

# **Impact of Public-School Funding on Juvenile Incarceration Rates**

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## **Abstract:**

For the past few decades, the United States has had one the highest incarceration rates in the world. With thousands of youths under the age of 18 being in prison, it is important to analyze which form of prevention is more effective in decreasing the juvenile incarceration rate. This paper examines whether an increase in education funding would help decrease the juvenile incarceration rate. Apart from analyzing the impact of federal spending on public schools, this paper also analyzes other explanatory variables such as poverty rates, crime rates, school drop-out rates, and school policies across states. Using data from 2016 to analyze juvenile incarceration rates, other variables were ultimately more impactful than funding to public schools.

## **I. Introduction**

The United States has seen a drastic increase in the number of people incarcerated with the number more than quadrupling in the past forty years; this number has increased steadily alongside the decrease of overall crime rates.

These statistics not only apply to adult incarceration rates but to the juvenile incarceration rates as well. It is estimated that in the long-term, juvenile detention centers may cost the United States anywhere from \$8 to \$21 billion (Ellison et al. 2017). This cost is currently being paid for by taxpayers. From an economic standpoint, it is important to find a way to decrease spending on prisons and reallocate that money and resources elsewhere. However, decreasing spending can only be obtained with a decrease in incarceration rates. From a different perspective, those under 18 can be prosecuted as adults in court. This means that although they are then incarcerated in juvenile centers, they are often facing adult sentences. Depending on which state they are convicted in, juveniles can face convictions such as life in prison or punishments as severe as solitary confinement. This can have a drastic impact on the rest of the youth's life, even after finishing their conviction. Not only are there psychological effects from incarceration at such a young age, but there is a greater risk of reincarceration. It is estimated that up to 75% of those that spent time in juvenile detention are incarcerated again as adults. Therefore, it is not only important to analyze adult incarceration when looking at the United States and mass incarceration but to also study juvenile incarceration to break this cycle.

This is a systemic problem that needs a more drastic solution than federal reform. Considering that the United States is the only developed country that faces this high incarceration rate, prevention is possible. Education has always been a focus on the discussion of preventing juvenile incarceration. The main way to invest in human capital is through investing in education. However, states sometime conduct cuts on education spending and federal aid may not often meet schools' expenditures. This paper evaluates whether differences in education spending can have significant statistical impacts on incarceration rates. I hypothesize that higher spending on primary and secondary education across 50 states is correlated to lower juvenile incarceration rates. Additionally, this paper includes other socioeconomic factors that could impact states' incarceration rates to further delve into possible solutions.

## II. Literature Review

Ellison et al. (2017) have investigated whether an increase in state fiscal effect for education is associated with decreased juvenile incarceration rates. This paper emphasizes the importance that education has when analyzing overall incarceration rates. This paper states that a strong relationship exists between drop out rates and becoming involved in the juvenile justice system. Approximately 40% of adult inmates did not obtain a high school diploma. Additionally, the chance of detainment increases by 3.5 times when adolescents drop out of high school. Investment in education has an impact in student achievement, as higher education investment is correlated with lower drop-out rates in public high schools. Cost of education is compared to the cost of juvenile incarceration in this paper. The cost of keeping a juvenile in a detention center is approximately \$148,767 per year which is much higher than keeping them in public school, which is estimated to cost \$11,011. This comparison is important as it shows just how drastic the cost of mass incarceration rate is for states. This paper had findings that support my hypothesis that increasing state fiscal effort for education leads to a decrease in juvenile incarceration expenses. Through the span of 25 years, researchers found that a 1% increase in state fiscal effort leads to a potential average yearly savings of nearly 5 million USD per state and a decrease of 36.28 juveniles in incarceration. Therefore, spending for education seems to have a positive relationship with overall state saving and a negative relationship with incarceration rates. From this study, it can be concluded that an increase in state spending on education has a significant impact on reducing immediate and long-term incarceration rates.

Heitzeg (2009) focuses on “zero tolerance policies” and how they lead to a “prison pipeline”. The author defines the term prison pipeline as a “consequence of schools which criminalize minor disciplinary infractions via zero tolerance policies, have a police presence at the school, and rely on suspensions and expulsions for minor infractions”. The author explains how these zero-tolerance policies have been a result of long-term political and social trends in the United States. While there is no strict definition of what zero-tolerance policies mean, Heitzeg describes these as school policies that apply harsh mandatory punishments to a violation of school rules. Examples of zero-tolerance policies include suspensions, expulsions, and increased police and security presence at school. Zero-tolerance policies have encouraged school systems to suspend or expel students when they violate school policies, despite context or seriousness of violation. This creates a drastic change to the school system, as it encourages schools to punish rather than prevent bad behavior. While these policies seem neutral, they are not applied equally to students. Studies by the NAACP have found that race, class, and gender play a significant role in which students are affected by these policies. Despite these policies having no evidence in improving school safety nor in decreasing crime, these policies remain in many school systems since their implementation in the late 20<sup>th</sup> century. The paper demonstrates how many incarceration trends are a result of

generational trends. For black men born after 1990, one of four had a father in prison by age of 14. Half of those that had a father in prison dropped out of high school. These staggering statistics show how certain demographics are more drastically impacted by these incarceration trends, and further push them to be more at risk of being incarcerated themselves. The racial disparities in the juvenile justice system are too great to be overlooked. Black youth only represent 17% of the population under 18 years old in the United States, but they accounted for 45% of all juvenile arrests in 2005. This form of injustice follows the entire process of incarceration as well. Black youth are more likely to be referred to court after being arrested, and more likely to be referred to be prosecuted as an adult. This paper further conceptualizes the impact incarceration can have on individuals. After serving time, individuals are further punished with voter disenfranchisement, denial of Federal welfare, medical, housing, benefits, loss of parental rights, all alongside exclusion of employment opportunities.

Christle et. al (2008) discuss how risk factors play a role in juvenile incarceration and how the juvenile justice system has become a default system for many that fall behind in school. Risk factors include low IQ, low family income, and neglectful parenting styles. Similar to the previous paper, this paper discusses the correlation that lack of school achievement has with delinquent behavior. Moreover, studies have found that 34% of those in juvenile detention have a disability, compared to 12.7% of youth enrolled in public schools. Although this does not show that poor academic skills leads to delinquency nor incarceration, these findings are important when discussing prevention of incarceration. The strongest external risk factors are family and poverty. Those that live in neighborhoods with similar socioeconomic disadvantages face additional community risk factors. Schools can also be a form of external risk behavior as they inadvertently contribute to youth delinquency. Once again, zero tolerance policies are analyzed as their excessive use of exclusionary discipline plays a role in youth delinquency. When looking at prevention, these policies are the opposite of what at-risk students need. School plays an important role in the identification, prevention, and treatment of at-risk juveniles. This paper finds that reading programs can have a positive impact in helping at-risk youth.

These previous papers give us a better understanding of how complicated the issue of juvenile incarceration is. This paper mainly focuses on the impact federal funding to public schools has to total juvenile arrests. Whereas Ellison et al. (2017) focuses on the time period 1986-2011, this paper looks at more recent data from 2015 to 2017. Additionally, this paper measures overall education trends, such as how many adults have completed college and schools' retention rates. This paper also includes variables that are now discussed in the greater discussion of disparities in the justice system, such as state laws and police funding.

### III. Data

The dependent variable for this paper is the juvenile incarceration rates of the 50 states. This was measured using the log of the juvenile arrest rates ages 10 to 17. This rate looked at the number of incarceration rates per 100,000 persons which is important when considering differences in population sizes. This data was gathered from the FBI's 2016 Crime in the United States Report. There are however some limitations to this data, as there is limited reported coverage for certain states. For my simple regression model, I decided to use log of federal aid for education as my independent variable. This was measured using the total revenue from federal sources for public elementary-secondary school systems from the 2016 Annual Survey of School System Finances. This data initially contained information regarding the District of Columbia, which I decided to omit as there was insufficient data regarding that district's juvenile incarceration rates in that district.

There are other explanatory variables that can be analyzed to better understand the dependent variable. These explanatory variables include crime rates, police spending, median household income, retention rates, expulsions, and average education of adults by state. I have chosen to include crime rates and income rates as they can tell us about external risk factors youth face. I hypothesize that crime rates have a positive relationship with arrests rates. I decided to measure median household income rather than average household income as to not skew results by households that have no income. I hypothesize that income has a negative relationship with the dependent variable, such that an increase in household income leads to lower arrests. I also included spending on police, as it is an important indicator of how governments invest in public institutions. I hypothesize that higher spending on police is correlated to higher arrest rates.

Retention rates refers to the graduation rates from public high schools. I chose this variable as the papers from Ellison et al. (2017) and Heitzeg (2009) heavily discuss the correlation between youth that drop-out of high school and those that enter the juvenile justice system. This variable also gives us more context about an individual's education that goes beyond simply knowing how much funding their schools are receiving. I hypothesize that this variable will have a negative relationship with arrests, such that higher retention rates are correlated with lower arrests. Heitzeg (2009) demonstrates the significant impact zero tolerance policies are in the school and juvenile justice system. Although it is difficult to find the impact of all zero-tolerance policies, I have decided to use expulsion rates as a variable. Heitzeg (2009) and the U.S. Department of Education highlight how the number of expulsions also include the removal of students that violate the Gun Free Schools Act, which is an example of a zero-tolerance policy. It is also interesting to look at whether these variables impact incarceration rates since previous studies have been published, as it is important to look at the long-term impact legislation has. I hypothesize that expulsion rates are positively related to arrest rates, such that an increase in expulsion

rates lead to an increase in juvenile arrests. A different form to measure education levels in each state is by measuring how many adults have completed college. I hypothesize that states with higher college rates have lower juvenile arrest rates. This variable is to measure how invested each college is on education rather than indicate any causation between itself and the dependent variable.

The decision to include these explanatory variables was made to find which variable can be more efficient in the prevention of juvenile detention. Race/ethnicity is not a risk factor as it is not something that can be changed, so I have decided to omit this variable, which was analyzed in previous papers. Since the topic of incarceration of youth is multi-faceted, it is interesting to evaluate which variables have a stronger correlation to the number of arrests, as each of these variables play some sort of role. The sources for my variables is described below.

Variable Descriptions:

Variable Name	Description	Year	Units	Source
log(Arrests)	Total juvenile arrests by state, for youth underage of 18	2016	Log of Arrest Rate per 100,000 persons	Federal Bureau of Investigation
log(FedAid)	Financial revenue from Federal sources for public elementary-secondary school system by state	2016	Log of Spending in USD (in thousands)	U.S. Census Bureau
log(Crime)	Total crime rate in the United States by state	2016	Log of Crime Rate per 100,000 persons	Federal Bureau of Investigation
log(Police)	Spending on police protection by state	2017	Log of Spending in USD	U.S. Census Bureau
Income	Median income of the householder and all other people 15 years and older in the household, includes those with no income	2016	USD	U.S. Census Bureau
Retention	4-year public school graduation rates by state	2015-2016 school year	Percentage	National Center for Education Statistics
Expelled	Students expelled from public elementary and secondary schools	2013-2014 school year	Percentage	National Center for Education Statistics
Bachelors	Adults over the age of 25 to have complete at least 2 years of college by state	2016	Percentage	U.S. Census Bureau

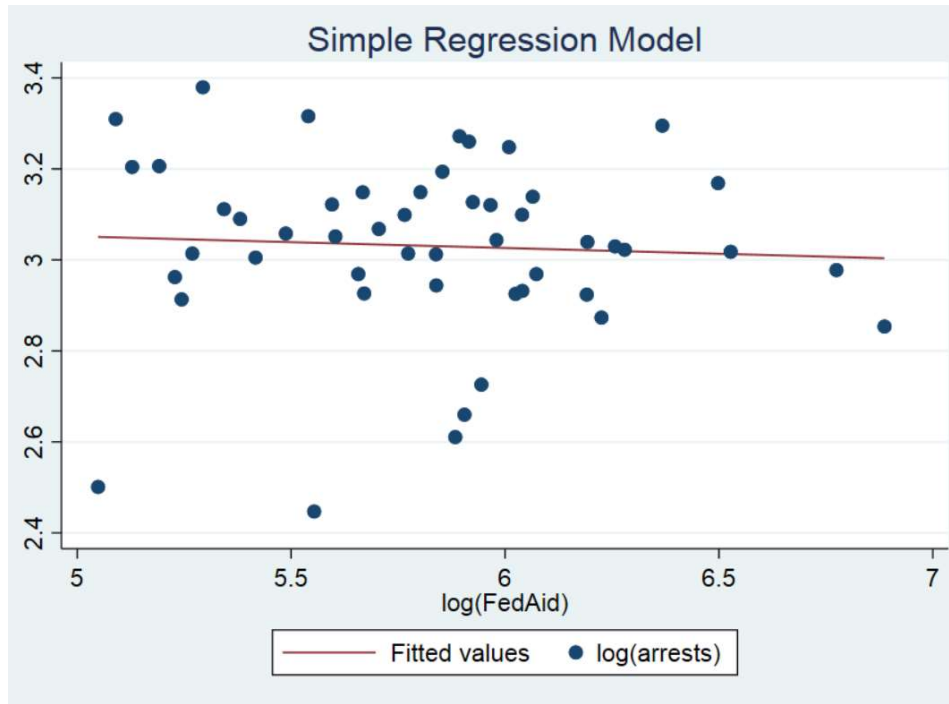
TriedAsAdult	States that have no minimum age requirement to prosecute minors as adults	2016	No minimum age for adult prosecution =1 Age restriction for adult prosecution= 0	Equal Justice Initiative
LeastStrictGunLaws	States that have been ranked as having the most lenient gun laws	2021	Least Strict gun laws = 1 Stricter gun law = 0	World Population Review

### Variable Summaries

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
log(Arrests)	3.03	0.20	2.45	3.38
log(FedAid)	5.82	0.42	5.05	6.89
log(Crime)	3.44	0.11	3.23	3.67
log(Police)	5.28	0.41	4.55	6.27
Income	57,795.66	9,597.95	41,754	78,945
Retention	84.01	4.61	71	91.3
Expelled	0.21	0.30	0.01	1.76
Bachelors	0.31	0.05	0.21	0.44
TriedAsAdult	0.26	0.44	0	1
LeastStrictGunLaws	0.42	0.50	0	1

The table above lists the statistical descriptions of my variables. Each variable has 50 observations, for each state in the United States. For my independent variables, I omitted data from the District of Columbia and Puerto Rico for my calculations, as that was not included in the total arrests by state. Additionally, I also looked at the total units of my variables and did look at the variables by race nor gender. Without taking the log, the average number of juvenile arrests per 100,000 in the year 2016 is approximately 1,172. This is an interesting find since according to the Bureau of Justice, the imprisonment rate of the United States in 2016 was 459 prisoners per 100,000 across all ages. This means that the juvenile incarceration rate for 2016 was more than double the overall incarceration rate. The scatter graph below shows that there is a weak correlation between these variables but there is a negative relationship between them. There does appear to be two outliers at the bottom of the graph, which represent Vermont and West Virginia.

Log(Arrests) Simple Regression Model:



Correlation Table:

	logArrests	logFedAid	logCrime	logPolice	Income	Retention	Expelled	Bachelors	TriedAs Adult	LeastStrict GunLaws
logArrests	1.000									
logFedAid	-0.055	1.000								
logCrime	0.206	0.207	1.000							
logPolice	-0.152	0.873	0.042	1.000						
Income	0.059	-0.063	-0.325	0.180	1.000					
Retention	-0.212	-0.033	-0.451	-0.007	0.072	1.000				
Expelled	-0.034	0.174	0.340	0.063	-0.332	-0.199	1.000			
Bachelors	-0.015	0.028	-0.435	0.311	0.817	0.137	-0.335	1.000		
TriedAsAdult	-0.016	-0.140	-0.029	-0.023	0.036	-0.033	-0.164	-0.099	1.000	
LeastStrictGunLaws	-0.022	-0.228	0.161	-0.356	-0.426	0.036	-0.007	-0.512	-0.043	1.000

Before creating my simple and multiple linear regression models, my data must satisfy all Classical Linear Model assumptions. Each assumption has been listed below:

1. Model is linear in parameters

My multiple linear regression models will follow the format  $y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_kx_k + u$ . This satisfies this assumption.

2. Random sampling was used in data selection

I gathered my data from government sources available. I made no edits to the data, other than omitted data that was not associated to the fifty states. Thus, there was no bias in sampling and this assumption is met.

3. No perfect collinearity in explanatory variables

The correlation table above proves that there is no perfect collinearity among the independent variables. The biggest correlation is between the variables  $\log(\text{FedAid})$  and  $\log(\text{Police})$  which is 0.873. Although this value will contribute to multicollinearity, this assumption is satisfied.

4. Zero conditional mean

The error term,  $u$ , is added to my regression formulas. However, it cannot be included in my estimated formulas, as other variables not accounted for could impact the log of arrests.

5. Homoskedasticity

The variance of the error term,  $u$ , is expected to be held constant. In my scatterplot above that looks at  $\log(\text{Arrests})$  and  $\log(\text{FedAid})$ , the points are not uniformly scattered. Thus, variance exists, and this assumption is met.

6. Normality of error term

Since it is difficult to measure the error term,  $u$ , I instead added as many explanatory variables as possible to evaluate my dependent variable. Since I am assuming  $u$  is 0 in my regression formulas, I will also assume that the  $u$  has a zero mean and variance.

## IV. Results

### Model 1:

Simple Regression Formula:

$$\log \text{Arrests} = \beta_0 + \beta_1(\log \text{FedAid}) + u$$

This simple regression model is going to be used to analyze the relationship between federal aid for education to a state and that state's juvenile incarceration rate.

Estimated formula:

$$\log \text{Arrests} = 3.179 - 0.025(\log \text{FedAid})$$

This model shows that there is negative relationship between the independent and dependent variable. This model tells us that a 1% increase in federal aid to public schools leads to a 0.025% decrease in juvenile incarceration rates. This means that my hypothesis regarding higher federal spending on education leading to lower juvenile incarceration rates is correct. However, this value is low, meaning only a dramatic increase in federal aid would impact juvenile incarceration rates. This small slope is seen as the line of best fit in the scatter graph above. The R-squared value of this model equals 0.003, which

means that there is very low correlation between variables. This is seen in the scatter graph where the regression line does not meet most of the points. The P-value of this model equals 0.702, which means that our coefficient is not statistically significant. Despite my findings not being statistically significant, this model tells us about the trajectory of total arrests. This model also gives a basis to compare the other explanatory variables in the other regression models

#### Model 2:

Multiple Linear Regression Formula:

$$\log\text{Arrests} = \beta_0 + \beta_1(\log\text{FedAid}) + \beta_2(\log\text{Crime}) + \beta_3(\log\text{Police}) + \beta_4(\text{Income}) \\ + \beta_5(\text{Retention}) + \beta_6(\text{Expelled}) + \beta_7(\text{Bachelors}) + u$$

Estimated Formula:

$$\log\text{Arrests} = 2.383 + 0.218(\log\text{FedAid}) + 0.352(\log\text{Crime}) - 0.30(\log\text{Police}) + 2.90(\text{Income}) \\ - 0.007(\text{Retention}) - 0.055(\text{Expelled}) + 0.497(\text{Bachelors})$$

This model gives us a clearer image of the correlations between our variables. Surprisingly, this model has a sign change for the variable  $\log(\text{FedAid})$ . This model indicates that a 1% increase in federal aid leads to a 0.218% increase in arrests, which contradicts my hypothesis. A possible explanation for this sign change is that this variable was already not statistically significant in the simple regression model. As seen in the model summary below, this variable is only statistically significant at the 20% level, meaning it is still not very significant.

This model does support my hypothesis with the variables  $\log(\text{Crime})$  and  $\text{Retention}$ . According to this model, a 1% increase in crime rates leads to a 0.35% increase in arrests and a 1% increase in high school graduation rates leads to a 0.01% decrease in arrests. This model indicates that a 1% increase in police spending leads to a 0.3% decrease in arrests. This indicates that state funding on police is not related to the number of arrests made. This model predicts that a dollar increase in median household income leads to 2.9% increase in arrests. A possible explanation for this is that areas with higher levels of income are harsher on juvenile arrests. This model also estimates that a 1% increase in expulsions leads to a 0.06% decrease in arrests. This variable is meant to represent the effect zero tolerance policies has in schools. Looking at this variable alone would indicate that contrary to previous literature, zero tolerance policies work in keeping youth out of the juvenile justice system. This formula also shows that a 1% increase in adults who complete college leads to an approximate 0.5% increase in juvenile arrests. A possible explanation is that college completion may not be a proper indicator of the general population's overall education levels. The R-squared value of this model is 0.153, meaning there is a low correlation between the variables.

Model 3:

For this multiple regression model, I decided to exclude the explanatory variables Retention, Expelled, and Bachelors, as those variables were not statistically significant at the 20% level.

MLR Formula:

$$\logArrests = \beta_0 + \beta_1(\logFedAid) + \beta_2(\logCrime) + \beta_3(\logPolice) + \beta_4(Income) + u$$

Estimated Formula:

$$\logArrests = 1.616 + 0.183(\logFedAid) + 0.415(\logCrime) - 0.262(\logPolice) + 5.28(Income)$$

This model estimates that a 1% increase in federal aid leads to a 0.183% increase in arrests. This indicates a positive relationship between these variables, which is once again different than what the simple regression model indicated. This model also estimates a 0.415% increase in arrests with a 1% increase in crime and a 0.262% decrease in arrests with a 1% increase in police funding. This is significant at the 10% level. This would indicate that increasing state funding in police could help decrease juvenile arrests. This model also predicts that a dollar increase in household income leads to a 5.38% increase in arrests. This value is almost not very statistically significant. This could indicate that increasing wages alone would not relieve arrests rates. The R-squared value of this model is 0.125, meaning there is a lower correlation between the variables than our previous model.

Regression Model Summary:

Variable	Dependent Variable: logArrests			
	Model 1	Model 2	Model 3	Model 4
logFedAid	-0.026 (0.066)	0.218* (0.160)	0.183 (0.152)	0.188 (0.161)
logCrime	---	0.352 (0.330)	0.415* (0.273)	0.421* (0.28)
logPolice	---	-0.300** (0.170)	-0.262** (0.156)	-0.275** (0.164)
Income	---	2.90 (5.120)	5.28* (3.320)	4.77* (3.610)
Retention	---	-0.007 (0.007)	---	---
Expelled	---	-0.055 (0.104)	---	---
Bachelors	---	0.497 (1.062)	---	---
TriedAsAdult	---	---	---	0.01 (0.065)
LeastStrictGunLaws	---	---	---	-0.029 (0.065)
Intercept	3.179*** (0.386)	2.383* (1.505)	1.616* (1.004)	1.681* (1.037)
R-squared	0.003	0.153	0.125	0.13
Adjusted R-squared	-0.018	0.012	0.048	0.009

Significant at \*20%, \*\*10%, \*\*\*1%

## V. Extensions

### Model 4: Addition of Dummy Variables

The model adds upon the multiple linear regression formula used for Model 3 with the extension of two variables, *TriedAsAdult* and *LeastStrictGunLaws*. I have decided to add these variables to evaluate whether individual state prison or gun laws impact juvenile incarceration rates.

In this model:

*TriedAsAdult* = 0 if there is a minimum age restriction in prosecuting minors as adults in court.

*TriedAsAdult* = 1 if there is no minimum age restriction to prosecute minors as adults.

*LeastStrictGunLaws* = 0 if the state has strict gun laws. *LeastStrictGunLaws* = 1 if the state has more lenient gun laws.

MLR Formula:

$$\log Arrests = \beta_0 + \beta_1(\log FedAid) + \beta_2(\log Crime) + \beta_3(\log Police) + \beta_4(Income) + \beta_5(TriedAsAdult) + \beta_6(LeastStrictGunLaws) + u$$

Estimated Formula:

$$\log Arrests = 1.681 + 0.188(\log FedAid) + 0.421(\log Crime) - 0.277(\log Police) + 4.77(Income) + 0.01(TriedAsAdult) - 0.029(LeastStrictGunLaws)$$

This model predicts that if a state has no minimum age to prosecute minors as an adult, there is an approximate 0.01% increase in juvenile arrest rates. A possible explanation for this finding is that states that are harsher on prosecuting juveniles are also harsher on arresting juveniles. This model also predicts that if state has more lenient gun laws, there is a 0.029% decrease in juvenile arrest rates. A possible explanation for this finding is that states with less strict gun laws, are also less strict on petty crime. In this model, only the variable *logPolice* is statistically significant at the 10% level. Neither of the dummy variables are statistically significant. The R-squared value for this model is 0.13.

### F-Test

The null hypothesis that the dummy variables are jointly insignificant can be stated as:

$$H_0 = \beta_5 = 0, \beta_6 = 0$$

The alternative hypothesis states that the dummy variables are jointly significant and can be stated as:

$$H_1: H_0 \text{ is false}$$

$$F = \frac{(R_{UR}^2 - R_R^2)/q}{(1 - R_{UR}^2)/(n - k - 1)} = \frac{(0.13 - 0.1252)/2}{(1 - 0.13)/(50 - 9 - 1)} = 0.11$$

The F-value of 0.11 was calculated and the critical value at the 10% significance level is 1.7929. The F-value is smaller than the critical value, so we fail to reject the null hypothesis and find that prosecuting minors as adults and gun laws are jointly insignificant for affecting juvenile arrest rates.

## **VI. Conclusions**

In conclusion, my initial hypothesis of an increase in funding for public schools leading to a decrease in juvenile arrest rates proved to only be true in the simple regression. In all my multiple linear regression models, the opposite seemed to be true with there being a positive relationship between public school funding and juvenile incarceration rates. A possible explanation for this finding is that these variables had a weak correlation as seen in the R-squared value of the simple regression equation. With this value being so almost zero, there is practically no significance between the dependent variable and the main independent variable. In all my multiple regression models, the only variable to prove to be statistically significant at the 1% level was the log of funding for police. This value indicated that a percentage increase in police spending would lead to a decrease in juvenile arrest rates. This contradicts my hypothesis of this value but it could indicate that heavier funding in the police could deter juvenile activity that would lead to arrests. Regardless, this variable would need to be looked at further to make this conclusion. It would be important to evaluate states are specifically allocating money for police as the police provide several services that are not directly linked to arrests. My R-squared values of all my models are close to 0, signifying that there is a relatively weak correlation of my variables.

My work indicates that there is no clear-cut answer regarding how to decrease juvenile incarceration rates. Previous literature demonstrates the social and economic costs of having high juvenile incarceration rates. Whereas literature suggests that falling behind in school can lead to an increased chance of dropping out of school and being arrested, my paper indicates that increasing school funding would not fix this dilemma. Obtaining more data through a longer period of time would be necessary to investigate if any of the explanatory variables in my paper would eventually lead to a decrease in juvenile incarceration rates.

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## Appendix

### Correlate Between Variables

```
. correlate logArrests logFedAid logCrime logPolice Income Retention Expelled Bachelors
(obs=50)
```

	logArrests	logFedAid	logCrime	logPolice	Income	Retention	Expelled	Bachelors
logArrests	1.0000							
logFedAid	-0.0554	1.0000						
logCrime	0.2063	0.2065	1.0000					
logPolice	-0.1516	0.8729	0.0416	1.0000				
Income	0.0591	-0.0626	-0.3253	0.1804	1.0000			
Retention	-0.2116	-0.0326	-0.4511	-0.0069	0.0715	1.0000		
Expelled	-0.0342	0.1742	0.3401	0.0627	-0.3324	-0.1994	1.0000	
Bachelors	-0.0148	0.0279	-0.4350	0.3110	0.8169	0.1373	-0.3347	1.0000

```
. correlate logArrests logFedAid logCrime logPolice Income Retention Expelled Bachelors TriedAsAdult LeastStrictGunLaws
(obs=50)
```

	logArrests	logFedAid	logCrime	logPolice	Income	Retention	Expelled	Bachelors	TriedAsAdult	LeastStrict
logArrests	1.0000									
logFedAid	-0.0554	1.0000								
logCrime	0.2063	0.2065	1.0000							
logPolice	-0.1516	0.8729	0.0416	1.0000						
Income	0.0591	-0.0626	-0.3253	0.1804	1.0000					
Retention	-0.2116	-0.0326	-0.4511	-0.0069	0.0715	1.0000				
Expelled	-0.0342	0.1742	0.3401	0.0627	-0.3324	-0.1994	1.0000			
Bachelors	-0.0148	0.0279	-0.4350	0.3110	0.8169	0.1373	-0.3347	1.0000		
TriedAsAdult	-0.0163	-0.1401	-0.0292	-0.0226	0.0359	-0.0336	-0.1643	-0.0994	1.0000	
LeastStrict	-0.0220	-0.2279	0.1612	-0.3558	-0.4258	0.0360	-0.0072	-0.5120	-0.0425	1.0000

### Simple Linear Regression

```
. regress logarrests logFedAid
```

Source	SS	df	MS	Number of obs	=	50
Model	.005743527	1	.005743527	F(1, 48)	=	0.15
Residual	1.8624602	48	.038801254	Prob > F	=	0.7021
Total	1.86820372	49	.038126607	R-squared	=	0.0031
				Adj R-squared	=	-0.0177
				Root MSE	=	.19698

logarrests	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
logFedAid	-.0254796	.0662256	-0.38	0.702	-.158635 .1076758
_cons	3.179231	.3862464	8.23	0.000	2.402631 3.955832

MLR Model 2

. regress logArrests logFedAid logCrime logPolice Income Retention Expelled Bachelors

Source	SS	df	MS	Number of obs	=	50
Model	.286488432	7	.040926919	F(7, 42)	=	1.09
Residual	1.58171529	42	.037659888	Prob > F	=	0.3889
				R-squared	=	0.1533
				Adj R-squared	=	0.0122
Total	1.86820372	49	.038126607	Root MSE	=	.19406

logArrests	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logFedAid	.2181549	.1599012	1.36	0.180	-.1045387	.5408485
logCrime	.3520731	.3298453	1.07	0.292	-.3135816	1.017728
logPolice	-.3003328	.1701611	-1.76	0.085	-.6437317	.0430662
Income	2.90e-06	5.12e-06	0.57	0.574	-7.43e-06	.0000132
Retention	-.0066539	.0068337	-0.97	0.336	-.0204448	.007137
Expelled	-.0547049	.1038905	-0.53	0.601	-.2643644	.1549545
Bachelors	.496612	1.062399	0.47	0.643	-1.647396	2.64062
_cons	2.383215	1.505263	1.58	0.121	-.6545277	5.420959

MLR Model 3

. regress logArrests logFedAid logCrime logPolice Income

Source	SS	df	MS	Number of obs	=	50
Model	.233975528	4	.058493882	F(4, 45)	=	1.61
Residual	1.6342282	45	.036316182	Prob > F	=	0.1881
				R-squared	=	0.1252
				Adj R-squared	=	0.0475
Total	1.86820372	49	.038126607	Root MSE	=	.19057

logArrests	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logFedAid	.1825434	.1519213	1.20	0.236	-.1234419	.4885286
logCrime	.4152667	.2731386	1.52	0.135	-.1348626	.965396
logPolice	-.2615418	.155937	-1.68	0.100	-.575615	.0525315
Income	5.28e-06	3.32e-06	1.59	0.119	-1.41e-06	.000012
_cons	1.615592	1.003508	1.61	0.114	-.4055765	3.636761

Extensions

```
. regress logArrests logFedAid logCrime logPolice Income TriedAsAdult LeastStrictGunLaws
```

Source	SS	df	MS	Number of obs	=	50
Model	.242799011	6	.040466502	F(6, 43)	=	1.07
Residual	1.62540471	43	.03780011	Prob > F	=	0.3950
				R-squared	=	0.1300
				Adj R-squared	=	0.0086
Total	1.86820372	49	.038126607	Root MSE	=	.19442

logArrests	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
logFedAid	.1880809	.1605914	1.17	0.248	-.1357825	.5119443
logCrime	.4214493	.2796095	1.51	0.139	-.1424371	.9853356
logPolice	-.2767275	.164424	-1.68	0.100	-.6083202	.0548652
Income	4.77e-06	3.61e-06	1.32	0.194	-2.52e-06	.0000121
TriedAsAdult	.0101443	.0650731	0.16	0.877	-.1210882	.1413768
LeastStrictGunLaws	-.0292485	.0650441	-0.45	0.655	-.1604225	.1019254
_cons	1.681198	1.036808	1.62	0.112	-.4097249	3.772121