax rate, then local districts received less than the guaranteed amount.

In 1973, the State switched to the "District Power Equalization Approach" which provided a guaranteed revenue yield and paid each district below this yield the difference in the form of State formula aid payments. If a district's local revenue per pupil per mill exceeded the State's guaranteed revenue under this formula, the district was "out-of-formula" and thus received no state aid. The benefit of this system was that school districts had the power to raise more revenue than was guaranteed by the State by levying a higher millage rate. This gave school districts more "control" over the amount of funds that their schools received, and the only disadvantage to them was that they were unable to receive state aid. The drawback of this system, however, was that it produced great wealth disparities between districts. Wealthier districts that enjoyed a high property tax base could raise large revenues with a low property tax rate, while poorer districts with a low tax base raised less money even after levying high rates. In other words, where a family lived largely determined the quality of its children's education.

Between 1972-1987, Michigan voters rejected nine of ten proposals to alter taxes, three of which involved education. One election in particular in 1981 involving a plan called Proposal A—a property tax cut tied to a sales tax increase was defeated by a 3-1 margin. For fifteen years

people were debating about property taxes and education and yet nothing had been resolved (Christoff, 9/27/87).

On February 10, 1987 the Michigan Citizens Property Tax Commission released a 38 page report recommending long-term changes in the property tax system, especially with regard to the financing of elementary and secondary education. It recommended an increase in the sales tax to 6% and advocated that the state should guarantee a $3,000-per-pupil minimum (similar to the recommendations made in 1981). The report said that the minimum amount would ensure that all students in Michigan receive a basic quality education regardless of the economic wealth of their jurisdiction. The report suggested that local property taxes in support of schools be lowered from the current average of 32 mills to an average of less than 20 mills (1/1000 of the taxable property value) (Jones, 2/10/87).

The purpose of this proposed legislation was not only to reduce property taxes for homeowners and business owners but to reduce the enormous gap in funding that existed between school districts. Whitefish School District in Chippewa County had the highest level of current operating expenditures per pupil for the 1985-86 school year with $6,208. Kingsley Area School District in Grand Traverse County ranked lowest (525th) with $2,107. This amounted to almost a 3-1 ratio between the highest and lowest funded schools.

A key recommendation in the Commissions' report was the increase in the statewide Sales Tax from 4% to 6%. The increase in sales tax revenue would be pulled and redistributed to all school districts by the state so that wealthier districts would no longer be able to create such disparities (DFP, 9/24/87).

Wealthier districts were against the proposal, arguing that their schools were being punished just because they had a natural advantage. State Treasurer Robert Bowman also objected to the proposal, saying it could cause a huge flow of tax revenues to Washington, since property taxes are deductible on federal income tax returns and sales taxes are not. Others claimed that sales taxes are regressive, and consequently, the poor would suffer the greatest burden. Since many of the poor do not own their own homes, property tax cuts do not provide any kind of relief, conversely the poor do spend a relatively large amount on consumer goods that are charged sales tax (Stroud, 5/9/93).

Proposal A, first voted on in 1981, reemerged as a special issue twelve years later in 1993 and was defeated. In July 1993, without regard to the consequences, the Michigan State House and Senate overwhelmingly approved a $5.6 Billion property tax cut (PA 145 of 1993) without identifying replacement funds for the school system (Andrews, 7/23/93). Many schools were left wondering how they would be able to function the following school year. In Eaton Rapids, property taxes made up about 58% of the school budget—approximately $7.8 million. In East Lansing, 94% or nearly $23 million of the school budget was generated through property taxes all of which was reduced as a result of the cuts (Iorio, 7/23/93). On March 15, 1994, voters were asked once again to choose between alternative plans to fill the hole in funding left by the property tax cut eight months earlier, Proposal A was passed by a 69-31margin (Kearney, 1994).

The following, outlines the specific changes made in the taxing system as a result of Proposal A:

	Pre-proposal A	Proposal A
Sales Tax	4%	6%
Income Tax	4.6%	4.4%
Property tax (mills):		
Homestead	34 (average)	6
Second homes	34 (average)	24
Comm. & Ind.	34 (average)	24
Enhancement	N/A	3
ISD's	3 (average)	3 (average)
Assessment cap	N/A	5% or CPI
Property transfer tax	.0011%	2.0%
Single business tax	2.35%	2.35%
Cigarette tax	25 cents	75 cents
Out-of-state calls	4%	6%
Personal income Tax exemption	$2,100	$2,100

Source: A Primer on Michigan School Finance, C. Philip Kearney

V. Education, the Community and Crime

A. Educational Indicators

It could be argued that changes in educational spending per student is not an adequate means of measuring student performance and that testing scores (i.e. ACT, SAT, etc.) would be better indicators when trying to establish a correlation between education and other variables (in this case crime and juvenile arrest rates). Still, many schools are often accused of excluding low scoring children from testing and focusing instruction on the skills measured by tests only (Murname, 1988). This would make the level of spending a more attractive variable. For the purpose of this paper, spending per student is the appropriate variable, as student performance is not in question. Students are not the unit of observation, rather it is communities and the benefit each derives from the level of spending. If spending levels do not mirror performance, then students, in turn, will not be productive in the future, which will only prove that spending on education has no positive effect on communities.

Despite the comments of Former U.S. Secretary of Education , William Bennett who contended that there was not a strong correlation between school spending and achievement referring to earlier research in an article "The Economics of Schooling: Production and Efficiency in Schools" (Hanushek, 1986); more recent findings suggest the relationship between spending and achievement was much higher than previously thought. Educational levels not "gains" were the focus of the earlier study which did not address what students had learned (Baker, 1991).

B. Education and Economic Activity in States

According to one study (Quan et al., 1987), the level of educational services may affect economic growth in a state in two ways. Potential migrants may choose to locate in states that

have a higher quality of education. This, in turn, contributes to a growing population, increasing both the supply of labor and the demand for local goods. They have termed this "parental migration effect" (Quan, 1987, 361). And secondly, as noted by other studies (Mandi, 1981, Teng, 1991, and Psacharoopoulos, 1993) with regard to the effects of education on nations, education may increase the productivity of workers. This productivity effect should raise wage rates in a state, however the studies revealed that increases (or decreases) in the quality of education can only be expected to have an impact on nations after 4 to 9 years and used lags in their regression to adjust for this contingency.

Their findings seemed to indicate that the effects of educational expenditures on the levels of wages and employment differ in the Northeast and the Sunbelt. Education expenditures have positive and significant effects on the levels of wage and employment in the Northeast, while the reverse is true in the Sunbelt. These "Northeast states" included, among others, Illinois, Ohio and Wisconsin, but not Michigan (Quan, 1987).

C. Involving the public more in Education

There is a fear that schools are becoming disconnected from the public. One of the main criticisms of Proposal A is that it has taken away "local control" of the schools and put it in the hands of the State. State dollars now provide 75% of the revenue schools receive with local revenues making up approximately 19% and the remaining 6% from the national government (Kearney, 1994). As part of Proposal A's mission, wealthier districts are less capable of raising their millage rates and increasing the amount of local funds available to schools.

For some, problems with schools seem to be a question of "legitimacy" rather than effectiveness of the public schools. There are a great many people who don't believe that the

public schools are their agents, who don't believe that the public schools are responsive to their concerns. Consequently, the public needs to get more involved (Danzberger et al., 1994). Social problems that affect student achievement can be addressed only if schools, families, and communities work together. And yet budget battles and voucher movements attest to the public's growing disenchantment with the public school system. The issue of legitimacy lies in the fact that people don't recognize that schools serve a public purpose, that everyone benefits not just parents. The solutions they suggested involve focus groups and town meetings to discuss the state of local education (Mathews, 1997).

If linkages between community and spending on public education exist, it could be a catalyst in increasing the amount of community involvement the authors above believe are necessary to increase student achievement because communities will have a proven stake in the effectiveness or "legitimacy" of schools.

D. Education as a deterrent to criminal activity

For years, the widespread assumption about the role of schools is that they function as a positive form of social control and act as a deterrent to delinquent behavior. Schools provide an important environment in which children learn to be law-abiding, and acquire the qualifications that give them the opportunity to have a stake in society (Gilling, 1997). Those who do not perform well, and perhaps even drop out, are presumed to be less likely to obtain employment, which, in turn, could lead to criminal behavior. Assumptions, such as these, have led to policy making to increase educational opportunities for young people and encourage those who have already "dropped out" to return to school, all in an effort to reduce delinquency and crime (Wolfgang et al., 1987).

Increasing amounts of delinquent behavior, both in and outside of schools, has been attributed by some to impersonal atmosphere created there as a result of budget crunches which have led to the consolidation of school districts, large classes, and other factors which have reduced opportunities for positive social interaction between school personnel and students (Kratcoski, 1990).

The majority of young men and young women participate in some kind of delinquent acts during their juvenile years. As one researcher noted, "By the age of 18 possibly over 90 percent of young males have participated in delinquent acts...50 to 60 percent of young females have been involved in delinquent acts by the time they are 18" (Witte, 1997, 219). Still, for most individuals, criminal activity is usually restricted to the teen years and those individuals who began offending as juveniles have usually stopped by their mid-twenties.

According to the National Crime Survey, the level of crime today is lower than it was in the late 1970's and early 1980's for crimes such as rape, aggravated assault, burglary, and larceny, as well as less-serious (non-index) offenses (Witte, 1997). Juvenile arrests, however, have been on the rise, particularly in Michigan. Between 1990 and 1994 juvenile arrests in the state increased by nearly 8%. Of these approximately 47% were index crimes[1] (Stoetzer et al., 1997).

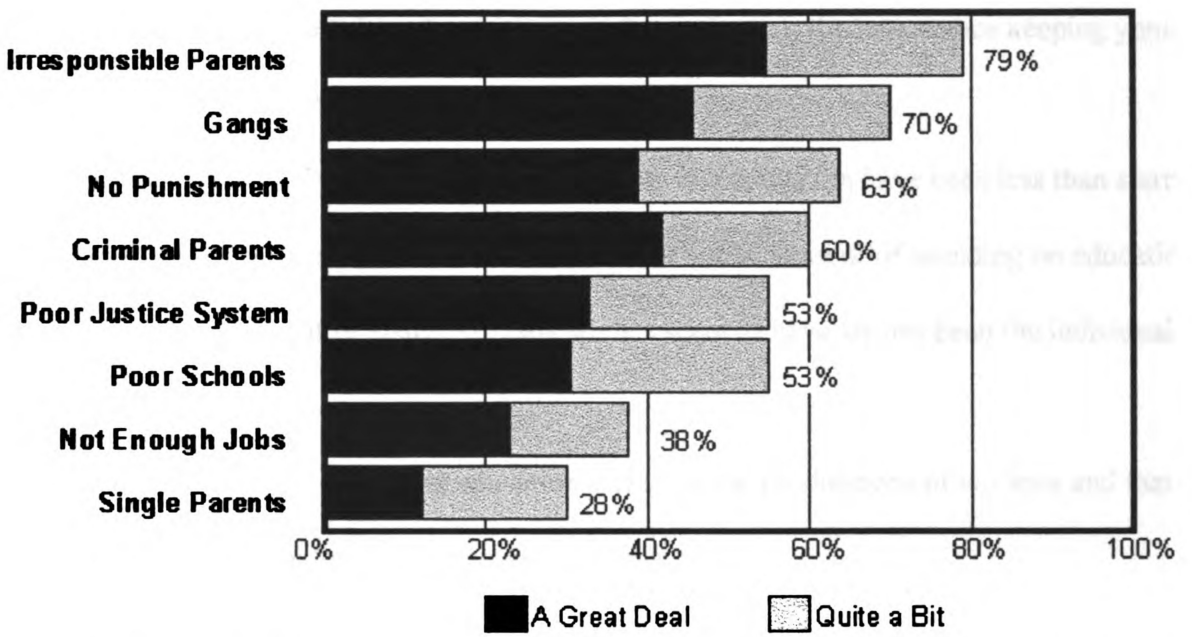
In 1996, the Institute for Public Policy and Social Research (IPPSR) at Michigan State University conducted its State of the State Survey (SOSS) of adult residents in Michigan. One of its goals was to gather information on perceptions of the causes of juvenile delinquency[2].

---

[1] A listing of index crimes appears on page 19.

[2] "Juvenile" for this study meant persons under the age of 18.

Perceived Causes of Delinquency



Factors which Michigan residents believe contribute "a great deal" or "quite a bit" to why some teenagers are juvenile delinquents.

MSU State of the State Survey (SOSS)
Spring 1996; N = 1133; Sampling Error = 2.9%
Michigan State University, IPPSR

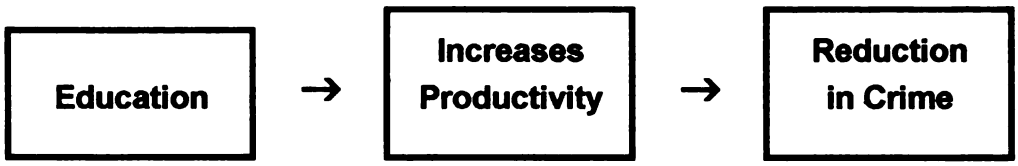
As the figure shows, people seemed to believe that the principle reasons for delinquency were irresponsible parents (79%) and gangs (70%) (these factors contributed "a great deal" or "quite a bit"). While it was not at the top of the list, "poor schools" tied for fifth as a perceived influence of juvenile delinquency (53%) (Stoetzer et al., 1997).

Despite all the assumptions and perceived influences, there is little evidence that education and criminal activity are related. Education has apparently not been analyzed in any great detail in correlational studies of crime. When studies did include education as a variable (measured in terms of grade completed, possession of a high school diploma, or scores on tests), researchers

concluded there was so significant relationship to crime. Some correlational studies, however, did find a statistically significant inverse relationship between the amount of time spent and the level of criminality. These results have been interpreted as indicating the importance keeping young people in school and off the streets (Witte, 1997).

While efforts to show linkages between crime and education have been less than startling, it appears that no attempts have been made to link the actual amount of spending on education to crime. Moreover, the unit of analysis in past studies seem to have always been the individual, rather than the community.

Recent studies do imply that education increases the productivity of workers and that productivity can, in turn, lead to a reduction in crime.



It is with this assertion, that this study shall continue.

VI. Data Collection

The purpose of the study is to compare data on school expenditures per student with data on various crimes and juvenile arrests. Crime/juvenile arrest data is available on an annual basis at the city level; while annual data on expenditures per student is available only for each school district. School districts may cut across city boundaries and may include more than one city. Cities may, in fact, have more than one school district operating within their city limits. The **unit of analysis** must remain consistent across variables, therefore cities were chosen based on the following criteria:

1) Current Operating Expenditures per Student (COES) data exists for each city/school district selected for years 1974-93 (i.e. the school district has operated since at least 1974).

2) There is only one school district for each city.

3) The school district entirely surrounds the city boundaries so that the figures to which it will be compared (crime rates) are consistent with the data on expenditures.

4) Crime data is available for cities for years 1982-1993.

While this does represent a non-probability (purposive) sample, and therefore has certain drawbacks with regard to the generalization of the results, using a probability sample (i.e. simple random sample, systematic random sample, stratified random sample, etc.) would undoubtedly produce cities in the sample population that would not fit the criteria and not be consistent with the unit of analysis.

The data had to be available for the range of years mentioned above so that time-periods and lags could be developed. This will be outlined in greater detail below. The following is a list of thirty-nine cities with their corresponding school district chosen for the study:

CITY	DISTRICT NAME
Allen Park	Allen Park Public Schools
Alpena[1]	Alpena Public Schools
Benton Harbor	Benton Harbor Area Schools
Berkley	Berkley School District
Birmingham	Birmingham City School District
Cadillac[1]	Cadillac Area Public Schools
Clawson	Clawson City School District
Dearborn	Dearborn City School District
East Lansing	East Lansing School District
Ecorse	Ecorse Public School District
Escanaba[1]	Escanaba Area Public Schools
Ferndale	Ferndale City School District
Garden City	Garden City School District
Hamtramck	Hamtramck Public Schools
Harper Woods	City of Harper Woods Schools
Hazel Park	Hazel Park City School District
Highland Park	Highland Park City Schools
Kentwood	Kentwood Public Schools
Lincoln Park	Lincoln Park Public Schools
Menominee[1]	Menominee Area Public Schools
Mt. Clemens	Mt. Clemens Community Schools
Muskegon Heights	Muskegon Heights School District
Norton Shores	Mona Shores Public School District
Novi	Novi Community School District
Oak Park	Oak Park City School District
Owosso	Owosso Public Schools
Portage	Portage Public Schools
Romulus	Romulus Community Schools
Roseville	Roseville Community Schools
Royal Oak	School District City of Royal Oak
Southfield	Southfield Public School District
Southgate	Southgate Community School District
Sterling Heights	Utica Community Schools
Taylor	Taylor School District
Traverse City[1]	Traverse City Area Public Schools
Trenton	Trenton Public Schools
Troy	Troy School District
Westland	Wayne-Westland Community School District
Wyandotte	Wyandotte City School District

[1] An intermediate school district is also located in these cities which directs expenditures for other services (special education, etc.). All public schools have intermediate school districts like these that direct these operations for a region.

Data on school expenditures was obtained from the Michigan Department of Education's, "Ranking of Michigan Public School Districts by Selected Financial Data: Bulletin 1012" for years 1974-75 through 1992-93. The publication includes several general fund expenditure categories for each of the school districts in the state. The category chosen for this study was Current Operating Expenditures per Pupil (COEP). This category represents the closest approximation of the dollar amount devoted to each pupil in each school district and does not include payments for community services and capital outlay.

Crime and Juvenile arrest variables were taken from the Michigan Department of State Police "Crime in Michigan: Uniform Crime Reports" for the years 1982-93. Four variables were used to compare to educational expenditures: Index Crimes, Non-Index Crimes, Grand Total Crimes, and Juvenile Arrests.

Index crimes include the following:

Murder & Non-negligent Manslaughter
Rape
Robbery
Burglary
Larceny
Motor Vehicle Theft
Arson

[1] In 1980 the subheading of the publication was changed from Bulletin 1012 to Bulletin 1014.

Non-index crimes include the following:

Negligent Manslaughter
Assault (Non-aggravated)
Forgery & Counterfeiting
Fraud
Embezzlement
Stolen Property
Vandalism
Weapons (carry, possession, etc.)
Prostitution & Common Law Vice
Sex Offenses (except rape & prostitution)
Narcotic Laws
Gambling
Family & Children
Driving Under Influence Alcohol or Narcotics
Liquor Laws
Disorderly Conduct
All Other (includes drunkenness & vagrancy)

Total crimes are the sum of all index and non-index crimes and **juvenile arrests** includes arrests of all individuals ages 16 & under.

VII. Data Adjustment

Expenditure data was adjusted for inflation using annual % change rates from a Consumer Price Index (CPI) for all urban consumers.

CONSUMER PRICES – ALL URBAN CONSUMERS
1970 THROUGH 1996
(1982-84 = 100)

CALENDER YEAR	U.S. CONSUMER PRICE INDEX	PERCENT CHANGE
1970	38.8	5.9
1971	40.5	4.3
1972	41.8	3.3
1973	44.4	6.2
1974	49.3	11.0
1975	53.8	9.1
1976	56.9	5.8
1977	60.6	6.5
1978	65.2	7.6
1979	72.6	11.4
1980	82.4	13.5
1981	90.9	10.3
1982	96.5	6.2
1983	99.6	3.2
1984	103.9	4.3
1985	107.6	3.6
1986	109.6	1.9
1987	113.6	3.6
1988	118.3	4.1
1989	124.0	4.8
1990	130.7	5.4
1991	136.2	4.2
1992	140.3	3.0
1993	144.5	3.0
1994	148.2	2.6
1995	152.4	2.8
1996	156.9	3.0

Source: U.S. Department of Commerce, Bureau of Labor Statistics

Formulas for adjustment of the data are shown below:

Adjusted COES 1975 = (COEP 1975)/(1 + % Change in CPI from 1974 to 1975)

= (COEP 1975)/(1 + 0.091) = (COEP 1976)/1.091

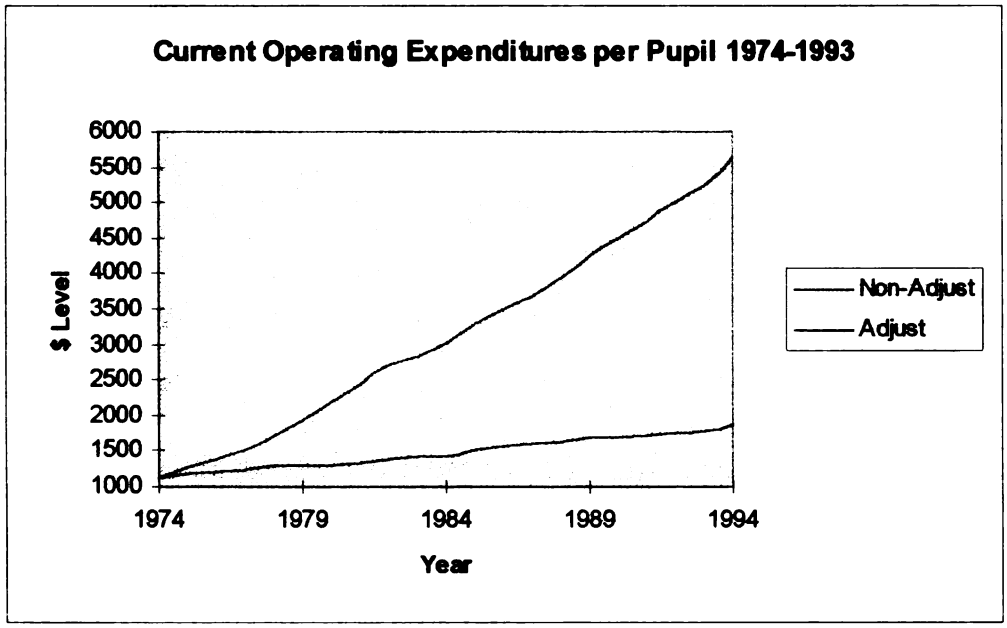
Adjusted COES 1976 = (COEP 1976)/{(1.091)*(1 + 0.058)}

Adjusted COES 1977 = (COEP 1977)/{(1.091)*(1.058)*(1 + 0.065)}

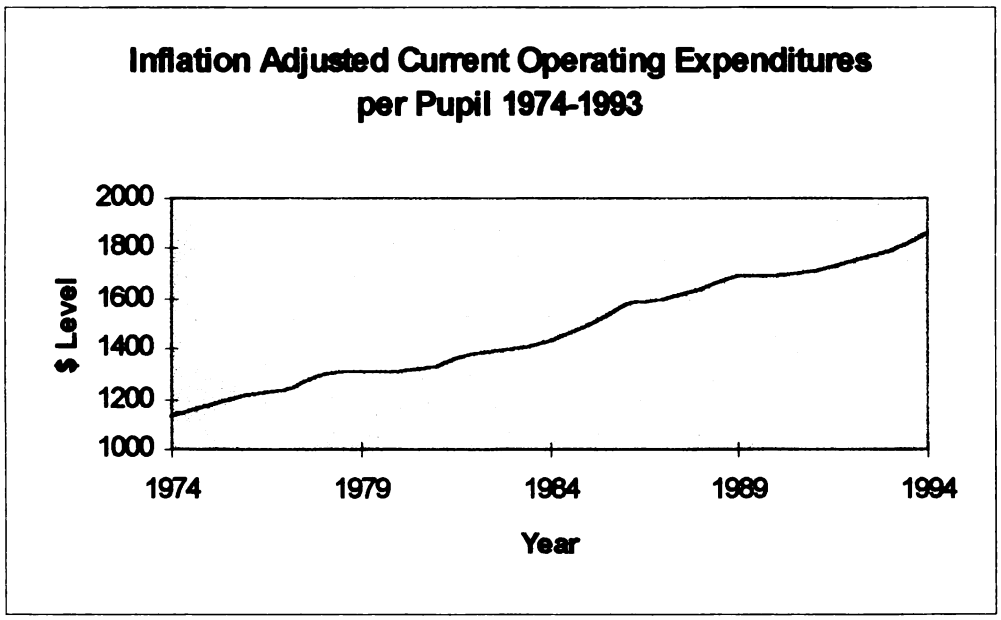
And so forth, through 1993 in which the adjusted figure is:

Adjusted COEP 1993 = (COEP 1993)/{ (1.091)*(1.058)*(1.065)*(1.076)*(1.114)*
(1.135)*(1.103)*(1.062)*(1.032)*(1.043)*
(1.036)*(1.041)*(1.048)*(1.054)*(1.042)*
(1.030)*(1.030) }

There is a significant difference between adjusted and unadjusted expenditures. Below is the average expenditures for years 1974-93 for the thirty-nine cities chosen for study.



Only inflation adjusted expenditures will be used in the study. Graphing average inflation adjusted expenditures alone enables us assess the amount of volatility that exists over the 20 year span.



Crime/juvenile arrest variables were also adjusted with regard to the population of the city to develop a rate per 100,000 people. Census figures can be used to adjust for population, however, the decennial census would provide only one change in population over the twelve-year span. To adjust the data more accurately, population estimates were obtained from the Michigan Information Center. [1] Population estimates were available annually at the sub-county level for the year 1990-93 (1990 = Census data). For the years 1982-89, estimates were only available on a biannual basis (even years), therefore, uneven years were adjusted using the most recent estimate.

[1] A complete listing of population estimates for each of the thirty-nine cities appears in Appendix B.

Example using the City of Alpena:

Crime/Juvenile Arrest Rate per 100,000 = {(Annual # of Index Crimes)/(Population)} * 100,000

	1984 Index Crime Total	1985 Index Crime Total	1986 Index Crime Total	1987 Index Crime Total	1988 Index Crime Total	1989 Index Crime Total	1990 Index Crime Total
City of Alpena	537	567	621	601	680	606	607

	Population Estimate 1984	Population Estimate 1986	Population Estimate 1988	Population Census 1990
City of Alpena	11535	11290	11350	11354

1984 Alpena Index Crime Rate per 100,000 people = {(1984 # of Index Crimes)/(1984 Population)} * 100,000

= {(537)/(11535)}*100000

= 4655.4

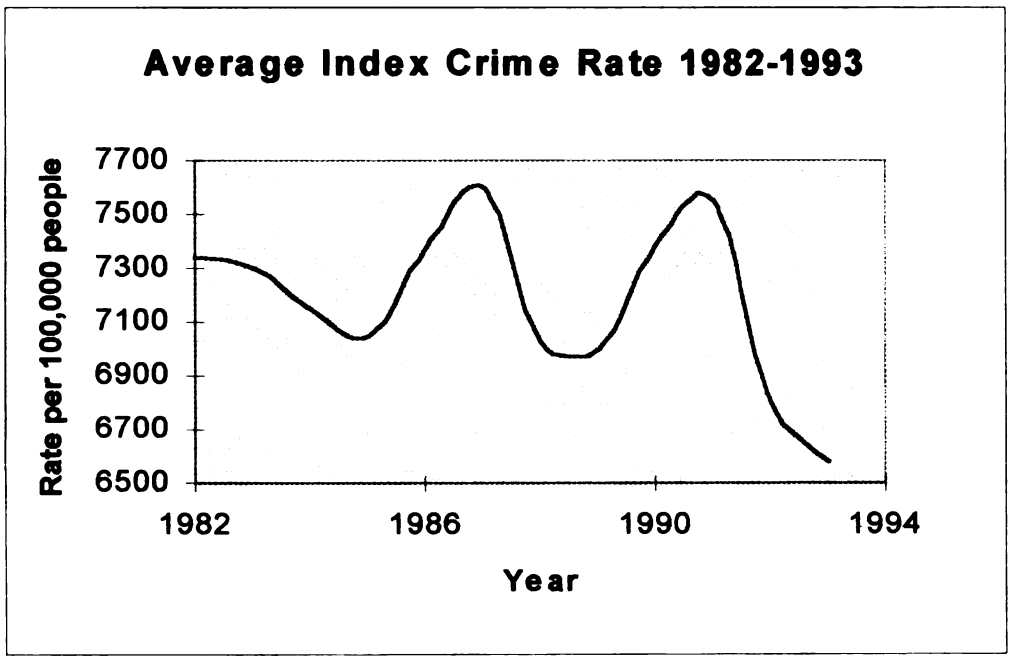
1989 Alpena Index Crime Rate per 100,000 people = {(1989 # of Index Crimes)/(1988 Population)} * 100,000

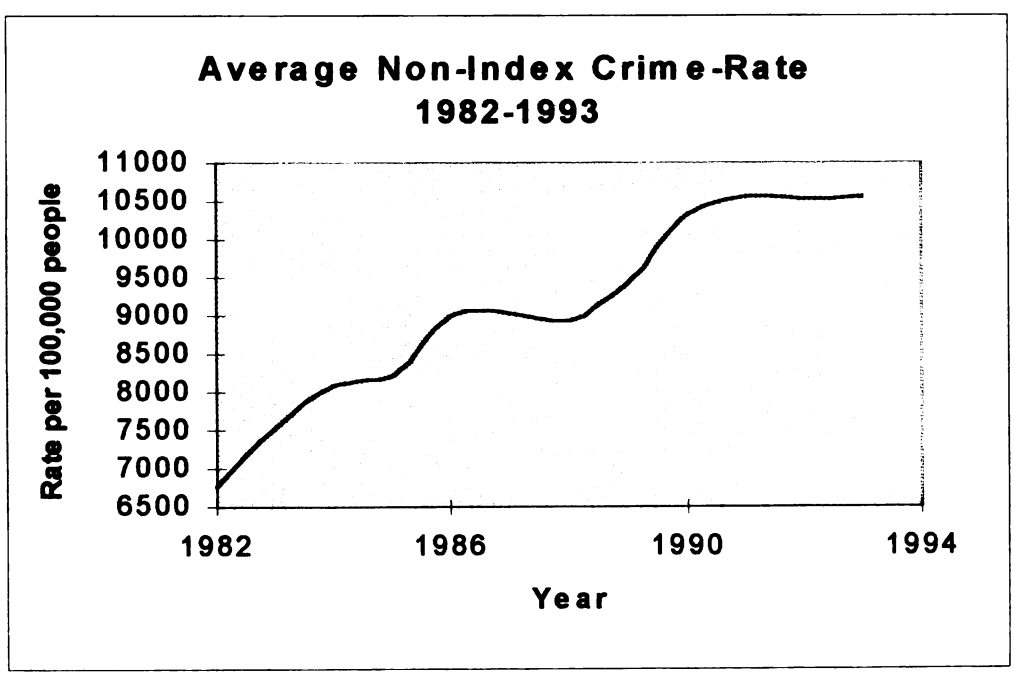
= {(606)/(11350)}*100000

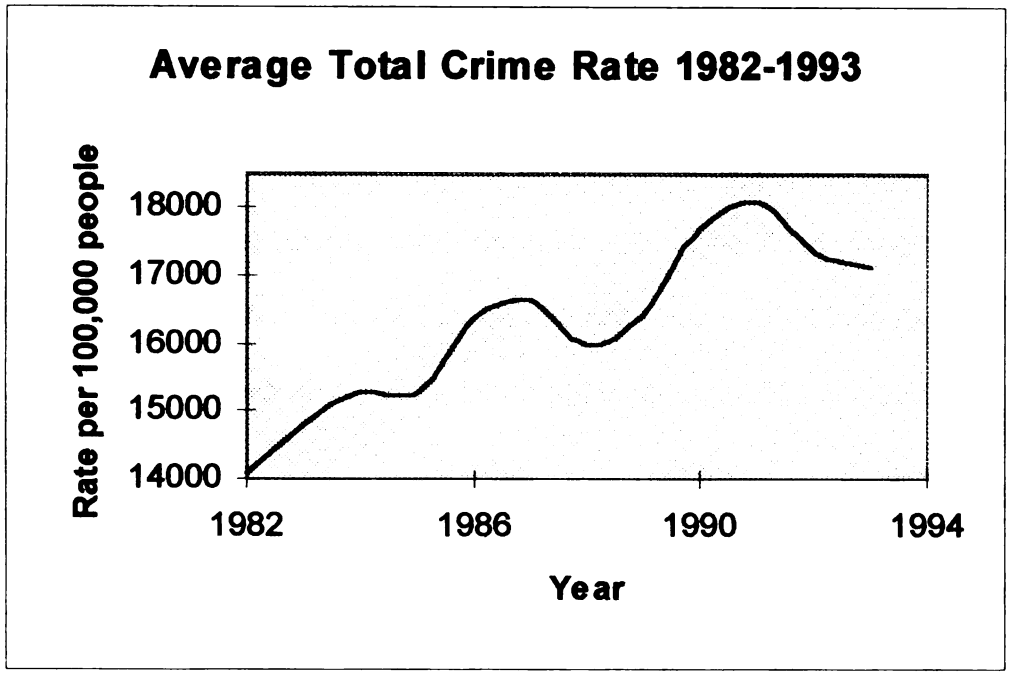
= 5339.21

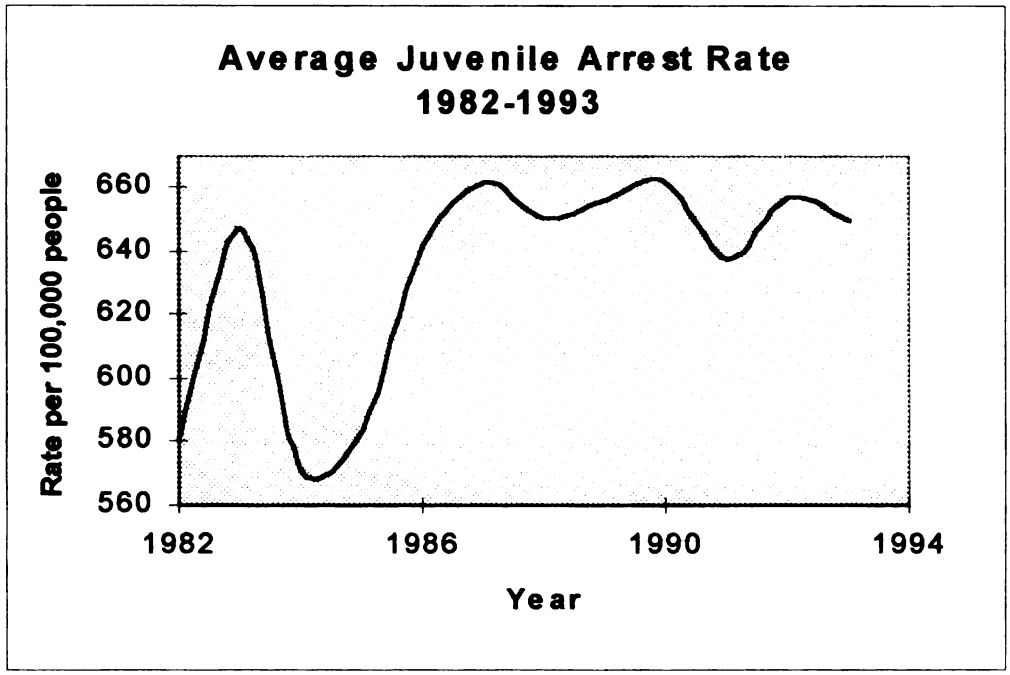
Rates were developed for non-index crimes, total crimes and juvenile arrests in the same fashion.

The following graphs show average trends for the thirty-nine cities with regard to these rates.


Average Index Crime Rate 1982-1993
Rate per 100,000 people
7700
7500
7300
7100
6900
6700
6500
1982
1986
1990
1994
Year


Average Non-Index Crime-Rate 1982-1993
Rate per 100,000 people
11000
10500
10000
9500
9000
8500
8000
7500
7000
6500
1982
1986
1990
1994
Year


Average Total Crime Rate 1982-1993
Rate per 100,000 people
18000
17000
16000
15000
14000
1982
1986
1990
1994
Year


Average Juvenile Arrest Rate
1982-1993
Rate per 100,000 people
660
640
620
600
580
560
1982
1986
1990
1994
Year

There is a lot more volatility in the average crime/juvenile arrest rates than in inflation adjusted expenditures. This proved difficult in finding a relationship between each of the variables, particularly the juvenile arrest rate; however, since the graphs above only show the "average" trends, they say nothing about the way in which inflation adjusted expenditures and crime/juvenile arrest rates are correlated with one another for each individual city.

In order to correlate the variables, data on expenditures and crime/juvenile arrest rates were placed into four time periods for each of the cities in the study. The four periods are as follows:

Period	Years	Data required
Period 1	1974-1978	Expenditure data only
Period 2	1979-1983	Expenditure data only
Period 3	1984-1988	Expenditure & Crime data
Period 4	1989-1993	Expenditure & Crime data

In order to make use of "lags" in the study, percentage change rates were developed using the procedure below:

1) Sum the inflation adjusted expenditures and crime/juvenile arrest rates for each of the applicable periods to develop four five-year time periods.

2) Develop a % change rate for expenditure data between the first and second period, the second and third period and the third and fourth period.

3) Develop a % change rate for crime/juvenile arrest rates between the third and fourth periods.

Current Operating Expenditure per Pupil (COEP) data actually cut across two different years (as does the school year) so the latter year was arbitrarily chosen as the year to which crime/juvenile arrest rates will be compared.

Example using the City of Alpena:

	1974	1975 Adjusted	1976 Adjusted	1977 Adjusted	1978 Adjusted
	COEP 73-74	COEP 75-76	COEP 75-76	COEP 76-77	COEP 77-78
Alpena	978	1018	1090	1062	1054

Alpena Adjusted COEP for Period 1 (1974-78) = 5202

This represents the entire amount of dollars spent on each student for the years 1974 through 1978 in the City of Alpena. Figures were computed for each of the other three periods and a % change computed from one period to the next.

Alpena Adjusted COEP for Period 2 (1979-83) = 5150

% Change in COEP from Period 1 to Period 2 = {(Adjusted COEP for Period 2 - Adjusted COEP for Period 1) / (Adjusted COEP for Period 1)} * 100

= {(5150 - 5202)/5202} * 100

= 0.999616

Crime/juvenile arrest rates were adjusted in the same fashion to develop % change rates for the applicable periods. [1]

[1] A complete listing of all variables is located in Appendix A.

VIII. Correlations

There were twenty individual correlations of variables (4 sets). Below are a list of the independent and dependent variables in each as well as a description of what each was to accomplish.

Set 1

Dependent variable		Independent variable
Crime/Juvenile Arrest Rates for Period 3:	Index	Expenditures Period 3
	Non-Index	
	Total	
	Arrest	
Crime/Juvenile Arrest Rates for Period 4:	Index	Expenditures Period 4
	Non-Index	
	Total	
	Arrest	

The eight correlations above will only indicate whether or not cities that have higher expenditures on education have correspondingly lower (or higher) crime rates. It would say nothing about whether or not a change in expenditures would potentially change crime rates. To find out whether or not a change in the level of expenditures has any effect on crime/juvenile arrest rates, data on the % change from one period to the next must be utilized.

Set 2

Dependent variable		Independent variable
% Δ in Crime/Juvenile Arrest Rates from Period 3 to Period 4:	Index	% Δ in Expenditures from Period 3 to Period 4
	Non-Index	
	Total	
	Arrest	

The four correlations above will show whether or not the change in expenditures from the third period to fourth produced any effect on the change in crime/juvenile arrest rates from the third period to the fourth.

Set 3

Dependent variable		Independent variable
% Δ in Crime/Juvenile Arrest Rates from Period 3 to Period 4:	Index	% Δ in Expenditures from Period 2 to Period 3
	Non-Index	
	Total	
	Arrest	

These next four correlations allow a five-year "lag" in the comparison of variables by comparing the change in expenditures from the second to third period with change in crime/juvenile arrest rates from the third to fourth period.

Set 4

Dependent variable		Independent variable
% Δ in Crime/Juvenile Arrest Rates from Period 3 to Period 4:	Index	% Δ in Expenditures from Period 1 to Period 2
	Non-Index	
	Total	
	Arrest	

The final four correlations compare the change in expenditures from the first to the second period with the change in crime/juvenile arrest rates from the third to the fourth period to allow a longer (10-year) "lag" to be used. Data from each of the four sets of correlations was analyzed to determine whether or not the relationship between the variables is statistically significant. [1]

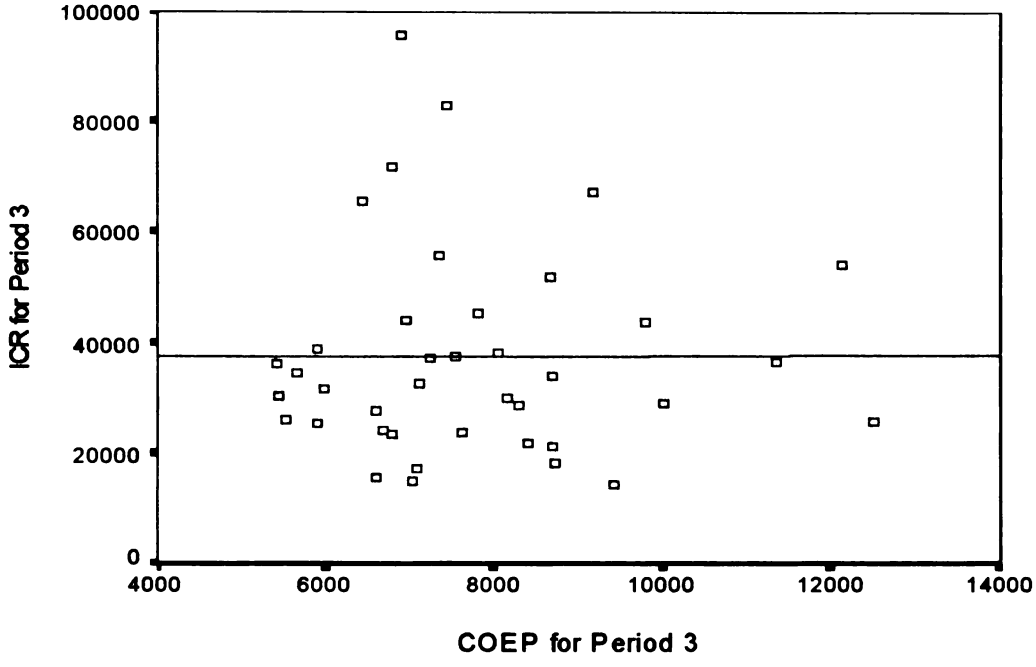
[1] Data was analyzed using Statistical Programming for Social Science (SPSS) software. Correlation output with matrices with Pearson's (r), two-tailed significance and number of cases are located in Appendix E.

A. Results from Correlations

Set 1

Ho: Current Operating Expenditures per Pupil for period 3 (1984-88) and Index Crime Rate for Period 3 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 3 (1984-88) and Index Crime Rate for Period 3 are related. (r is not equal to 0).



The data points are dispersed evenly about the graph. The slope of the fit line is nearly horizontal, perhaps even positive, indicating there is almost no relationship between these two variables.

Statistical Analysis

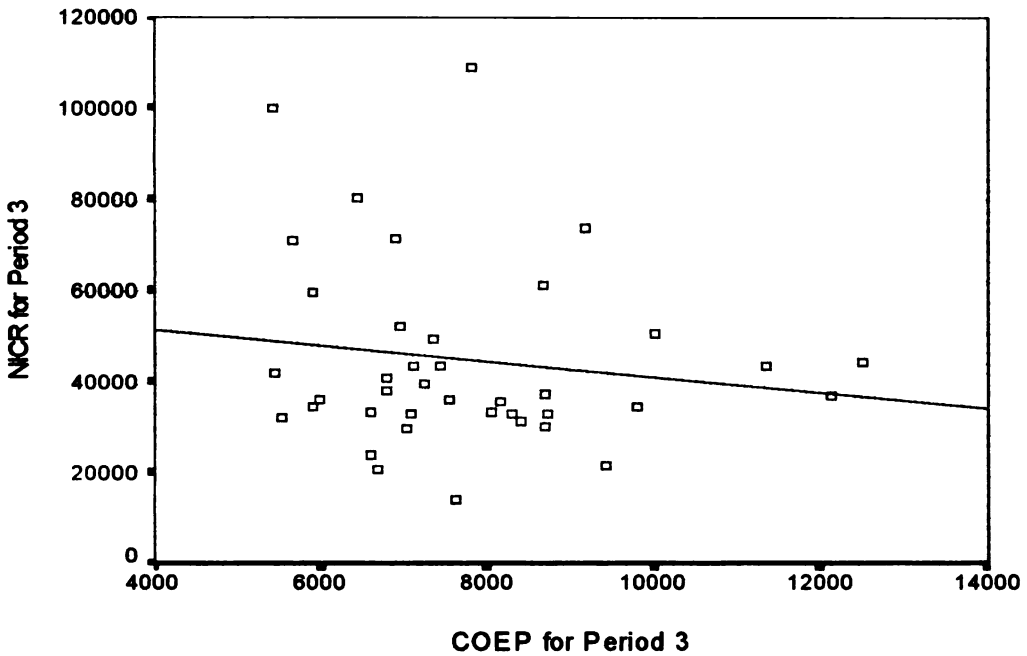
Pearson's Correlation (r) = .002

Significance (2-tailed) = .992

As expected, the correlation is not significant (.992 > .05) and therefore the null hypothesis can not be rejected.

Ho: Current Operating Expenditures per Pupil for period 3 (1984-88) and Non-Index Crime Rate for Period 3 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 3 (1984-88) and Non-Index Crime Rate for Period 3 are related (r is not equal to 0).



The data points again seem to have a good dispersion. The slope of the fit line is negative, however it doesn't seem great enough to be significant.

Statistical Analysis

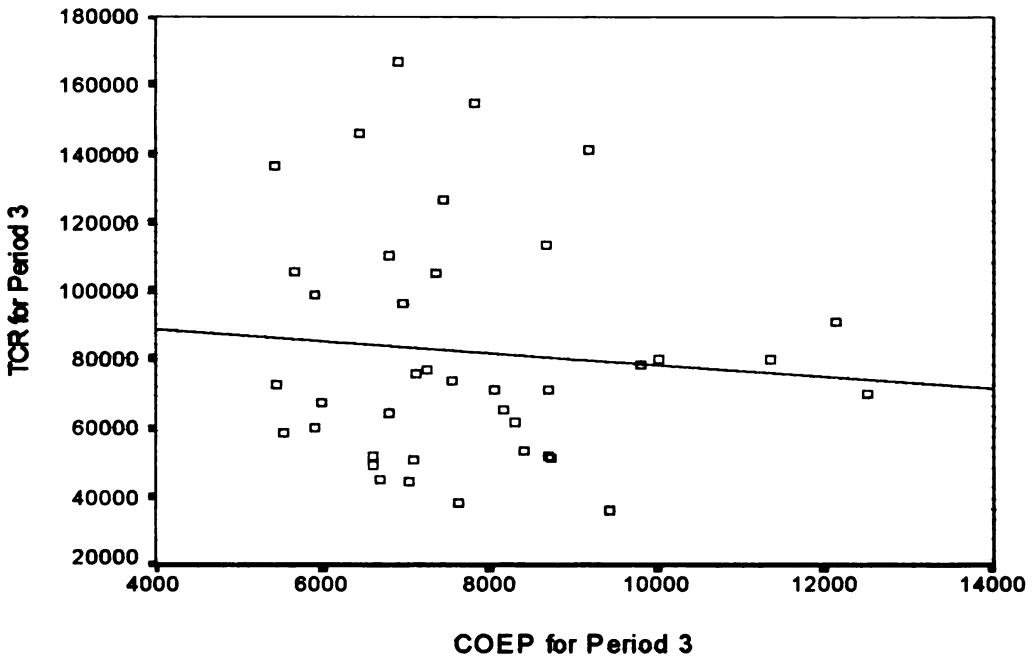
Pearson's Correlation (r) = -.148

Significance (2-tailed) = .369

The correlation is not significant (.369 > .05) and therefore the null hypothesis is accepted.

Ho: Current Operating Expenditures per Pupil for period 3 (1984-88) and Total Crime Rate for Period 3 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 3 (1984-88) and Total Crime Rate for Period 3 are related (r is not equal to 0).



There is a wide dispersion of data points on both sides of the fit line. A negative slope indicates a modest negative relationship, but most likely one that is statistically insignificant.

Statistical Analysis

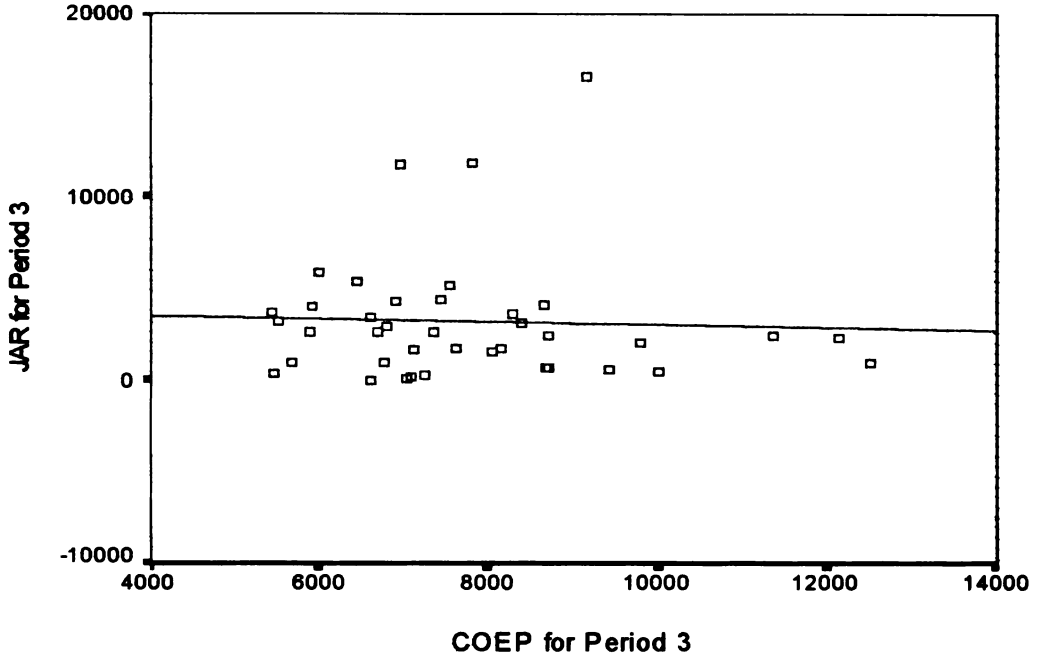
Pearson's Correlation (r) = -.088

Significance (2-tailed) = .594

The relationship is statistically insignificant (.594 > .05) and the null hypothesis is accepted.

Ho: Current Operating Expenditures per Pupil for period 3 (1984-88) and Juvenile Arrest Rate for Period 3 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 3 (1984-88) and Juvenile Arrest Rate for Period 3 are related (r is not equal to 0).



The data points are much more grouped around the fit line than in previous correlations, with the exception of three outliers. Apparently there is a much lower variance for the cities studied with regard to Juvenile Arrest Rate for Period 3. The fit line has a modest downward slope, but there is clearly no significant relationship between these two variables.

Statistical Analysis

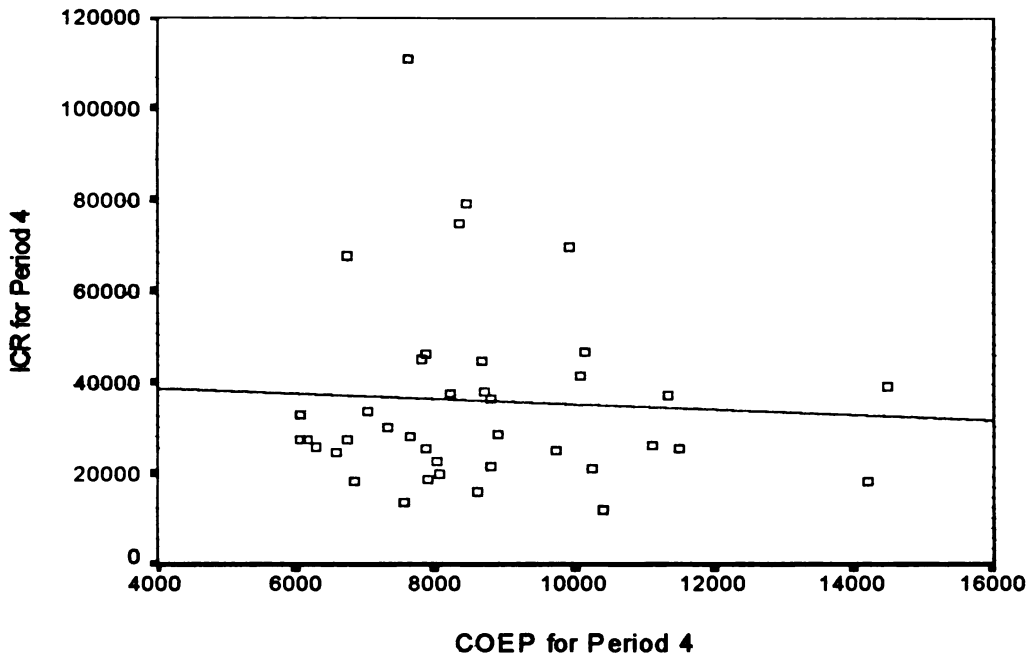
Pearson's Correlation (r) = -.042

Significance (2-tailed) = .800

The relationship is indeed insignificant (.800 > .05) and the null hypothesis is accepted.

Ho: Current Operating Expenditures per Pupil for period 4 (1989-93) and Index Crime Rate for Period 3 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 4 (1989-93) and Index Crime Rate for Period 3 are related (r is not equal to 0).



The data points are scattered nicely about the fit line with one notable outlier (Benton Harbor ICR = 111,211.0). Apparently there is a very slight negative relationship, but nothing significant.

Statistical Analysis

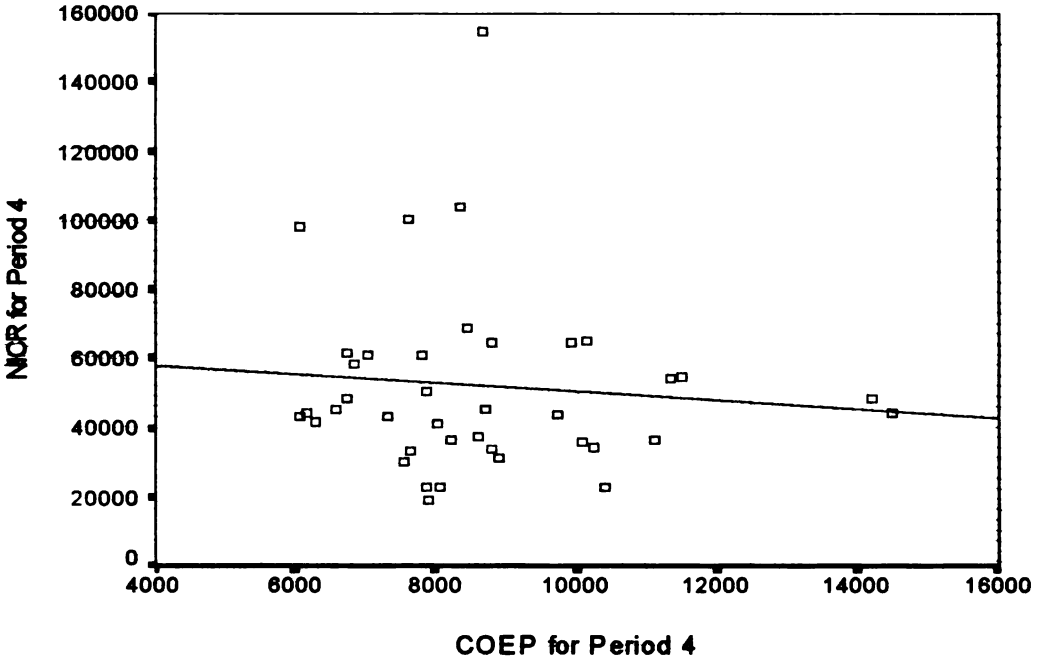
Pearson's Correlation (r) = -.057

Significance (2-tailed) = .729

The relationship is not significant (.729 > .05), therefore the null hypothesis can not be rejected.

Ho: Current Operating Expenditures per Pupil for period 4 (1989-93) and Non-Index Crime Rate for Period 4 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 4 (1989-93) and Non-Index Crime Rate for Period 4 are related (r is not equal to 0).



The data points are nicely dispersed with one notable outlier (Mt. Clemens NICR = 155,038.1). The slope of the fit line is slightly negative, but obviously insignificant.

Statistical Analysis

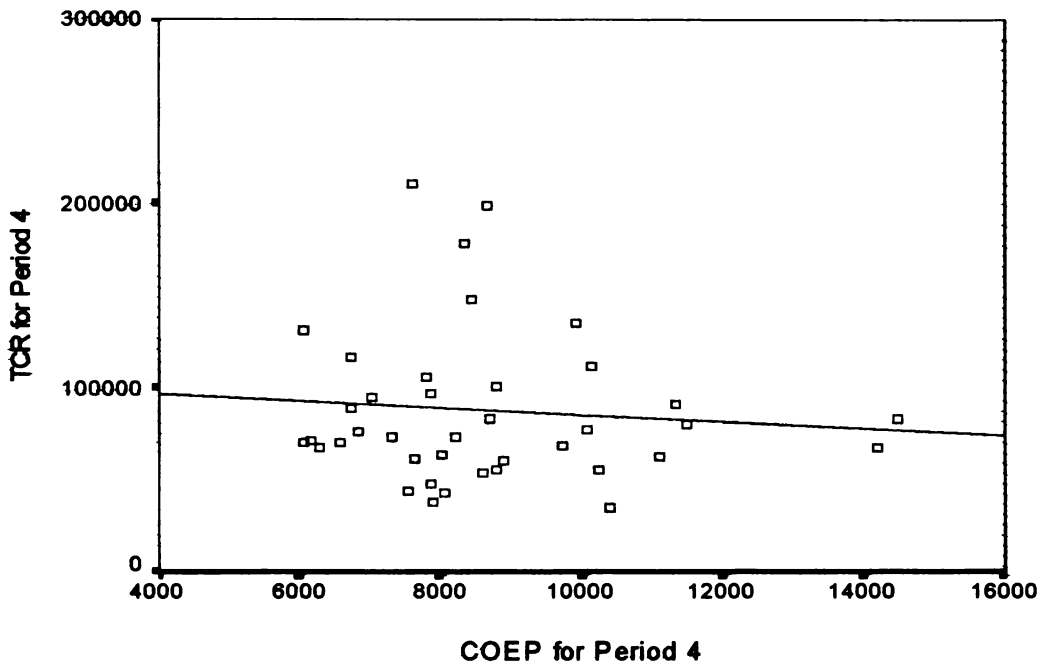
Pearson's Correlation (r) = -.095

Significance (2-tailed) = .564

The relationship is indeed insignificant (.564 > .05) and the null hypothesis is accepted.

Ho: Current Operating Expenditures per Pupil for period 4 (1989-93) and Total Crime Rate for Period 4 are independent events (r is equal to 0).

HA: Current Operating Expenditures per Pupil for period 4 (1989-93) and Total Crime Rate for Period 4 are related (r is not equal to 0).



The data points are dispersed nicely with no major outliers. The slope of the fit line is negative, but the relationship is insignificant.

Statistical Analysis

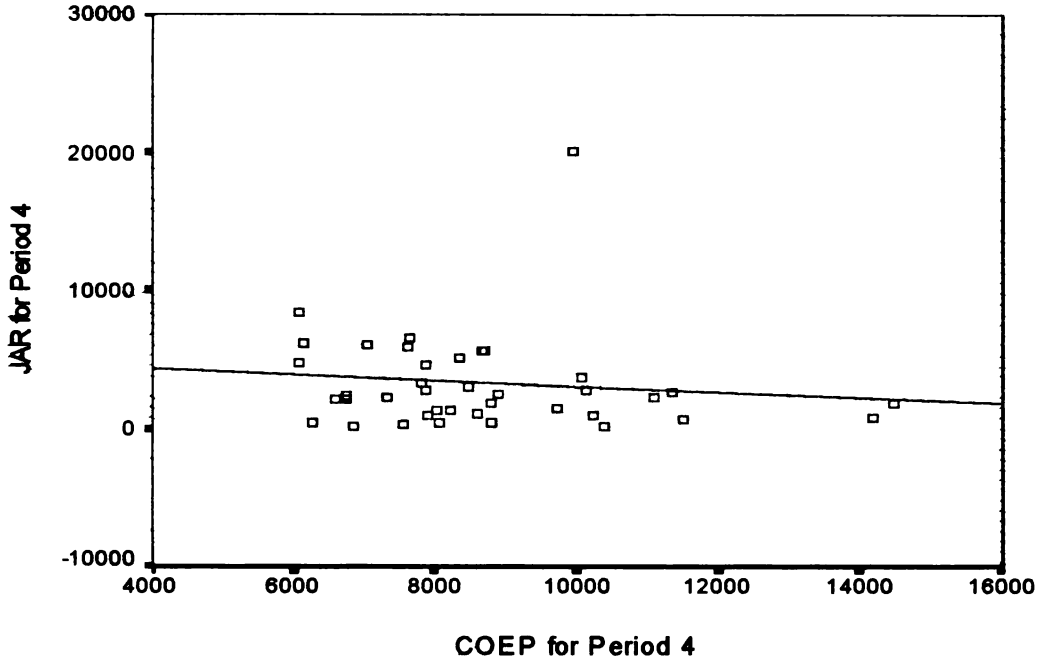
Pearson's Correlation (r) = -.088

Significance (2-tailed) = .593

The correlation does not produce a significant relationship (.593 > .05), therefore the null hypothesis can not be rejected.

Ho: Current Operating Expenditures per Pupil for period 4 (1989-93) and Juvenile Arrest Rate for Period 4 are independent events (r is equal to 0).

Ha: Current Operating Expenditures per Pupil for period 4 (1989-93) and Juvenile Arrest Rate for Period 4 are related (r is not equal to 0).



The data points are grouped around the fit line producing a slightly negative relationship with one notable outlier (Harper Woods JAR = 20,137.51). The relationship between these two variables is obviously insignificant.

Statistical Analysis

Pearson's Correlation (r) = -.177

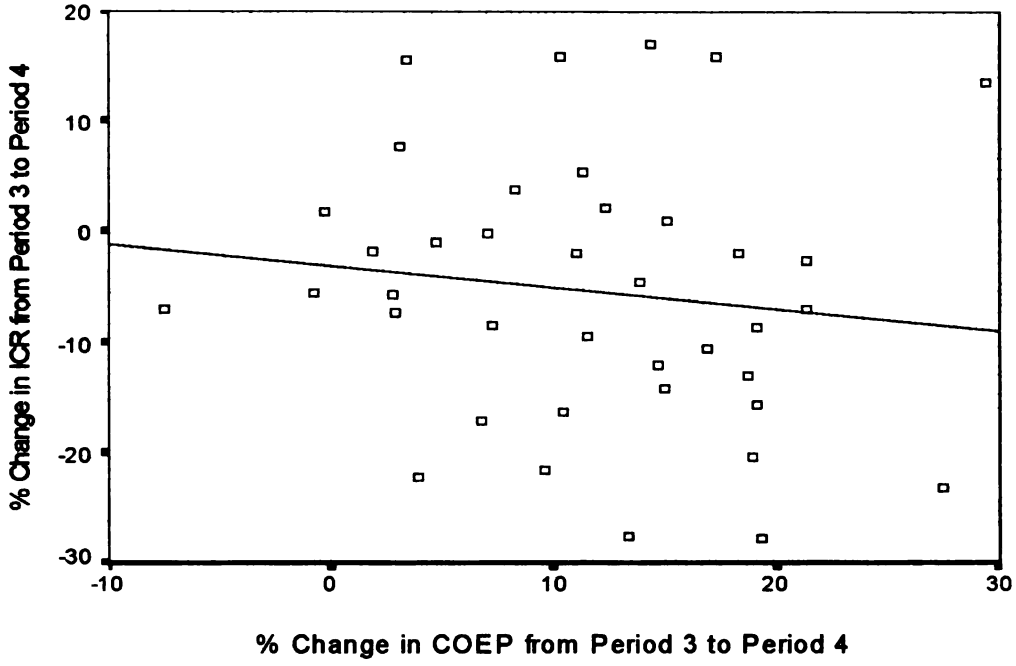
Significance (2-tailed) = .480

Once again the relationship is statistically insignificant (.480 > .05) and the null hypothesis is accepted.

Set 2

Ho: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

Ha: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



This is the first correlation to show percentage change rates between periods and has perhaps the greatest dispersion of data points thus far. This represents a high variance between both variables. It appears that several cities actually fell in the amount of expenditures allocated from period 3 to period 4 which proves that adjusting for inflation was, indeed, a worthwhile effort. The slope of the fit line is negative, but the relationship is most likely insignificant.

Statistical Analysis

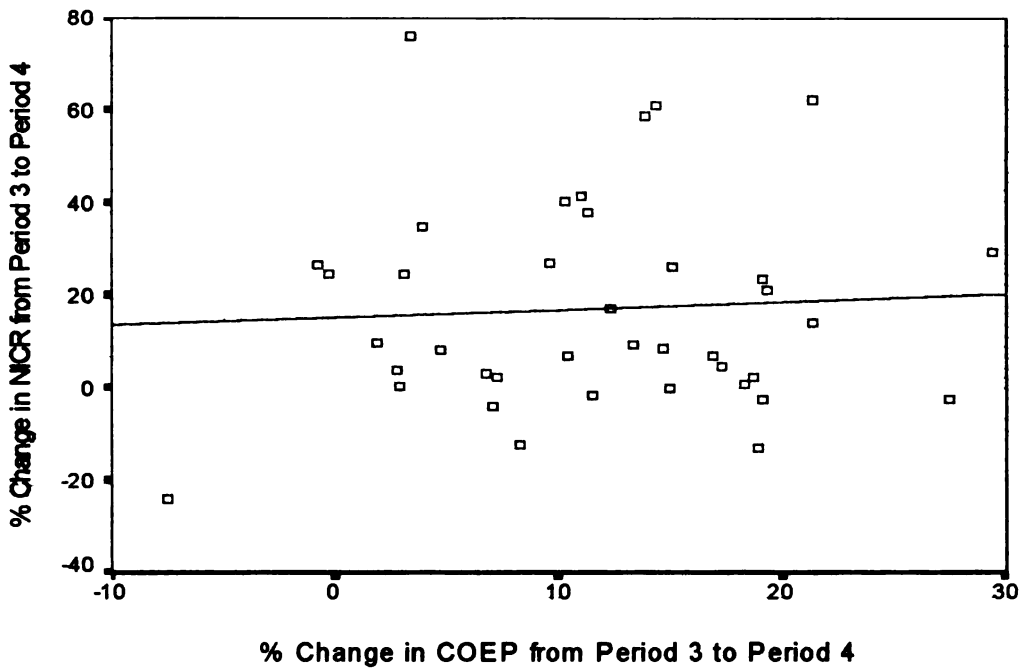
Pearson's Correlation (r) = -.131

Significance (2-tailed) = .427

The relationship is insignificant (.427 > .05) and the null hypothesis is accepted.

Ho: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



Unlike the former correlations, this one clearly exhibits a positive relationship; however is it still appears to be statistically insignificant. Once city, in particular, seemed to have both a reduction in COEP and NICR (City of Allen Park -7.4466 and -23.6005 respectively).

Statistical Analysis

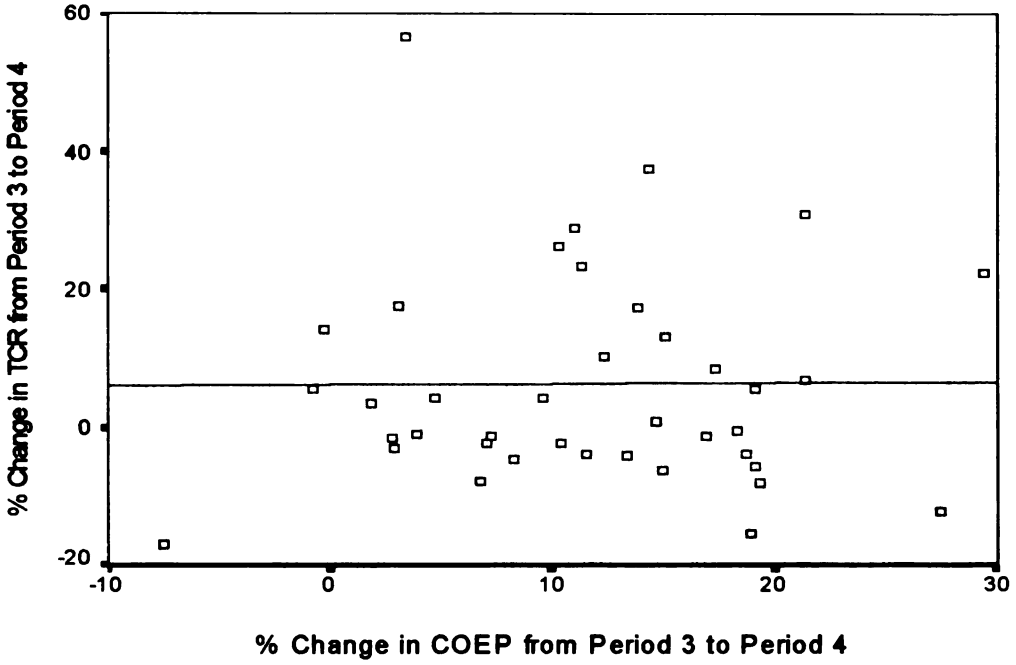
Pearson's Correlation (r) = .059

Significance (2-tailed) = .721

The relationship is not significant (.721 > .05) and therefore the null hypothesis can not be rejected.

Ho: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



There appears to many cities from the sample that exhibited both a positive % change in COEP and a negative % change in TCR and yet, the fit line is almost horizontal, perhaps even positive.

Statistical Analysis

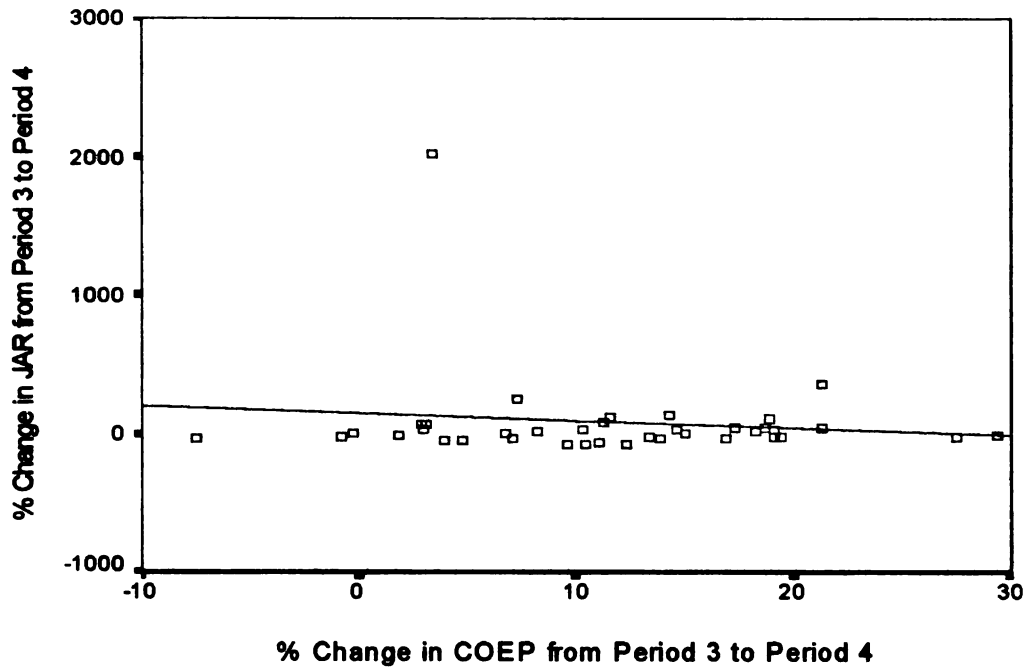
Pearson's Correlation (r) = .006

Significance (2-tailed) = .969

The relationship is, in fact, positive, but nonetheless insignificant (.969 > .05), therefore the null hypothesis must be accepted.

Ho: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Juvenile Arrest Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 3 (1984-88) to period 4 (1989-93) and % change in Juvenile Arrest Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



The data points appear to be situated closely around the fit line, however, this is most likely a result of the wide range required for the graph to include the one major outlier which represents the City of Norton Shores. This city displayed a more than 2000% increase in the juvenile arrest rate from period 3 to period 4 (period 3 = 14.04; period 4 = 248.68). The negative slope of the fit line appears to be insignificant.

Statistical Analysis

Pearson's Correlation (r) = -.121

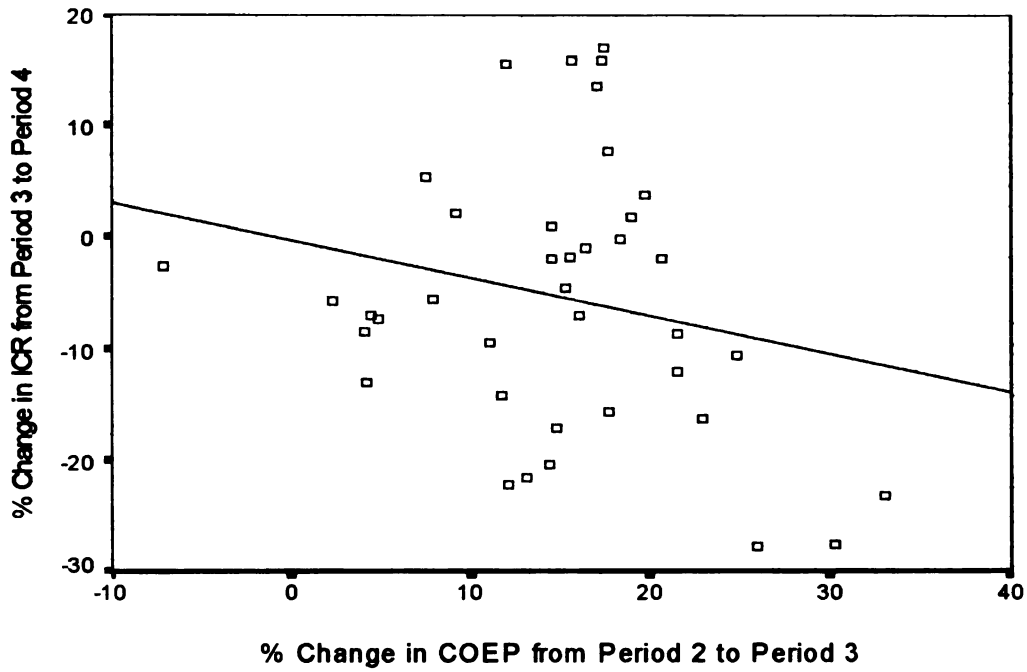
Significance (2-tailed) = .463

The relationship is insignificant (.463 > .05) and the null hypothesis is accepted.

Set 3

Ho: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



Clearly, a negative relationship exists between these two variables. The data points are dispersed nicely and it appears that the relationship could be significant.

Statistical Analysis

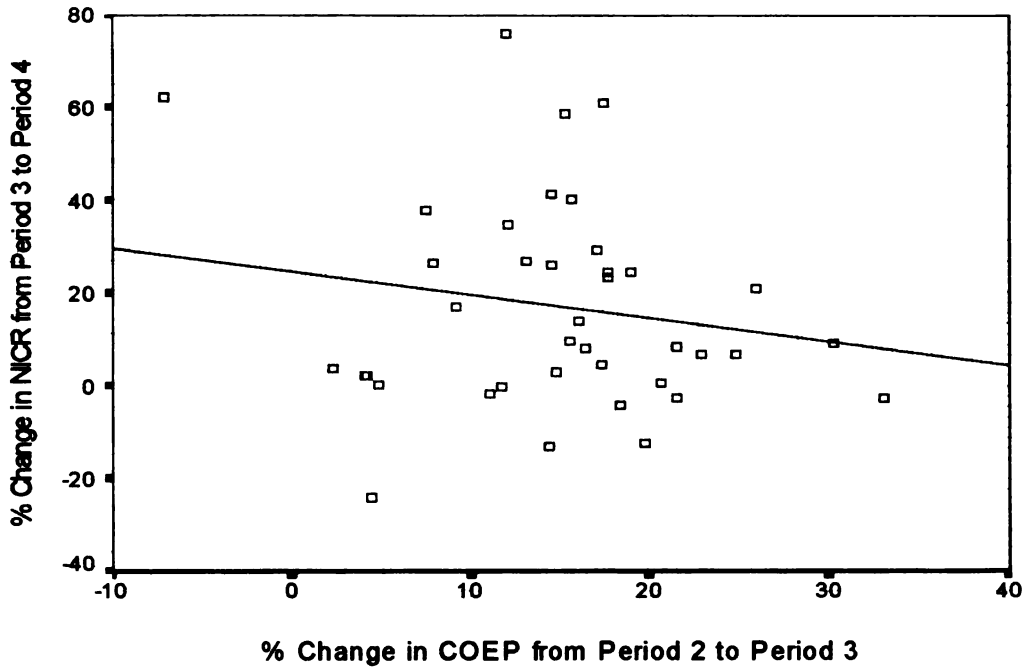
Pearson's Correlation (r) = -.220

Significance (2-tailed) = .178

Despite the downward slope of the fit line, the chances of making a type I error are still too great (.178 > .05). Therefore the null hypothesis cannot comfortably be rejected.

Ho: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



Again there seems to be a clear negative relationship between the two variables and the data points are dispersed evenly about the graph. Judging by the last correlation, however, the relationship here would appear to be insignificant as well.

Statistical Analysis

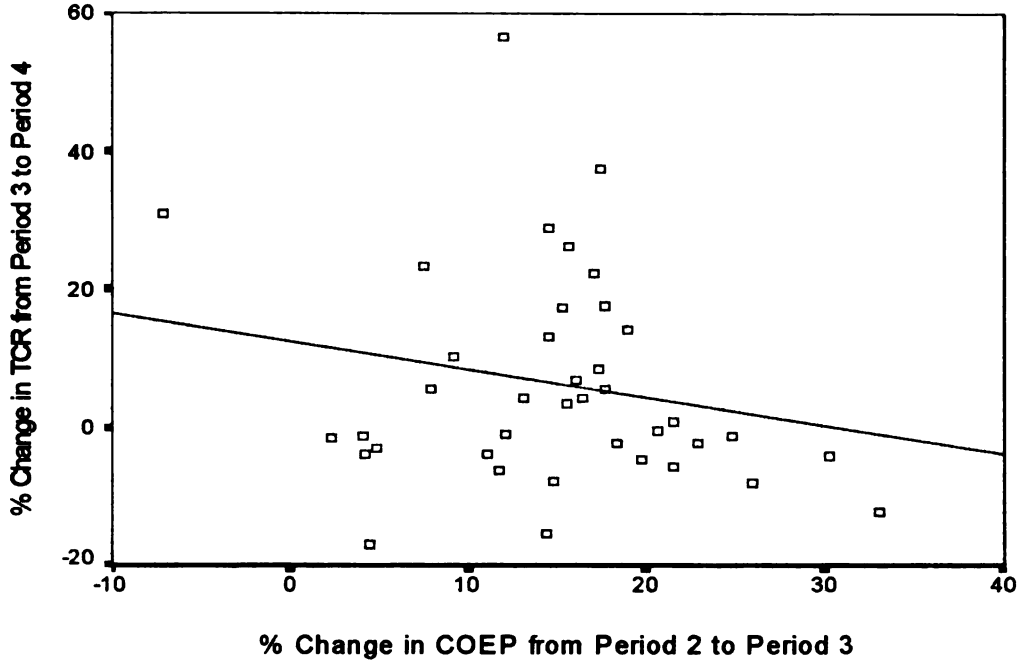
Pearson's Correlation (r) = -.175

Significance (2-tailed) = .288

The relationship is not significant enough to comfortably reject the null hypothesis (.288 > .05) therefore it must be accepted.

Ho: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

Ha: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



The downward slope of the fit line indicates a negative relationship between the two variables. The data points are grouped around the center of the graph with a few exceptions.

Statistical Analysis

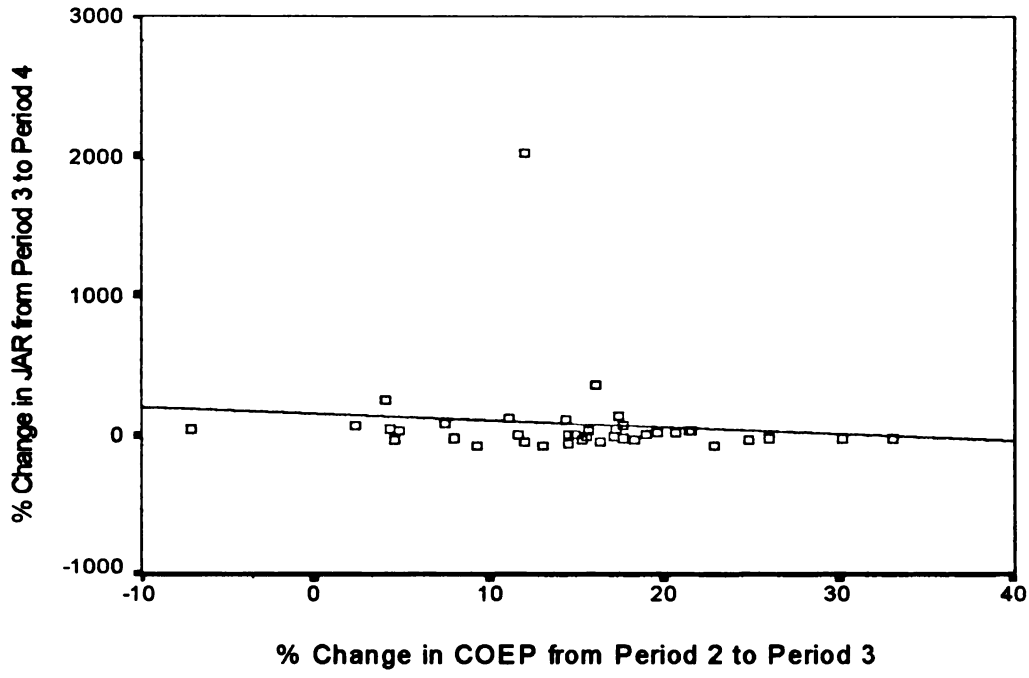
Pearson's Correlation (r) = -.207

Significance (2-tailed) = .205

Although there is a clear negative relationship, it is not significant enough to comfortably reject the null hypothesis (.205 > .05).

Ho: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Juvenile Arrest Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 2 (1979-83) to period 3 (1984-88) and % change in Juvenile Arrest Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



Again the data points appear to be closely positioned around the fit line because of the graphs wide y-axis range to include the large outlier (Norton Shores). There appears to be a slight negative relationship, but nothing significant.

Statistical Analysis

Pearson's Correlation (r) = -.114

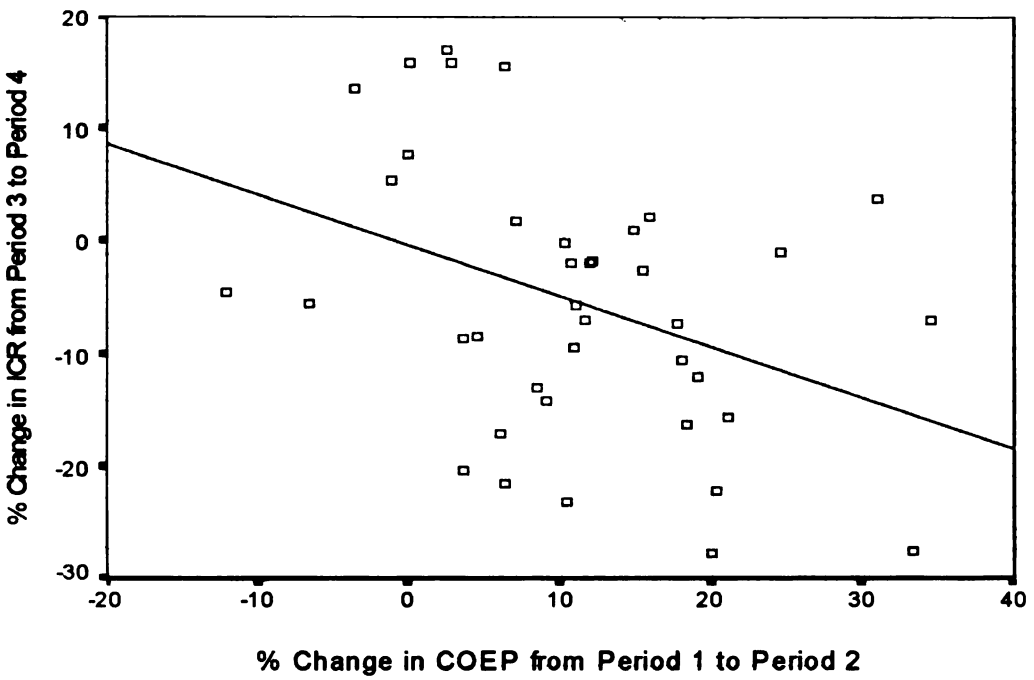
Significance (2-tailed) = .489

The relationship is, indeed, insignificant (.489 > .05) and therefore the null hypothesis is accepted.

Set 4

Ho: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



The first of the correlations in the longest time lag produced a nice scattering of data points about the graph and a clear negative relationship between the two variables. The relationship appears as though it could be a significant one.

Statistical Analysis

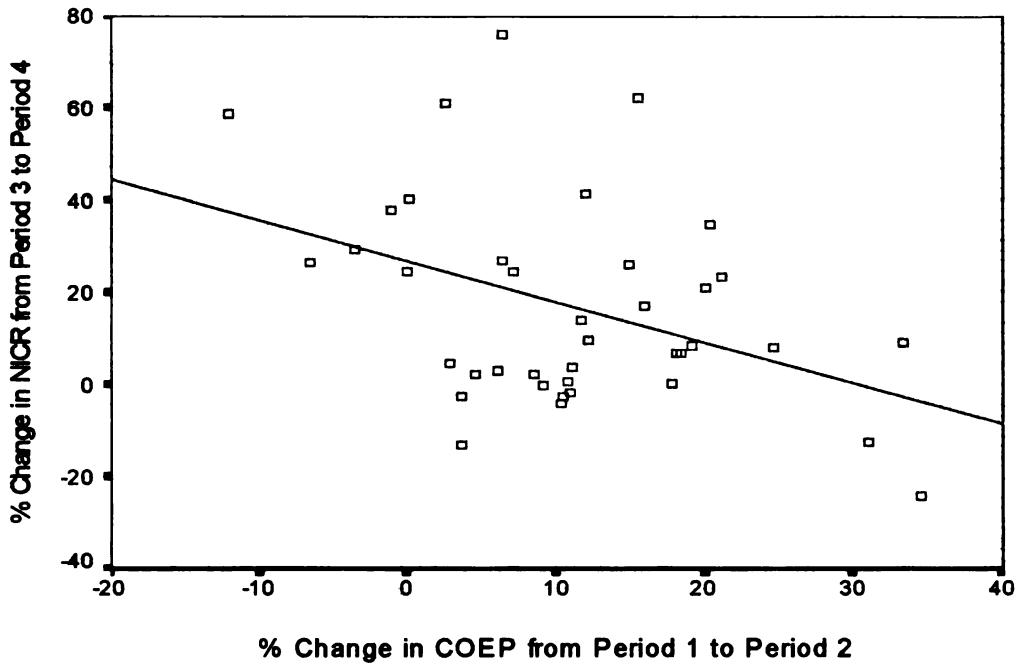
Pearson's Correlation (r) = -.385

Significance (2-tailed) = .015

The relationship between the two variables is, in fact, statistically significant (.015 < .05). This is the first correlation in which the null hypothesis can comfortably be rejected.

Ho: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



Again there is a nice scattering of the data points and a clear negative relationship between these two variables.

Statistical Analysis

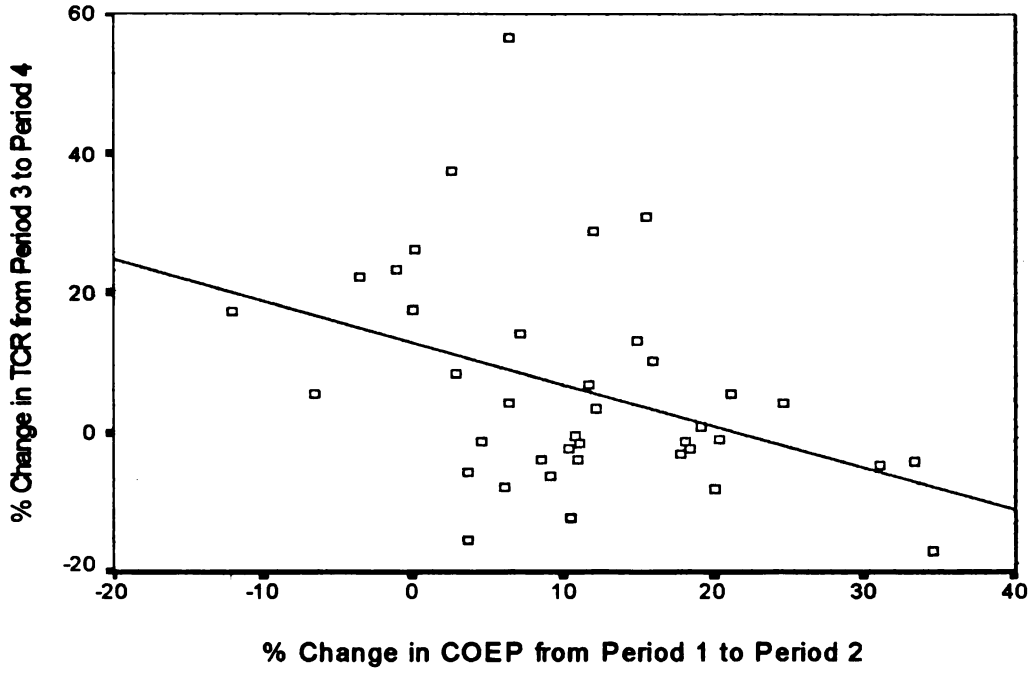
Pearson's Correlation (r) = -.407

Significance (2-tailed) = .010

This correlation is statistically significant as well (.010 < .05), therefore the null hypothesis can be rejected for its alternative.

Ho: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



This correlation, the third in the set of longest lags, produces another fit line with a negative slope which implies that these two variables are inversely related as well.

Statistical Analysis

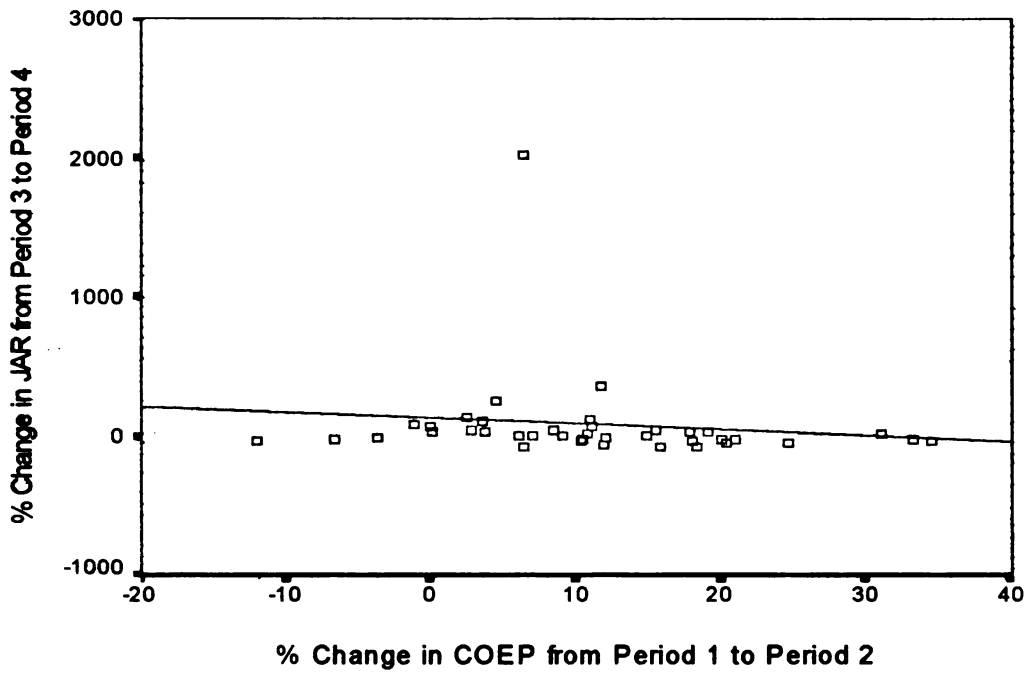
Pearson's Correlation (r) = -.400

Significance (2-tailed) = .012

This correlation, like the latter two, is significant (.012 < .05) and the null hypothesis is rejected.

Ho: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Juvenile Arrest Rate from period 3 (1984-88) to period 4 (1989-93) are independent events (r is equal to 0).

HA: % change in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83) and % change in Juvenile Arrest Rate from period 3 (1984-88) to period 4 (1989-93) are related (r is not equal to 0).



The fourth correlation, in the longest lagged series, does not appear to have a significant relationship. It resembles the two previous correlations that used $ change in JAR from period 3 to period 4 as its y-axis.

Statistical Analysis

Pearson's Correlation (r) = -.133

Significance (2-tailed) = .419

The final correlation is not a significant one (.419 > .05) and therefore there is no other choice but to accept the null hypothesis.

B. Discussion

While the ultimate goal of this study is to determine whether or not changes in school expenditures have any effect on crime/juvenile arrest rates, the aim of the first set of correlations was only to show whether or not cities with higher expenditures on education enjoy lower crime/juvenile arrest rates, but said nothing about increases or decreases. The correlations for both period 3 and period 4 produced no statistically significant results. This would seem to indicate that communities with large amounts of expenditures are just as susceptible to crime and juvenile arrests as are communities with relatively low expenditures on education.

The second set of correlations used the % change in expenditures from period 3 to period 4 for both expenditures and crime/juvenile arrest rates as dependent and independent variables, respectively. Again there was so significant relationship to be found between these variables. It was not until the third set of correlations in which the "five-year lag" was incorporated into expenditures that there appeared to be a clear relationship between the two variables. Although, still statistically insignificant, the likelihood of a Type I error had fell considerably.

It was in the fourth set (10-year lag) that there were three statistically significant correlations between % change in current operating expenditures per pupil from period 1 to period 2 and % change variables from period 3 to period 4 (i.e. index crime rate, non-index crime rate and total crime rate). This implies that there is a relationship between educational expenditures and crime/juvenile arrest rates, but only in the long term. Surprisingly enough, there was no relationship between changes in the juvenile arrest rate and expenditures, even with regard to the longest lagged correlation. This could be attributed to the enormous volatility in the juvenile arrest rate as shown in the graph on page 27, or perhaps it was the more than 2000%

increase in the City of Norton Shores juvenile arrest rate that skewed the data. There is, perhaps, another explanation. Educational expenditures were, in fact, found to be related to crime rates, but only in the long term. This could suggest that increased expenditures help students to form a more law-abiding community when they are older. After all, juveniles, would cease to be juveniles after ten years. The fact that there was no relationship in the non-lagged correlations would seem to indicate that a community doesn't benefit from increased expenditures on education until juveniles have grown and become part of the adult community.

IX. Regressions

The three sets of correlated variables found to be statistically significant were further analyzed using Ordinary Least Squares (OLS) regressions[1]:

$$Y = b_0 + b_1X_1 + e$$

where Y = dependent variable
X_1 = independent variable
b_0 = constant (y-intercept)
b_1 = x-coefficient (slope)
e = standard error term

Regressional analysis determines the extent to which the variables are related (i.e. explained variation in the dependent variable). It will also indicate how the independent variable (crime/juvenile arrest rate) responds to per-unit changes in the independent variable (educational expenditures). Assumptions in linear regression are as follows:

1) The relationship between x (the independent variable) and y (the dependent variable) is linear.

2) The values of x are fixed (y varies as a function of x).

3) The data points are evenly distributed about the line:

    a. Error term has constant variance across values of x (homoskedasticity).

    b. The errors are uncorrelated across observations.

    c. The error is normally distributed.

[1] Data was analyzed using Statistical Programming for Social Science (SPSS) software. Regression output with model summaries, ANOVA and coefficients appears in Appendix F.

A. Results from Regressions

The three regressions were carried out are as follows:

	Dependent variable	Independent variable
1.	% Δ in Index Crime Rate (ICR) from period 3 (1984-88) to period 4 (1989-93)	% Δ in Current Operating Expenditures per Pupil (COEP) from period 1 (1974-78) to period 2 (1979-83)

(ICR % Δ from period 3 to period 4) = b_0 + b_1(% Δ in COEP from period 1 to period 2) + e

Statistical Analysis

Coefficient of Determination (r^2) = .148

Standard Error of the Estimate = .1127

Constant (β) = -3.6E-03 = -0.0036

X-coefficient = -.452

The regression equation that describes the relationship between the two variables:

(ICR % Δ from period 3 to period 4) = -.0036 - (.452)(% Δ in COEP from period 1 to period 2)

The proportion of squared deviations from the mean that are "explained" by the regression equation and the degree to which a change in expenditures can affect a change in the Index Crime Rate in a city in the next ten years 14.8%.

For each 1% increase in Current Operating Expenditures per Pupil from period 1 to period 2 there is a corresponding decrease in the Index Crime Rate from the third to fourth period by 0.452%.

	Dependent variable	Independent variable
2.	% Δ in Non-Index Crime Rate from period 3 (1984-88) to period 4 (1989-93)	% Δ in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83)

(NICR % Δ from period 1 to period 2) = b_0 + b_1(% Δ in COEP from period 1 to period 2) + e

Statistical Analysis

Coefficient of Determination (r^2) = .166

Standard Error of the Estimate = .2068

Constant (β) = .268

X-coefficient = -.884

The regression equation that describes the relationship between the two variables:

(NICR % Δ from period 1 to period 2) = .268 - (.884)(% Δ in COEP from period 1 to period 2)

The proportion of squared deviations from the mean that are "explained" by the regression equation and the degree to which a change in expenditures can affect the Non-Index Crime rate in a city in the next ten years is 16.6%.

For each 1% increase in Current Operating Expenditures per Pupil from period 1 to period 2 there is a corresponding decrease in the Non-Index Crime Rate from the third to fourth period by 0.884%.

	Dependent variable	Independent variable
3.	% Δ in Total Crime Rate from period 3 (1984-88) to period 4 (1989-93)	% Δ in Current Operating Expenditures per Pupil from period 1 (1974-78) to period 2 (1979-83)

(TCR % Δ from period 1 to period 2) = b_0 + b_1(% Δ in COEP from period 1 to period 2) + e

Statistical Analysis

Coefficient of Determination (r^2) = .160

Standard Error of the Estimate = .1425

Constant (β) = .129

X-coefficient = -.597

The regression equation that describes the relationship between the two variables:

(TCR % Δ from period 1 to period 2) = .129 - (.597)(% Δ in COEP from period 1 to period 2)

The proportion of squared deviations from the mean that are "explained" by the regression equation and the degree to which a change in current operating expenditures per pupil can affect the Total Crime Rate in a city in the next ten years is 16.0%.

For each 1% increase in Current Operating Expenditures per Pupil from period 1 to period 2 there is a corresponding decrease in the Total Crime Rate from the third to fourth period by 0.597%.

B. Discussion

Changes in the Non-Index Crime Rate appears to be affected most by changes in expenditures, followed by the Total Crime Rate and finally the Index Crime Rate. While 16.6% explained variation may not seem significant , the goal here was not to "explain" crime rates. If that were the case, then adding additional independent variables, already proven to be related to crime, to a multiple regression would undoubtedly produce a more significant explanation. The purpose here, however was to determine whether or not, educational expenditures alone can have any impact on crime rates. The results from the regressions indicate that there is, in fact, a relationship between the two.

Whether the relationship between the variables found to be related is truly a causal one may remain suspect. Since the unit of observation had to be consistent for the study, the sample was in effect, non-random. It may be inappropriate to generalize the findings of this study to cities that did not meet the criteria for the sample.

Nonetheless, the very fact that a relationship was found to exist between the variables, even if only in lagged correlations, serves as a step in the right direction with regard to showing the way in which public education is, in fact, a benefit to all.

X. Conclusion

A reduction in crime is but one of many potential ways in which changes in educational expenditures could affect communities. Originally, it was my intention to include other dependent variables in this study, in addition to crime/juvenile arrest rates, to determine whether or not they exhibited any relationship to changes in educational expenditures. The potential variables to be studied include median income, wages and salaries and unemployment rates. Unfortunately, this data was not available annually at the sub-county level.

Proposal A in Michigan, which raised the sales tax by 2% for educational expenditures, prompted this study. The thought being that if non-property owner, non-parent citizens of Michigan are expected to pay for provision of education, then research should demonstrate that these citizens benefit from public education.

For future study, the inclusion of the other potential dependent variables would be a worthwhile effort. That is, of course if those variables could be obtained. Perhaps other states in the US do have access to this information annually. The fact that this study was, in essence, directed by the availability of the data, makes it difficult to generalize the results. Developing a method by which cities with more than one school district could be added to the model, could make the study more representative and add to the strength of the results. If this were done, a similar study could even take place using samples from various states.

Bibliography

Anderson, Robert C., "The Interorganizational Community," Lewiston, NY, Queenston, Ontario and Lapeter, Wales, The Edwin Mellen Press, 1993.

Andrews, Chris and Greg J. Borowski, "State slashes tax, no plan for schools," *Lansing State Journal*, pp. 1A, July 23, 1993.

Andrews, Chris, "Citizens' commission proposes property tax levy cut, sales tax hike," *Lansing State Journal*, pp. 3A, Feb. 10, 1987.

Babbie, Earl, "The Practice of Social Research," Wadsworth Publishing Company, 1995.

Bailey, Kenneth D., "Methods of Social Research," New York: Free Press; Toronto: Maxwell Macmillan Canada; New York: Macmillan International, 1994.

Baker, Keith, "Yes, Throw Money at Schools," *Phi Delta Kappan*, April 1991, v72, n8, pp. 628-31.

Christoff, Chris, "School tax reform plan may face rocky road," *Detroit Free Press*, September 27, 1987.

Clark, W . A. V. and P. L. Hosking, "Statistical Methods for Geographers," New York, John Wiley & Sons, Inc., 1986.

Danzberger, Jacqueline P. and Michael D. Usdan, "Local education governance: perspectives on problems and strategies for change," *Phi Delta Kappan*, Jan. 1994, v75, n5, p. 366.

"Data Collection and Analysis," London; Thousand Oaks, CA, Sage in association with Open University, 1996.

Decker, Paul T., "Findings From Education and the Economy: An Indicators report," Washington, DC: National Center for Education Statistics, US Dept. of Education, Office of Educational Research and Improvement.

Gilling, Daniel, "Crime Prevention: Theory, Policy and Politics," London and Bristol, PA, UCL Press, 1997.

"GOP calls property tax funding for schools unfair, wants changes: Republican leaders say that less affluent districts are losing out," *Detroit Free Press*, February 3, 1987.

Iorio, Mary E., "Schools stunned by revenue loss," *Lansing State Journal*, July 23, 1993.

Jones, Tim, "Report says sales tax of 6% would aid schools," *Detroit Free Press*, February 10, 1987.

Kearney, C Philip, "A Primer on Michigan School Finance Third Edition," The University of Michigan, 1994.

Kratcoski, Peter C. and Lucille Dunn Kratcoski, "Juvenile Delinquency: Third Edition," Englewood Cliffs, NJ, Prentice-Hall, Inc., 1990.

Mandi, Peter, "Education and Economic Growth in the Developing Countries," Budapest, Hungary, Akademiai, 1981.

Mathews, David, "The Lack of Public for Public Schools," *Phi Delta Kappan*, June 1997, v78, n10, pp. 740-55.

Murnane, Richard J. and Edward W. Pauly, "Lessons from Comparing Educational and Economic Indicators," *Phi Delta Kappan*, March 1988, , v69, n7, pp. 509-13.

Nation, Jack R., "Research Methods," Upper Saddle River, NJ, Prentice Hall, 1997.

Pierce, Hank, "Fiscal Focus: Proposal A and Pupil Equity," prepared for the *House Fiscal Agency*, December 1996.

Psacharopoulous, George and Eduardo Velez, "Educational quality and labor market outcomes: evidence from Bogota, Colombia," *Sociology of Education*, April 1993, v66, n2, pp. 130-45.

Psacharopoulous, George assisted by Keith Hinchliffe, "Returns to Education: An International Comparison," San Francisco; Washington, Jossey-Bass Inc., 1973.

Quan, Nguyen T. and John H. Beck, "Public Education Expenditures and State Economic Growth: Northeast and Sunbelt Regions," *Southern Economic Journal*, Oct. 1987, v54, n2, pp. 361-66.

"Questions, answers on plan to overhaul school finance," *Detroit Free Press*, September 24, 1987.

Stroud, Joe H., "Prop A offers meaningful improvements," *Detroit Free Press*, May 9, 1993.

Stoetzer, Karin E. and Merry Morash, "Juvenile Crime in Michigan: Evidence and Public Perceptions," East Lansing, MI, Institute for Public Policy & Social Research, 1997.

Teng, Teng, "Education Spurs Economic and Social Progress," *Beijing Review*, Dec. 2-8, 1991, v72, n8, pp. 28-31.

Whorton, Joseph W. Jr. and David R. Morgan, "Measuring Community Performance: A Handbook of Indicators," *Bureau of Government Research*, 1975.

Witte, Ann Dryden, "Crime," from *The Social Benefits of Education*, ed. Jere R. Behrman and Nevzer Stacey, Ann Arbor, MI, The University of Michigan Press, 1997.

Wolfgang, Marvin E., Terence P. Thornberry and Robert M. Figlio, "From Boy to Man, from Delinquency to Crime," Chicago and London, The University of Chicago Press, 1987.

APPENDIX A – List of Variables

	CITY	School District	COEP Period 1 1974-1978	COEP Period 2 1979-1983	COEP Period 3 1984-1988	COEP Period 4 1989-1993	COEP % Change Period 1 to 2	COEP % Change Period 2 to 3	COEP % Change Period 3 to 4	ICR Period 3 1984-1988
1	Alpena	Alpena Public Schools	5202	5150	5537	6165	-0.009996155	0.075145631	0.113418819	26385.79
2	Benton Harbor	Benton Harbor Area Schools	5964	5973	6910	7624	0.001509054	0.156872593	0.103328509	95847.53
3	Escanaba	Escanaba Area Public Schools	4992	5312	6009	6590	0.064102564	0.131212349	0.096688301	31794.84
4	Traverse City	Traverse City Area Public Schools	4795	4969	5684	6761	0.0362878	0.143892131	0.18947924	34834.35
5	East Lansing	East Lansing School District	7235	7441	8732	10247	0.028472702	0.173498186	0.173499771	18486.45
6	Portage	Portage Public Schools	5563	5705	6702	7666	0.025525795	0.174758983	0.14383766	24284.96
7	Kentwood	Kentwood Public Schools	5241	5436	6609	7875	0.03720664	0.215783664	0.191556968	27888.3
8	Mt. Clemens	Mt. Clemens Community Schools	6088	6818	7809	8673	0.119908016	0.145350543	0.110641567	45733.53
9	Roseville	Roseville Community Schools	5488	6363	6954	7812	0.159438776	0.092880717	0.123382226	44350.04
10	Sterling Heights	Utica Community Schools	5078	5629	6792	8040	0.108507286	0.206608634	0.183745583	23549.77
11	Menominee	Menominee Area Public Schools	5011	5015	5905	6090	0.000798244	0.177467597	0.031329382	25628.89
12	Muskegon Heights	Muskegon Heights School District	5711	5510	6452	8352	-0.035195237	0.170961887	0.294482331	66011.91
13	Norton Shores	Mona Shores Public School District	5553	5911	6623	6851	0.064469656	0.120453392	0.034425487	15967.04
14	Berkley	Berkley School District	6482	6775	7055	7570	0.045202098	0.041328413	0.072997874	15056.66
15	Birmingham	Birmingham City School District	7205	9609	12521	14199	0.333657183	0.303049225	0.134014855	25904.49
16	Clawson	Clawson City School District	5467	6112	7098	8615	0.117980611	0.16132199	0.213722175	17544.01
17	Ferndale	Ferndale City School District	6225	6981	8067	8222	0.121445783	0.155565105	0.019214082	38311.27
18	Hazel Park	Hazel Park City School District	6048	6421	7376	7875	0.06167328	0.148730727	0.067651844	56127.04
19	Novi	Novi Community School District	5733	6944	8175	9743	0.211233211	0.177275346	0.191804281	30081.52
20	Oak Park	Oak Park City School District	8923	9561	11372	11348	0.071500616	0.189415333	-0.002110447	36804.82
21	Royal Oak	School District City of Royal Oak	6928	8257	10030	11502	0.191830254	0.214726898	0.146759721	29277.75
22	Southfield	Southfield Public School District	8022	9634	12140	14499	0.200947395	0.260120407	0.19431631	54521.66
23	Troy	Troy School District	5924	6548	8716	11112	0.105334234	0.331093464	0.274896742	34144.72
24	Owosso	Owosso Public Schools	4482	4895	5469	6292	0.092146363	0.117262513	0.150484549	30560.36
25	Allen Park	Allen Park Public Schools	6181	8322	8702	8054	0.34638408	0.0456621	-0.07446564	21545.95
26	Dearborn	Dearborn City School District	8614	9579	9804	10087	0.112026933	0.023488882	0.028865769	44040.67
27	Ecorse	Ecorse Public School District	6747	7801	7251	8803	0.156217578	-0.070503782	0.214039443	37383.6
28	Garden City	Garden City School District	5789	7217	8403	8806	0.246674728	0.164334211	0.047959062	22119.68
29	Hamtramck	Hamtramck Public Schools	6731	6290	6793	6745	-0.065517754	0.079968203	-0.007066097	72172.2
30	Harper Woods	City of Harper Woods Schools	5846	7668	9179	9943	0.311666096	0.197052686	0.083233468	67520.82
31	Highland Park	Highland Park City Schools	7324	6446	7434	8470	-0.119879847	0.153273348	0.139359699	83257.91
32	Lincoln Park	Lincoln Park Public Schools	5236	5680	5925	7037	0.084797555	0.043133803	0.187679325	39135.16
33	Romulus	Romulus Community Schools	5885	6950	8675	10149	0.180968564	0.248201439	0.169913545	52278.62
34	Southgate	Southgate Community School District	5762	6793	7127	7340	0.178930927	0.049168261	0.029886348	32694.05
35	Taylor	Taylor School District	5734	6595	7555	8698	0.150156958	0.145564822	0.151290536	37893.01
36	Trenton	Trenton Public Schools	6476	7669	9426	10410	0.184218653	0.229104186	0.104392107	14643.65
37	Westland	Wayne-Westland Community School District	6356	7019	8304	8895	0.104310887	0.183074512	0.07117052	28955.87
38	Wyandotte	Wyandotte City School District	5647	6799	7623	7924	0.204002125	0.121194293	0.039485767	24156.21
39	Cadillac	Cadillac Area Public Schools	4411	4899	5444	6075	0.11063251	0.111247193	0.115907421	36556.62

	CITY	ICR Period 4 1989-1993	ICR % Change Period 3 to 4	NICR Period 3 1984-1988	NICR Period 4 1989-1993	NICR % Change Period 3 to 4	TCR Period 3 1984-1988	TCR Period 4 1989-1993	TCR % Change Period 3 to 4	JAR Period 3 1984-1988	JAR Period 4 1989-1993	JAR % Change Period 3 to 4
1	Alpena	27833.62	0.05487158	32329.89	44662.72	0.381468356	58715.68	72496.34	0.234701531	3280.2	6222.8	0.897079446
2	Benton Harbor	111211	0.160290724	71507.1	100462.3	0.404927483	167354.6	211673.3	0.26481895	4370.27	6022.22	0.37799724
3	Escanaba	24975.06	-0.214493295	36111.9	45928.62	0.271841692	67906.74	70903.68	0.044133174	5916.15	2185.12	-0.630651691
4	Traverse City	27767.58	-0.202867859	70981.51	62067.58	-0.125581014	105815.9	89835.14	-0.151023783	997.41	2171.09	1.176727725
5	East Lansing	21436.79	0.15959473	33193.07	34768.22	0.047454182	51679.53	56205.02	0.087568327	709.33	1072.39	0.511835112
6	Portage	28446.23	0.171351734	21009.95	33928.79	0.614891516	45294.93	62375.01	0.377085912	2682.24	6631.62	1.472418576
7	Kentwood	25534.52	-0.084400268	24020.66	23481.97	-0.022426112	51908.96	49016.48	-0.055722172	3438.37	4708.85	0.369500665
8	Mt. Clemens	44922.01	-0.01774453	109365.9	155038.1	0.417609572	155099.4	199960.1	0.289238468	11882.37	5804.75	-0.511482137
9	Roseville	45334.22	0.022191186	52344.32	61443.41	0.173831468	96694.35	106777.6	0.104280033	11839.81	3355.58	-0.716584979
10	Sterling Heights	23119.56	-0.018268119	41125.56	41458.17	0.008087671	64675.32	64577.73	-0.001508922	1075.37	1418.3	0.318894892
11	Menominee	27626.51	0.07794407	34710.07	43414.2	0.250766708	60338.97	71040.71	0.177360336	2647.68	4796.55	0.811604877
12	Muskegon Heights	75047.4	0.136876664	80445.57	104289.5	0.296398795	146457.5	179337	0.224498233	5414.41	5265.97	-0.02741573
13	Norton Shores	18477.39	0.15722075	33406.16	58845.91	0.761528712	49373.17	77323.29	0.566099361	14.04	298.68	20.27350427
14	Berkley	13796.38	-0.083702494	29806.97	30606.75	0.026763085	44865.62	44403.13	-0.010308339	107.85	383.41	2.555030134
15	Birmingham	18773.24	-0.275290114	44695.61	49039.99	0.097199255	70600.11	67813.24	-0.039474018	1019.17	870.59	-0.145785296
16	Clawson	16324.9	-0.069488674	33314.18	38134.88	0.144704147	50858.21	54459.78	0.070815902	264.7	1238.27	3.678012845
17	Ferndale	37707.25	-0.015766118	33370.09	36685.81	0.099362033	71681.34	74393.07	0.037830347	1577.06	1477.61	-0.063060378
18	Hazel Park	46558.93	-0.170472378	49443.54	51020.65	0.03189719	105570.6	97579.58	-0.075693699	2708.96	2888.24	0.066180379
19	Novi	25415.25	-0.155120818	35737.44	44154.13	0.235514631	65818.96	69569.38	0.056980846	1797.57	1527.13	-0.150447549
20	Oak Park	37541.52	0.0200164	43676.78	54503.5	0.247882742	80481.59	92045.01	0.143677827	2485.01	2759.06	0.110289295
21	Royal Oak	25773.06	-0.119704895	50961.83	55359.38	0.086291054	80239.57	81132.44	0.011127552	552.92	771.81	0.395880055
22	Southfield	39434.64	-0.276716079	36914.86	44817.91	0.214088581	91436.5	84252.56	-0.07856753	2384.73	1955.9	-0.179823292
23	Troy	26291.07	-0.230010672	37457.86	36677.19	-0.020841287	71602.58	62968.27	-0.120586577	2543.02	2353.21	-0.074639602
24	Owosso	26248.07	-0.141107304	42309.19	42319.11	0.000234464	72869.55	68567.17	-0.05904222	424.69	464.58	0.093927335
25	Allen Park	20053	-0.069291445	30537.37	23330.39	-0.236005262	52083.32	43383.41	-0.167038315	758.48	526.4	-0.305980382
26	Dearborn	41589.74	-0.055651515	34750.19	36248.04	0.043103361	78790.87	77837.8	-0.012096198	2085.56	3832.64	0.837703063
27	Ecorse	36474.66	-0.02431387	39913.72	64884.64	0.625622468	77297.34	101359.3	0.311291048	315.66	468.37	0.483760016
28	Garden City	21944.57	-0.00791648	31748.33	34369.48	0.082560248	53868.02	56314.05	0.045407832	3170.48	1959.36	-0.38199894
29	Hamtramck	68211.88	-0.054873206	38420.88	48701.48	0.267578463	110593.1	116913.4	0.057148778	2945.73	2465.27	-0.163103883
30	Harper Woods	70186.3	0.039476416	74009.35	65207	-0.118935648	141530.2	135393.3	-0.043360928	16584.89	20137.51	0.214208234
31	Highland Park	79594.29	-0.044003266	43596.33	69401.52	0.59191198	126854.2	148995.8	0.174543569	4425.49	3168.07	-0.284131249
32	Lincoln Park	34054.97	-0.129811402	59943.79	61446.03	0.025060811	99078.95	95500.99	-0.036112212	4045.35	6191.27	0.530465843
33	Romulus	46828.13	-0.10425849	61368.66	65739.38	0.071220718	113647.3	112567.5	-0.009501063	4142.24	2890	-0.302309861
34	Southgate	30354.99	-0.071543905	43554.03	43734.97	0.00415438	76248.08	74089.97	-0.028303795	1735.89	2365.67	0.362799486
35	Taylor	38323.33	0.011356184	36100.07	45612.6	0.263504475	73993.11	83935.93	0.134374944	5253.72	5751.58	0.09476333
36	Trenton	12273.01	-0.1618886	21739.06	23303.34	0.071957113	36382.71	35576.35	-0.022163275	633.44	241.73	-0.618385325
37	Westland	28965.71	0.000339627	33134.84	31873.39	-0.0380702	62090.71	60839.11	-0.020157605	3860.91	2678.71	-0.268293949
38	Wyandotte	18829.3	-0.220519278	14468.05	19521.59	0.349289642	38624.25	38350.89	-0.007077419	1804.82	986.5	-0.453406096
39	Cadillac	33128.12	-0.093786023	100154.3	98668.98	-0.014829825	136710.9	131797.1	-0.035942716	3776.65	8508.8	1.253001999

APPENDIX B – Population Estimates

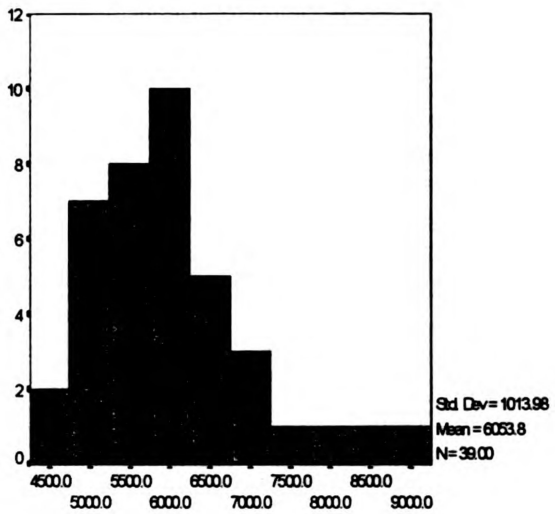
	CITY	Population Estimate 1984	Population Estimate 1986	Population Estimate 1988	Population Census 1990	Population Estimate 1991	Population Estimate 1992	Population Estimate 1993	Population Estimate 1994
1	Alpena	11535	11290	11350	11354	11446	11544	11580	11484
2	Benton Harbor	14246	14160	14550	12818	12331	12252	12160	12028
3	Escanaba	14391	13900	13800	13659	13698	13679	13696	13640
4	Traverse City	15406	15810	16670	15155	15080	15136	15165	15118
5	East Lansing	46739	48120	48070	50677	49831	48490	48423	48828
6	Portage	39837	40430	40460	41042	41462	41811	42373	42514
7	Kentwood	34113	35750	37080	37826	39108	39667	40093	40860
8	Mt. Clemens	18755	19300	19770	18405	18202	17995	17806	17542
9	Roseville	52043	51790	50520	51412	51705	51760	51684	51335
10	Sterling Heights	109440	111960	114720	117810	118458	118256	118027	117427
11	Menominee	9706	9540	9430	9398	9233	9158	9061	8958
12	Muskegon Heights	14258	14610	14790	13176	13099	13027	12961	12805
13	Norton Shores	21375	21710	22080	21755	22031	22167	22337	22395
14	Berkley	17618	17470	17370	16960	16901	16966	16945	16899
15	Birmingham	20739	20540	19950	19997	19976	20043	19998	19934
16	Clawson	14356	14100	13730	13874	13824	13935	13925	13871
17	Ferndale	25195	25070	24450	25084	24955	24963	24895	24764
18	Hazel Park	20294	20200	20050	20051	20021	20076	20029	19924
19	Novi	24785	27990	31330	32998	35562	36900	39137	40487
20	Oak Park	30514	31120	31090	30468	30358	30436	30368	30259
21	Royal Oak	67436	66190	64120	65410	65230	65398	65264	65280
22	Southfield	73405	72910	71870	75727	76048	76382	76306	76132
23	Troy	67403	67270	68700	72884	73986	75741	76820	77904
24	Owosso	15614	15420	15680	16322	16292	16238	16191	16086
25	Allen Park	31619	31130	30530	31092	30891	30530	30097	29570
26	Dearborn	86960	86420	86180	89286	88384	87373	86361	85542
27	Ecorse	13405	13050	12430	12180	12033	11897	11734	11526
28	Garden City	33255	32530	32130	31846	31458	31063	30640	30175
29	Hamtramck	19510	18690	17580	18372	18105	17857	17572	17232
30	Harper Woods	15106	14710	14110	14903	14720	14542	14330	14073
31	Highland Park	25890	25620	25450	20121	19687	19197	18780	18354
32	Lincoln Park	43201	42850	42400	41832	41354	40896	40315	39595
33	Romulus	23842	24100	23990	22897	22905	22783	22489	22073
34	Southgate	30742	30390	30350	30771	30462	30140	29749	29415
35	Taylor	73179	72440	71640	70811	69973	69196	68285	67497
36	Trenton	21263	21170	20870	20586	20488	20349	20191	19877
37	Westland	81143	81190	81490	84724	84819	84674	84786	84136
38	Wyandotte	31888	31350	30710	30938	30774	30551	30213	29780
39	Cadillac	10509	10550	10490	10104	10154	10236	10343	10480

APPENDIX C – Descriptive Statistics

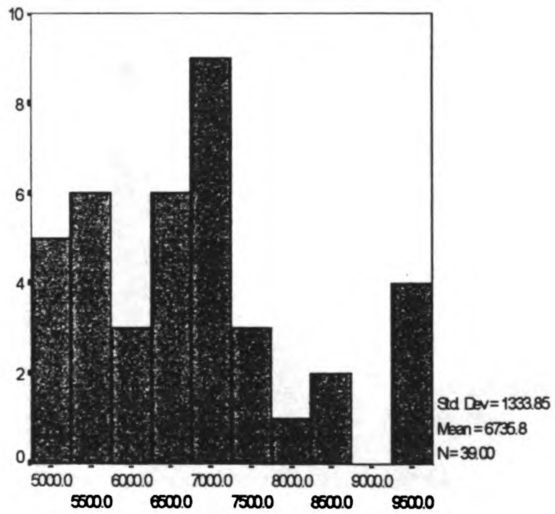
	N	Range	Minimum	Maximum	Mean	Variance
% Change in COEP from Period 1 to Period 2	39	.47	-.12	.35	.1113	1.1E-02
% Change in COEP from Period 2 to Period 3	39	.40	-.07	.33	.1489	6.1E-03
% Change in COEP from Period 3 to Period 4	39	.37	-.07	.29	.1168	6.4E-03
COEP for Period 1	39	4512.00	4411.00	8923.00	6053.82	1028152
COEP for Period 2	39	4739.00	4895.00	9634.00	6735.79	1779146
COEP for Period 3	39	7077.00	5444.00	12521.00	7753.38	2997836
COEP for Period 4	39	8424.00	6075.00	14499.00	8645.10	3946804
% Change in ICR from Period 3 to Period 4	39	.45	-.28	.17	-5.E-02	1.5E-02
ICR for Period 3	39	81203.88	14643.65	95847.53	37524.4	3.6E+08
ICR for Period 4	39	98937.99	12273.01	111211.0	35805.3	4.2E+08

	N	Range	Minimum	Maximum	Mean	Variance
% Change in JAR from Period 3 to Period 4	39	20.99	-.72	20.27	.8105	10.964
JAR for Period 3	39	16570.85	14.04	16584.89	3217.25	1.2E+07
JAR for Period 4	39	19895.78	241.73	20137.51	3302.96	1.2E+07
% Change in NICR from Period 3 to Period 4	39	1.00	-.24	.76	.1701	5.0E-02
NICR for Period 3	39	94897.81	14468.05	109365.9	44658.5	4.2E+08
NICR for Period 4	39	135517	19521.59	155038.1	51927.0	6.8E+08
% Change in TCR from Period 3 to Period 4	39	.73	-.17	.57	6.3E-02	2.4E-02
TCR for Period 3	39	130972	36382.71	167354.6	82182.9	1.2E+09
TCR for Period 4	39	176097	35576.35	211673.3	87732.3	1.7E+09
Valid N (listwise)	39					

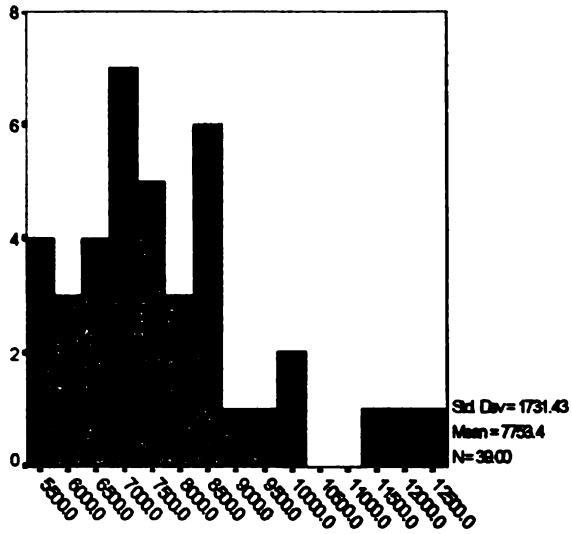
APPENDIX D – Distributions



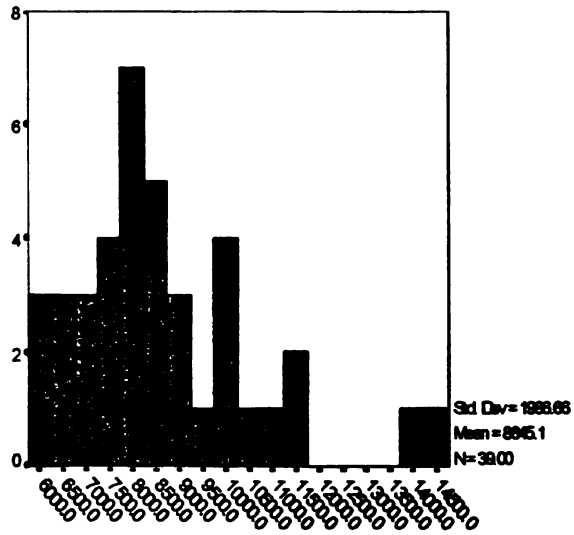
COEP for Period 1



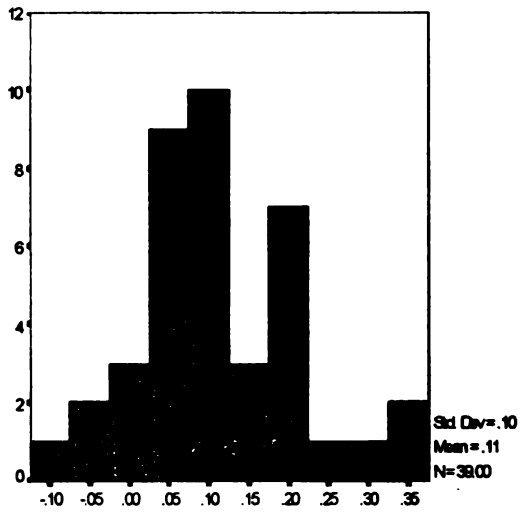
COEP for Period 2



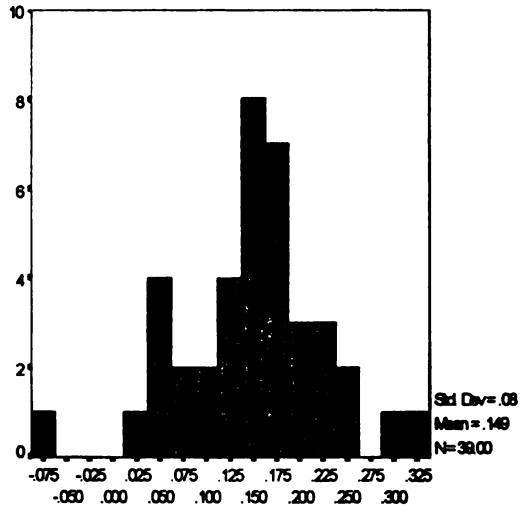
COEP for Period 3



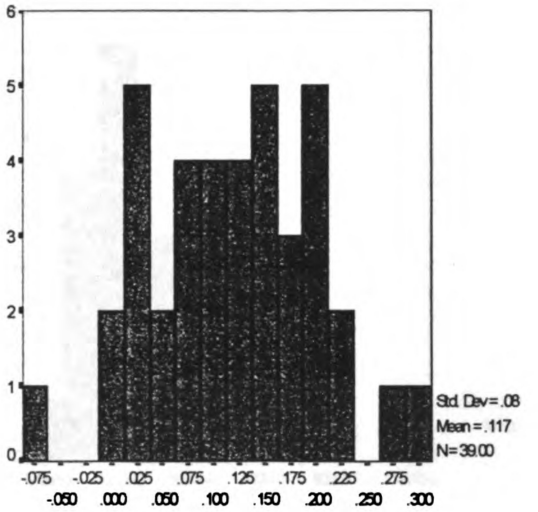
COEP for Period 4



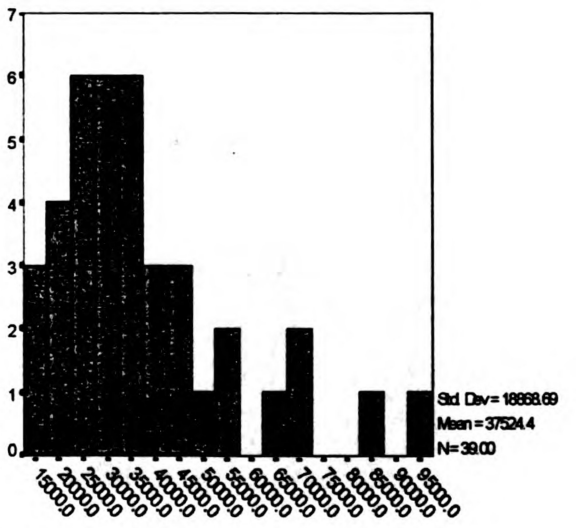
% Change in OCEP from Period 1 to Period 2



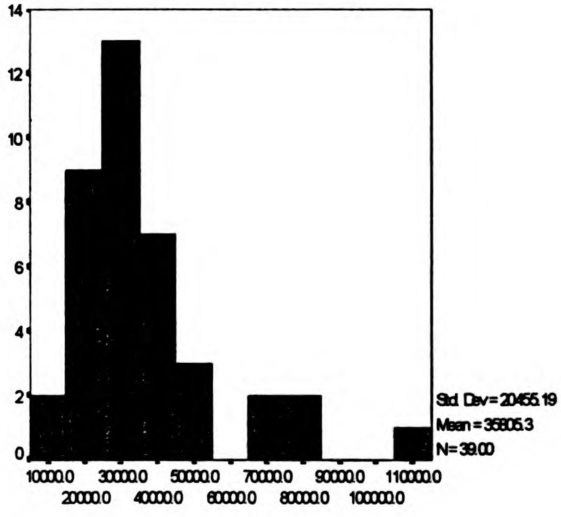
% Change in OCEP from Period 2 to Period 3



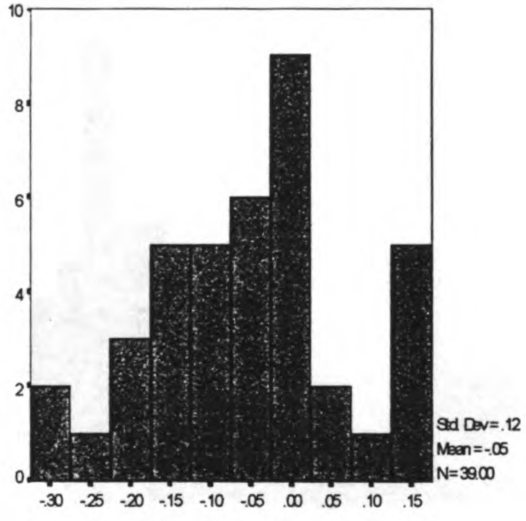
% Change in OCEP from Period 3 to Period 4



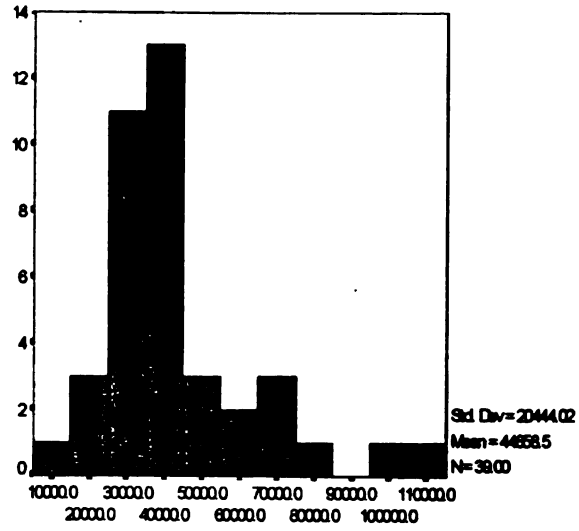
ICR for Period 3



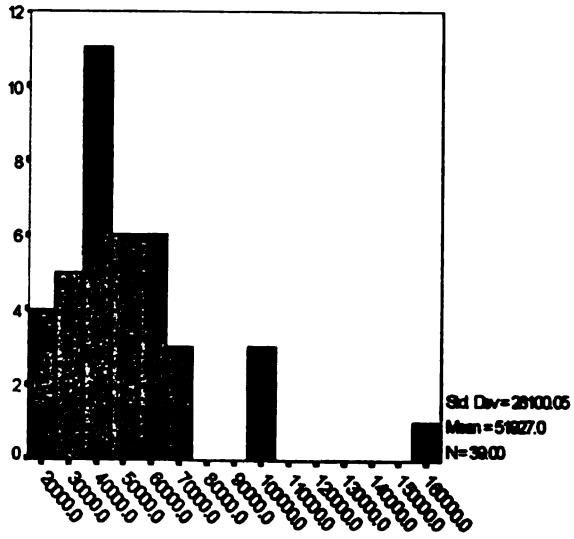
ICR for Period 4



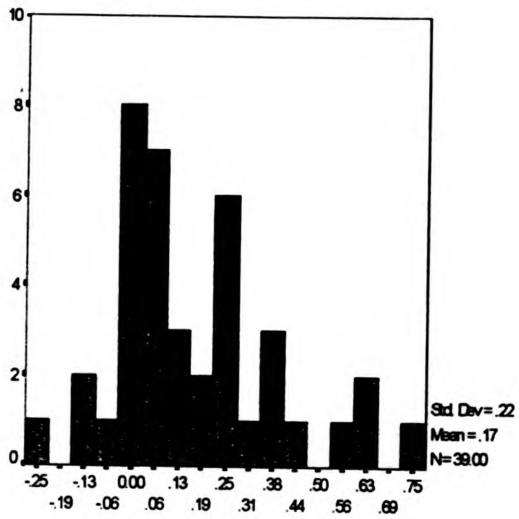
% Change in ICR from Period 3 to Period 4



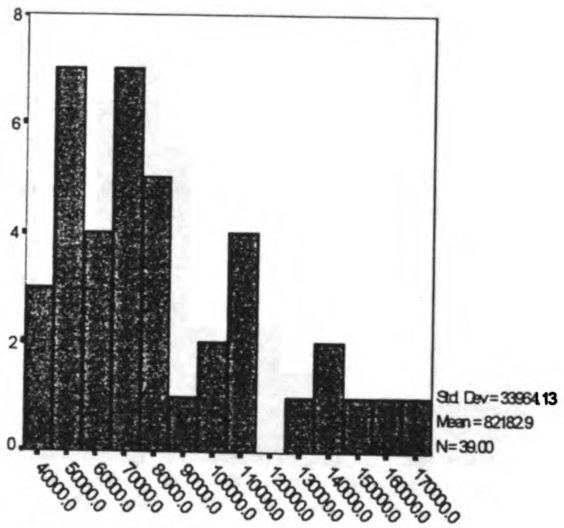
NCR for Period 3



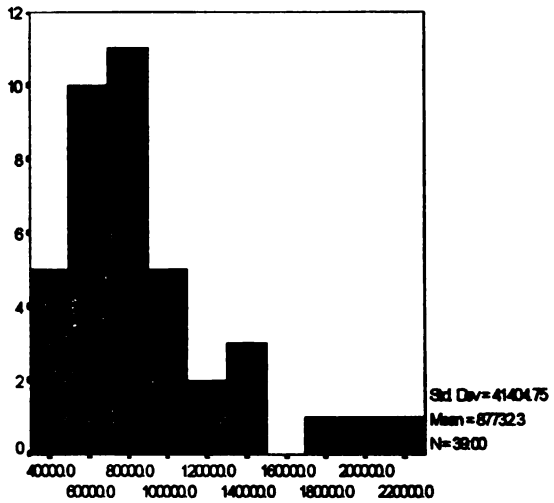
NCR for Period 4



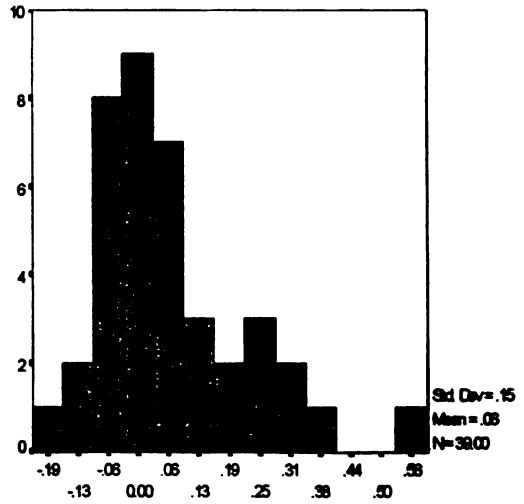
% Change in NICR from Period 3 to Period 4



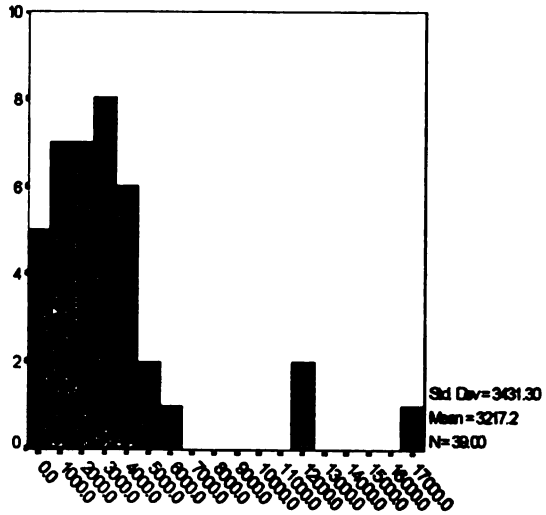
TCR for Period 3



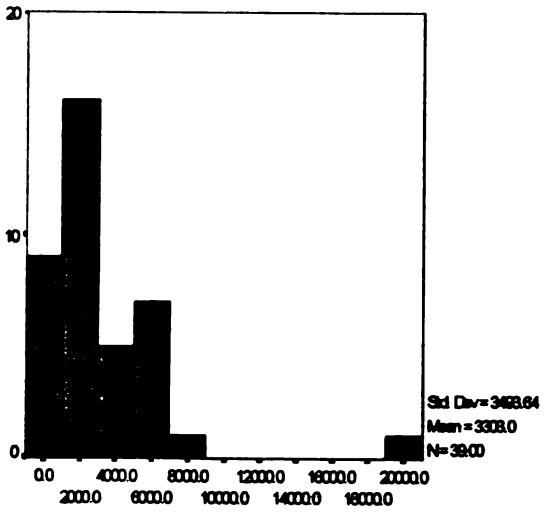
TCR for Period 4



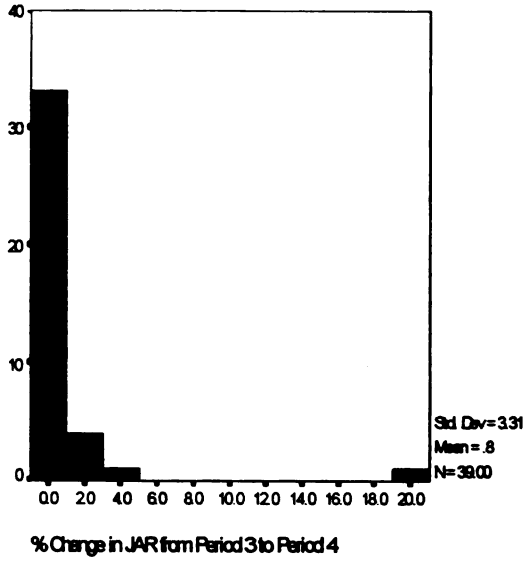
% Change in TCR from Period 3 to Period 4



JARate for Period 3



JAR for Period 4


40
30
20
10
0
0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0
Std. Dev=3.31
Mean=.8
N=39.00
% Change in JAR from Period 3 to Period 4

APPENDIX E – Correlation Output

Correlations

		COEP for Period 3	ICR for Period 3
Pearson Correlation	COEP for Period 3	1.000	.002
	ICR for Period 3	.002	1.000
Sig. (2-tailed)	COEP for Period 3	.	.992
	ICR for Period 3	.992	.
N	COEP for Period 3	39	39
	ICR for Period 3	39	39

Correlations

		COEP for Period 3	NICR for Period 3
Pearson Correlation	COEP for Period 3	1.000	-.148
	NICR for Period 3	-.148	1.000
Sig. (2-tailed)	COEP for Period 3	.	.369
	NICR for Period 3	.369	.
N	COEP for Period 3	39	39
	NICR for Period 3	39	39

Correlations

		COEP for Period 3	TCR for Period 3
Pearson Correlation	COEP for Period 3	1.000	-.088
	TCR for Period 3	-.088	1.000
Sig. (2-tailed)	COEP for Period 3	.	.594
	TCR for Period 3	.594	.
N	COEP for Period 3	39	39
	TCR for Period 3	39	39

Correlations

		COEP for Period 3	JAR for Period 3
Pearson Correlation	COEP for Period 3	1.000	-.042
	JAR for Period 3	-.042	1.000
Sig. (2-tailed)	COEP for Period 3	.	.800
	JAR for Period 3	.800	.
N	COEP for Period 3	39	39
	JAR for Period 3	39	39

Correlations

		COEP for Period 4	ICR for Period 4
Pearson Correlation	COEP for Period 4	1.000	-.057
	ICR for Period 4	-.057	1.000
Sig. (2-tailed)	COEP for Period 4	.	.729
	ICR for Period 4	.729	.
N	COEP for Period 4	39	39
	ICR for Period 4	39	39

Correlations

		COEP for Period 4	NICR for Period 4
Pearson Correlation	COEP for Period 4	1.000	-.095
	NICR for Period 4	-.095	1.000
Sig. (2-tailed)	COEP for Period 4	.	.564
	NICR for Period 4	.564	.
N	COEP for Period 4	39	39
	NICR for Period 4	39	39

Correlations

		COEP for Period 4	TCR for Period 4
Pearson Correlation	COEP for Period 4	1.000	-.088
	TCR for Period 4	-.088	1.000
Sig. (2-tailed)	COEP for Period 4	.	.593
	TCR for Period 4	.593	.
N	COEP for Period 4	39	39
	TCR for Period 4	39	39

Correlations

		COEP for Period 4	JAR for Period 4
Pearson Correlation	COEP for Period 4	1.000	-.117
	JAR for Period 4	-.117	1.000
Sig. (2-tailed)	COEP for Period 4	.	.480
	JAR for Period 4	.480	.
N	COEP for Period 4	39	39
	JAR for Period 4	39	39

Correlations

		% Change in COEP from Period 3 to Period 4	% Change in ICR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 3 to Period 4	1.000	-.131
	% Change in ICR from Period 3 to Period 4	-.131	1.000
Sig. (2-tailed)	% Change in COEP from Period 3 to Period 4	.	.427
	% Change in ICR from Period 3 to Period 4	.427	.
N	% Change in COEP from Period 3 to Period 4	39	39
	% Change in ICR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 3 to Period 4	% Change in NICR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 3 to Period 4	1.000	.059
	% Change in NICR from Period 3 to Period 4	.059	1.000
Sig. (2-tailed)	% Change in COEP from Period 3 to Period 4	.	.721
	% Change in NICR from Period 3 to Period 4	.721	.
N	% Change in COEP from Period 3 to Period 4	39	39
	% Change in NICR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 3 to Period 4	% Change in TCR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 3 to Period 4	1.000	.006
	% Change in TCR from Period 3 to Period 4	.006	1.000
Sig. (2-tailed)	% Change in COEP from Period 3 to Period 4	.	.969
	% Change in TCR from Period 3 to Period 4	.969	.
N	% Change in COEP from Period 3 to Period 4	39	39
	% Change in TCR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 3 to Period 4	% Change in JAR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 3 to Period 4	1.000	-.121
	% Change in JAR from Period 3 to Period 4	-.121	1.000
Sig. (2-tailed)	% Change in COEP from Period 3 to Period 4	.	.463
	% Change in JAR from Period 3 to Period 4	.463	.
N	% Change in COEP from Period 3 to Period 4	39	39
	% Change in JAR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 2 to Period 3	% Change in ICR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 2 to Period 3	1.000	-.220
	% Change in ICR from Period 3 to Period 4	-.220	1.000
Sig. (2-tailed)	% Change in COEP from Period 2 to Period 3	.	.178
	% Change in ICR from Period 3 to Period 4	.178	.
N	% Change in COEP from Period 2 to Period 3	39	39
	% Change in ICR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 2 to Period 3	% Change in NICR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 2 to Period 3	1.000	-.175
	% Change in NICR from Period 3 to Period 4	-.175	.1.000
Sig. (2-tailed)	% Change in COEP from Period 2 to Period 3	.	.288
	% Change in NICR from Period 3 to Period 4	.288	.
N	% Change in COEP from Period 2 to Period 3	39	39
	% Change in NICR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 2 to Period 3	% Change in TCR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 2 to Period 3	1.000	-.207
	% Change in TCR from Period 3 to Period 4	-.207	1.000
Sig. (2-tailed)	% Change in COEP from Period 2 to Period 3	.	.205
	% Change in TCR from Period 3 to Period 4	.205	.
N	% Change in COEP from Period 2 to Period 3	39	39
	% Change in TCR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 2 to Period 3	% Change in JAR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 2 to Period 3	1.000	-.114
	% Change in JAR from Period 3 to Period 4	-.114	1.000
Sig. (2-tailed)	% Change in COEP from Period 2 to Period 3	.	.489
	% Change in JAR from Period 3 to Period 4	.489	.
N	% Change in COEP from Period 2 to Period 3	39	39
	% Change in JAR from Period 3 to Period 4	39	39

Correlations

		% Change in COEP from Period 1 to Period 2	% Change in ICR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 1 to Period 2	1.000	-.385*
	% Change in ICR from Period 3 to Period 4	-.385*	1.000
Sig. (2-tailed)	% Change in COEP from Period 1 to Period 2	.	.015
	% Change in ICR from Period 3 to Period 4	.015	.
N	% Change in COEP from Period 1 to Period 2	39	39
	% Change in ICR from Period 3 to Period 4	39	39

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		% Change in COEP from Period 1 to Period 2	% Change in NICR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 1 to Period 2	1.000	-.407*
	% Change in NICR from Period 3 to Period 4	-.407*	1.000
Sig. (2-tailed)	% Change in COEP from Period 1 to Period 2	.	.010
	% Change in NICR from Period 3 to Period 4	.010	.
N	% Change in COEP from Period 1 to Period 2	39	39
	% Change in NICR from Period 3 to Period 4	39	39

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		% Change in COEP from Period 1 to Period 2	% Change in TCR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 1 to Period 2	1.000	-.400*
	% Change in TCR from Period 3 to Period 4	-.400*	1.000
Sig. (2-tailed)	% Change in COEP from Period 1 to Period 2	.	.012
	% Change in TCR from Period 3 to Period 4	.012	.
N	% Change in COEP from Period 1 to Period 2	39	39
	% Change in TCR from Period 3 to Period 4	39	39

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		% Change in COEP from Period 1 to Period 2	% Change in JAR from Period 3 to Period 4
Pearson Correlation	% Change in COEP from Period 1 to Period 2	1.000	-.133
	% Change in JAR from Period 3 to Period 4	-.133	1.000
Sig. (2-tailed)	% Change in COEP from Period 1 to Period 2	.	.419
	% Change in JAR from Period 3 to Period 4	.419	.
N	% Change in COEP from Period 1 to Period 2	39	39
	% Change in JAR from Period 3 to Period 4	39	39

APPENDIX F – Regression Output

Model Summary[a,b]

Model	Variables Entered	Variables Removed	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	% Change in COEP from Period 1 to Period 2[c,d]	.	.385	.148	.125	.1127

a. Dependent Variable: % Change in ICR from Period 3 to Period 4

b. Method: Enter

c. Independent Variables: (Constant), % Change in COEP from Period 1 to Period 2

d. All requested variables entered.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.2E-02	1	8.2E-02	6.444	.015[b]
	Residual	.470	37	1.3E-02		
	Total	.552	38			

a. Dependent Variable: % Change in ICR from Period 3 to Period 4

b. Independent Variables: (Constant), % Change in COEP from Period 1 to Period 2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-3.6E-03	.027		-.136	.893
	% Change in COEP from Period 1 to Period 2	-.452	.178	-.385	-2.538	.015

a. Dependent Variable: % Change in ICR from Period 3 to Period 4

Model Summary[a,b]

Model	Variables Entered	Variables Removed	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	% Change in COEP from Period 1 to Period 2[c,d]	.	.407	.166	.143	.2068

a. Dependent Variable: % Change in NICR from Period 3 to Period 4

b. Method: Enter

c. Independent Variables: (Constant), % Change in COEP from Period 1 to Period 2

d. All requested variables entered.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.314	1	.314	7.343	.010[b]
	Residual	1.582	37	4.3E-02		
	Total	1.896	38			

a. Dependent Variable: % Change in NICR from Period 3 to Period 4

b. Independent Variables: (Constant), % Change in COEP from Period 1 to Period 2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.268	.049		5.463	.000
	% Change in COEP from Period 1 to Period 2	-.884	.326	-.407	-2.710	.010

a. Dependent Variable: % Change in NICR from Period 3 to Period 4

Model Summary[a,b]

Model	Variables Entered	Variables Removed	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	% Change in COEP from Period 1 to Period 2[c,d]	.	.400	.160	.137	.1425

a. Dependent Variable: % Change in TCR from Period 3 to Period 4

b. Method: Enter

c. Independent Variables: (Constant), % Change in COEP from Period 1 to Period 2

d. All requested variables entered.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.143	1	.143	7.052	.012[b]
	Residual	.751	37	2.0E-02		
	Total	.894	38			

a. Dependent Variable: % Change in TCR from Period 3 to Period 4

b. Independent Variables: (Constant), % Change in COEP from Period 1 to Period 2

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	.129	.034		3.809	.001
	% Change in COEP from Period 1 to Period 2	-.597	.225	-.400	-2.655	.012

a. Dependent Variable: % Change in TCR from Period 3 to Period 4