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Analyzing Social Factors and Intervention Strategies of Juvenile Delinquency Using Multiple Regression Models

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Abstract In the context of today's society, juvenile vicious incidents occur frequently, and the under-ageing of crime has become a hot topic of public discussion. Actively responding to the problem of underage crime underage is of great significance to the long-term stability of the society. On the basis of analyzing the characteristics of juvenile crime, the article sorted out the social factors affecting juvenile crime, i.e., the insufficient effect of legal regulation and the influence of network bad information. On this basis, a multiple linear regression model is constructed by choosing the effect of severe punishment policies and regulations and the rate of network bad information regulation as the explanatory variables, and the juvenile delinquency rate as the explanatory variable. The empirical analysis shows that the stronger the effect of severe punishment policies and regulations and the rate of network bad information regulation, the lower the juvenile delinquency rate will be, i.e., there is a significant inhibitory effect on the juvenile delinquency rate at the 1% level of the two. Minors' crimes require the introduction of reasonable and applicable educational and disciplinary measures, the creation of integrated protection and crime prevention and control mechanisms, and the active improvement of the network environment to provide a reliable guarantee for the healthy growth of minors.

Index Terms multiple linear regression model, juvenile delinquency, social factors, legal regulation effect, network bad information

I. Introduction

In recent years, malignant incidents among minors have occurred frequently, and the under-ageing of crime has become a hot topic of discussion among the public. According to the latest survey data, it can be seen that minors have a high degree of cognition of the nature and results of the behaviors they commit before committing crimes [1]. That is, most of the crimes committed by minors are intentional crimes, and the degree of crime committed by individual minors is even more unimaginable, which means that not all crimes committed by minors should be lenient and mitigating punishment [2], [3]. Therefore, in today's social context, the establishment of the criminal responsibility judgment system for minors with obvious wrongdoing, by assessing whether the subjective “malicious intent” to punish and sentencing is of great significance [4]-[6].

In addition, with the juvenile delinquency problem is becoming more and more prominent, the construction and improvement of the relevant judicial procedures are also advancing [7]. When the judicial reform of minors focuses on sentencing, trial, execution and other levels, the construction of preventive mechanisms is also indispensable and cannot be ignored [8], [9]. After all, “treatment of disease in the early” is to ensure the healthy growth of minors. Junior strong is China strong, juvenile law-abiding is China rule, let the rule of law consciousness, legal concepts into the world of children, not only can effectively reduce the rate of social crime, but also can play a good role in guiding the minors' future work and life production [10]. Based on this, actively explore the causes of juvenile delinquency and countermeasures, on the one hand, can actively manage the problem of underage crime, on the other hand, also for the root causes of juvenile delinquency prevention to provide support, and ultimately to achieve long-term social peace and security [11]-[13].

With the rapid development of society, the problem of juvenile delinquency is very prominent. Such crimes are characterized by violence. The impact on the victim and society is very bad. In this paper, based on analyzing the social factors of juvenile delinquency, a fixed-effect model of juvenile delinquency is constructed by introducing multiple regression model. Taking the judgments of the intermediate people's courts on juvenile crimes from 2010 to 2022 as the research object, it explores the age distribution of juvenile crimes and the performance of bad behaviors, and deeply analyzes the effect of severe punishment policies and regulations and the influence of the

rate of regulation of bad information on the Internet on the juvenile crime rate. Based on the results of the empirical analysis, the intervention strategy for juvenile delinquency is proposed.

II. Theoretical analysis and research hypotheses

Minors are in an important stage of physical and mental development, both physically and psychologically immature, they are often weak in their ability to distinguish right from wrong and self-control, and are prone to difficulties in controlling their own behavior and distortions of their outlook, and if they are not guided correctly and in a timely manner, they will easily embark on the path of delinquency and crime. In recent years, the crime rate of minors has been increasing and tends to be at a younger age; minors are a strong reserve force for the country and the future of the nation, and research into solving the problem of the under-ageing of juvenile delinquency will help to strengthen the country.

II. A. Concepts related to juvenile delinquency

II. A. 1) Definition of juvenile delinquency

A good definition of the concept of juvenile will help us to deepen our understanding of the underage nature of juvenile delinquency, thus laying a solid foundation for the study of underage juvenile delinquency. The term “juvenile” in international law has a similar meaning to the term “minor” we are talking about now. Specifically, juveniles in the occurrence of delinquency, in the treatment of a class of people different from adults [14].

Today's juvenile delinquency is not to be underestimated, has developed into a major problem in modern society. In recent years, a new type of juvenile delinquency phenomenon gradually revealed, showing a new criminal characteristics, no longer confined to theft, robbery or simple revenge and other crimes, rape, murder and other premeditated, purposeful crimes are also endless. The means of crime adult, violence, high IQ has been enhanced, the age of crime is gradually reduced, the proportion of gang crimes increased, and network-related juvenile crime increased and so on. We have to cause us to think deeply, is in the formation of the three views of the period of minors, extremely easy to embark on the road of illegal and criminal, as the key protection object, we should give more attention and pay attention to the minors have bad behavior to raise vigilance, the minors have already embarked on the road of crime to persuade him to return to the wrong way.

II. A. 2) Characteristics of juvenile delinquency

(1) The education level of minors at fault is generally low. The vast majority of minors who have committed crimes were only able to complete nine years of compulsory education before committing their crimes, and in some of the less-developed provinces, even basic primary education is not universalized. The lack of basic education is one of the most fundamental reasons why these minors commit criminal acts.

(2) The crimes committed by minors at fault tend to be violent. With the wide dissemination of movies and TV works, some movies and TV works containing violence and gore have serious adverse effects on minors, who are weak in their ability to distinguish between right and wrong, and are prone to imitate the mentality after coming into contact with this kind of undesirable information, thus committing violent criminal acts.

(3) The crime of minors tend to simplify the cause of crime. Minors often lack of meticulous planning, their crime triggers are often very simple. Due to the immaturity of the mind, when minors have a criminal mentality, they are eager to commit criminal

II. B. Social factors of juvenile delinquency

II. B. 1) Insufficient regulatory effect of the law

Chinese law provides that minors under the age of 14 who commit crimes are not liable for any criminal responsibility at all, that minors between the ages of 14 and 16 are liable for only eight more serious crimes, and that minors over the age of 16 are liable for full criminal responsibility; the criterion for adulthood is 18 years of age, but these age criteria do not accurately reflect the true maturity of a person's body and mind. This stage of a minor's transition to adulthood is prone to the phenomenon of precocious maturity, and it is also a period of high incidence of minors committing illegal and criminal acts. Some minors know the law and violate it, and do as they please, knowing that they are exempt from criminal punishment and that correctional institutions lack the necessary institutionalization and disciplinary measures for minors who are in conflict with the law.

This period is the peak of their absorption of all kinds of information, and they are full of strong desire and curiosity for all new things, and the vast majority of minors who have already been involved in the law have no awareness of the illegality of their own behavior, the severity of the penal consequences, and the stakes in their future development. When minors are unable to overcome their negative psychology, they are prone to commit illegal acts. Only when the law regulates in advance, so that more minors realize the stakes between the act and the result, and form a correct legal understanding, can the occurrence of juvenile delinquency be prevented.

Based on this, this paper puts forward the following hypotheses:

H1: The stronger the effect of legal regulation, the lower the incidence of juvenile crime rate.

II. B. 2) Influence of undesirable information on the Internet

The Internet provides a broad channel for minors to obtain information and knowledge, and is an important means for minors to learn and live. However, in addition to useful information, there is also a great deal of undesirable information on the Internet, which can have a negative impact on the healthy growth of minors. From the perspective of minors' growth, the undesirable information on the Internet refers to the information disseminated on the Internet that can lead to minors' thought confusion, psychological abnormality and physical damage, which mainly includes the information of distorted values, low morality, pornography, violence and anti-science, and so on. Minors are in the period of formation of outlook on life and values, limited by knowledge and experience, and lacking the ability to discern information, so they are easily affected by the negative influence of Internet bad information, and in some serious cases, they even embark on the road of crime as a result. It can be said that the network bad information has become an important factor to induce minors to commit crimes [15].

At present, violence and pornographic information are the usual forms of network bad information, and they are also the two types of network bad information that minors are most easily recognized and influenced. Most of the underage offenders agree that violent information and pornographic information will induce crime. From this, it can be seen that undesirable information on the Internet, especially violent information and pornographic information, is very likely to trigger criminal behavior. Therefore, among the network factors in the work of preventing juvenile delinquency, the focus should be on monitoring violent information and pornographic information in the network.

Based on this, this paper proposes the following hypotheses:

H2: The stronger the monitoring rate of network bad information, the lower the incidence of underage crime rate.

III. Modeling of research on juvenile delinquency

In recent years, the trend towards underage juvenile delinquency has become obvious, and has gradually become a major social problem; it has become a consensus that the problem of underage juvenile delinquency can be effectively dealt with by constantly improving the juvenile delinquency prevention system as well as the juvenile education and correctional system. Research into the problem of juvenile delinquency, analysis of its current situation, characteristics and causes, and the proposal of reasonable countermeasures to prevent juvenile delinquency at an early age, constantly improve the system of education and correction for minors, in line with the judicial concept of combining education and punishment for minors, will help to create a good and harmonious social atmosphere.

III. A. Sources of data on juvenile delinquency

In today's society, juvenile delinquency is regarded as one of the world's three major public hazards, along with environmental pollution and drug trafficking and abuse, which shows its prevalence and serious harm. Juvenile delinquency is not only harmful and far-reaching, but also difficult to govern and control, so how to fundamentally govern juvenile delinquency has always been an important topic in both academia and practice. The prerequisite for effective management of juvenile delinquency is in-depth understanding and analysis of the specific situation of juvenile delinquency, and only by comprehensively and thoroughly grasping the actual distribution of juvenile delinquency cases and the influencing factors can we put forward effective management programs in a targeted manner.

The raw data of this paper are the criminal judgment documents used to reflect the local peace situation that have been adjudicated by intermediate people's courts and above in various parts of China since 2010~2022. The adjudicating subjects of the judgments include intermediate people's courts and the higher people's courts of provinces, municipalities, and autonomous regions, and the trial levels include first trial, second trial, and retrial, totaling 45,829. By screening the raw data, this paper extracted the judgments of which in cases of crimes committed by minors under the age of 16 for analysis, summarized the basic case distribution of crimes committed by minors in China from 2010 to 2022 and conducted regression analysis. In addition, some relevant data from the China Legal Statistics Yearbook and the China Statistical Yearbook are also selected, and to ensure the completeness of the research data, the missing part of the data is filled in by interpolation.

III. B. Knowledge of multiple regression models

III. B. 1) Mathematical expression of multiple regression

Regression analysis looks for a correlation between an explained variable and an explanatory variable through a large amount of data on the variable in question in an objective matter, on the basis of which an expression (i.e., a regression function) between the two variables is then established, which is essentially a problem of function

estimation. Linear regression is usually the first choice when learning predictive models, where one-dimensional linear regression is the establishment of a relationship between an explanatory variable and a variable. If a relationship is established between an explanatory variable and more than one variable, it is called a multiple linear regression model [16].

The general mathematical equation for multiple linear regression model is as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon \tag{1}$$

where β_0 and ε are the constant and error terms, and $\beta_1, \beta_2, \cdots, \beta_n$ are the regression coefficients.

The matrix is represented as:

$$Y = X \cdot B + \varepsilon \tag{2}$$

$Y = [y_1, y_2, ..., y_n]^T, B = [\beta_1, \beta_2, ..., \beta_n]^T, \varepsilon = [\varepsilon_1, \varepsilon_2, ..., \varepsilon_n]^T$ of them.

III. B. 2) Model parameter estimation methods

The sample regression function of the classical linear regression model can be expressed as:

$$\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_{i1} + \hat{\beta}_2 x_{i2} + \cdots + \hat{\beta}_p x_{ip} \ (i = 1, 2, \cdots, n) \tag{3}$$

$$\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_{i1} + \hat{\beta}_2 x_{i2} + \cdots + \hat{\beta}_p x_{ip} + e_i \ (i = 1, 2, \cdots, n) \tag{4}$$

Eq. (4) is a stochastic expression in which the e_i residuals are used as an approximate replacement for the random error term ε_t in the classical linear regression model. Ordinary Least Squares (OLS) requires that the resulting regression function model fit the sample observations as closely as possible, in other words that the "overall error" between the points in the regression model and the true observations be as small as possible, and that the sum of squared deviations reflect the overall closeness of the points in the regression model to the true observations, and the sum of squared deviations reflect the overall closeness of the points in the regression model to the true observations. The sum of squared deviations reflects the overall proximity of the points in the regression model to the true observations, which is the principle of least squares. This is the principle of least squares, i.e., the sum of squared deviations:

$$Q = \sum_{i=1}^{n} e_i^2 = \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 = \sum_{i=1}^{n} \left[y_i - (\hat{\beta}_0 + \hat{\beta}_1 x_{i1} + \hat{\beta}_2 x_{i2} + \cdots + \hat{\beta}_p x_{ip}) \right]^2 \tag{5}$$

is minimized, the parameter estimates can be obtained by solving the system of formal equations for the parameter estimates to be estimated as:

$$\hat{\beta} = (X^T X)^{-1} X^T Y \tag{6}$$

The residuals between the estimated and true observed values of the explanatory variables are:

$$\begin{aligned} e &= Y - X\hat{\beta} \\ &= X\beta + \varepsilon - X(X^T X)^{-1} X^T (X\beta + \varepsilon) \\ &= \varepsilon - X(X^T X)^{-1} X^T \varepsilon \\ &= [I - X(X^T X)^{-1} X^T]\varepsilon \\ &= X_r \varepsilon \end{aligned} \tag{7}$$

where $X_r = I - X(X^T X)^{-1} X^T$ is a symmetric equal-power matrix, i.e., $X_\tau = X_\tau^T$, and $X_\tau^T X_r = X_\tau$.

The residual sum of squares is expressed as:

$$e^T e = \varepsilon^T X_r^T X_r \varepsilon = \varepsilon^T X_r \varepsilon \tag{8}$$

So:

$$\begin{aligned} E(e^T e) &= E\{\varepsilon^T [I - X(X^T X)^{-1} X^T] X\} \\ &= \sigma^2 tr[I - X(X^T X)^{-1} X^T] \\ &= \sigma^2 (n-k-1) \end{aligned} \tag{9}$$

This yields an unbiased estimate of the variance of the random error term ε under ordinary least squares as:

$$\hat{\sigma}^2 = \frac{e^T e}{n-k-1} \tag{10}$$

Under the assumption of classical linear regression, the least squares estimator is a linear unbiased estimator with minimum variance, where unbiasedness and validity (least squares) are the most important among the small sample properties, which do not change depending on the size of the sample size. Since the discussion here focuses on the finite sample case, the three properties of the finite sample property or the small sample property of the sample estimator are introduced here, and the estimator that possesses such properties is called the best linear unbiased estimator.

III. B. 3) Significance testing of the model

After establishing a multiple linear regression model, it is necessary to conduct a model test, the reason for the test is to determine whether there is an effective effect of the input independent variable on the dependent variable. Commonly used test methods include goodness-of-fit test (R test), equation significance test (F test), etc.

(1) Goodness-of-fit test of the model

Goodness of fit is used to analyze the validity of the regression effect, and the square of the decidable coefficient R is used to measure the degree of fit of the predicted values to the actual values, $0 \le R^2 \le 1$, the closer R^2 is to 1, the higher the degree of correlation between the independent variable and the dependent variable, and the better the regression equation is fitted. Then:

$$R^2 = \frac{SSR}{SST} = 1 - \frac{SSE}{SST} = 1 - \frac{\sum (y - \hat{y})^2}{\sum (y - \bar{y})^2} \tag{11}$$

SSR stands for sum of squares of regression, SSE stands for sum of squares of residuals, and SST stands for sum of squares of total deviations.

(2) Equation significance test (F-test)

The hypothesis tested is $H1: \beta_0 = \beta_1 = \beta_2 = ... = \beta_k = 0$. The alternate assumption is that $H2$ has at least one $\beta_i (i = 1, 2, ..., k)$ is not zero.

Then the test statistic is:

$$F = \frac{(n-2)\sum_{i=1}^{n} (\hat{y}_i - \bar{y})^2}{\sum_{i=1}^{n} (y_i - \hat{y}_i)^2} \sim F(k, n-k-1) \tag{12}$$

If there is $F > F_a(k, n-k-1)$, the regression equation is proved to be significant.

(3) Regression coefficient test

The original hypothesis of the test is H1: $\beta_i = 0$ and the alternate hypothesis is $\beta_i \neq 0$.

Then the test statistic is:

$$T = \frac{\sum_{i=1}^{n} (x_i - \bar{x}) \cdot y_i}{\sqrt{\sum_{i=1}^{n} (x_i - \bar{x})^2 \sum_{i=1}^{n} (y_i - \hat{y}_i)^2}} \sim t(n-k-1) \tag{13}$$

When $|T| > T_{a/2}(n-k-1)$, the regression coefficient is significant and vice versa the regression coefficient is not significant.

III. C. Research Variables and Research Modeling

III. C. 1) Selection of research variables

In the multiple linear regression model established in this paper, the explanatory variable is the juvenile crime rate (CR). Currently there are various types of division on the age group of minors, synthesizing the existing data as well as the nodes of the academic community on juveniles, this paper defines the group of minors as under 16 years old. For how to measure the crime rate has been one of the important issues in the field of crime research, this paper refers to the existing research on the measure of the crime rate, using the ratio of the number of crimes committed per 10,000 people in the population of 0 to 16 years old to measure the crime rate of minors.

The explanatory variables in the model contain the harshness of punishment policies and regulations (YL) and the rate of regulation of bad information on the Internet (JG). The ratio of the number of people sentenced by the Supreme People's Court to five or more years of imprisonment to the total number of convicted criminals is used to measure the punishment policy of severity (YL). The rate of regulation of undesirable information on the Internet (JG) is quantified by the number of occurrences of undesirable information on the Internet per 100,000 articles under the supervision of the Internet police.

In addition, this paper also chooses the proportion of the minor population to the total population (ADO), the state's judicial investment (TR), the minor school enrollment rate (HS), the economic level (ECO), and the educational level (EDU) as control variables. Among them, the proportion of the minor population to the total population (ADO) is measured using the proportion of China's population aged 10 to 16 to the total population, the national judicial investment (TR) is measured using the proportion of public prosecution and law enforcement expenditures to the government's fiscal expenditures, and the underage school enrollment rate (HS) is measured using the gross enrollment rate of minors aged 0 to 16. The economic level (ECO) and education level (EDU) are obtained by homogenizing data from the China Statistical Yearbook.

III. C. 2) Research modeling

In order to analyze the social factors of juvenile delinquency, this paper constructs the following benchmark regression model by combining multiple linear regression models from the dimensions of legal regulation effects and regulation of undesirable information on the Internet:

$$CR_{it} = \beta_0 + \beta_1 YL_{it} + \beta_2 JG_{it} + \beta_3 \sum Control_{it} + \gamma_i + \mu_t + \varepsilon_{it} \tag{14}$$

where i and t denote different periods and regions, CR_{it} denotes the juvenile delinquency rate, YL_{it} denotes the severity of the punitive policies and regulations, JG_{it} denotes the rate of regulation of bad information on the internet, $Control_{it}$ denotes the rate of each control variable, γ_i denotes the time fixed effect, and μ_t denotes the province fixed effect. In addition, β is the estimated coefficient and ε_{it} is the random error term.

IV. Analysis of social factors in juvenile delinquency

Juvenile delinquency is an issue of general concern to academia and society. In recent years, with the development of society, the phenomenon of juvenile delinquency is becoming more and more serious, and the underage of juvenile delinquency is showing a more and more intense trend, and its social harm is extremely great. With the rapid development of the information age, a huge amount of information floods people's lives. In the face of violence, pornography and other undesirable information, many minors who do not have strong discernment ability have embarked on the road of crime due to the lack of positive guidance from family education and moral and legal education in schools. In recent years, the trend of juvenile delinquency has become more and more prominent as a result of the poor environment in which they grow up.

IV. A. Statistical analysis of crimes committed by minors

IV. A. 1) Age distribution of minors committing crimes

For this paper collects the judgment of juvenile crime cases of the people's courts of all provinces and cities in China, and obtains the age distribution of juvenile crime through the split-word technology, a total of 689 case judgments are extracted, of which the number of males and females are 641 and 48 respectively. The age of the first offense of juvenile crime was counted, and the distribution of the age of the first offense was shown in Table 1, and the test of normal distribution was shown in Figure 1.

In the distribution of age at first offense of juvenile delinquency, the age at first offense is between 10 and 16 years old, the median is 13 years old, and the mean value of age at first offense is 13.12±1.29 years old. Combined

with the results of normal distribution, the skewness and kurtosis of the age of first offense of juvenile delinquency are 0.073 and -0.873, respectively, and the W-value of the normality test is 0.893 and P<0.05. This indicates that the samples taken in this study are non-normally distributed, and their distribution curves show a certain degree of positive skewness and are relatively flat. However, combined with the figure can be seen, under the sampling of juvenile delinquency of the age of the first offense distribution still has a certain normality, taking into account the sample proportion of juvenile delinquency cases accounted for a high proportion of judgments, can also be approximated that the data distribution of juvenile delinquency rate related to the data obtained in this paper has a normality.

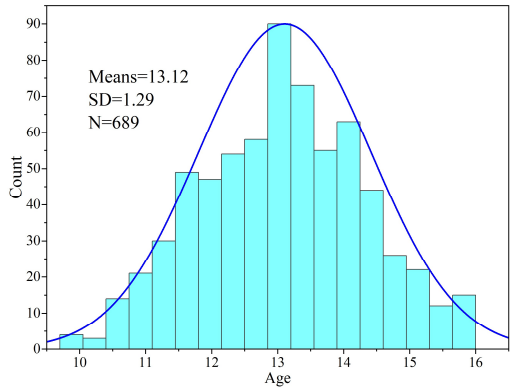

Figure 1: Test of age distribution of first-time offenders

Table 1: Age distribution of first-time offenders

Age	Frequency	Percentage/%	Cumulative/%
10	11	1.597	1.597
11	47	6.821	8.418
12	105	15.239	23.657
13	152	22.061	45.718
14	148	21.480	67.198
15	124	17.997	85.195
16	102	14.804	100.00

IV. A. 2) Juvenile delinquent behavior

Juvenile delinquency is generally characterized by suddenness and accidentality, but the emergence of their criminal behaviour is not accidental, and begins with their being subjected to undesirable influences from family, peers, society and other sources in the course of their socialization. To internalize their own wrong ideological concepts and distorted values, and further externalized into malpractices that do not conform to social norms and behaviors that endanger society. Until breaking the law and embarking on the road of crime, it is a process of gradual escalation and gradual evolution. This paper uses first-hand information from the 2022 National Survey of Juvenile Offenders to make a basic analysis of the bad behavior of minors before they commit crimes and the factors influencing them, and identifies problems in comparison with ordinary secondary school students, with a view to providing lessons for the prevention of juvenile delinquency.

The survey involves 15 kinds of juvenile delinquent behaviors, including general delinquent behaviors and serious delinquent behaviors, and asks juvenile offenders, “Before committing a crime, have you ever done any of the following behaviors?” The results of their comparison with ordinary middle school students are shown in Table 2.

Overall, the juvenile offenders' bad behaviors before committing crimes were significantly higher than those of ordinary middle school students. The specifics are as follows:

(1) Quantitatively, the percentage of underage offenders who had bad behaviors before committing crimes was much higher than that of ordinary middle school students, with the overall average percentage 17.33 times higher.

(2) In terms of content, the top six bad behaviors of juvenile offenders are "smoking", "not returning home at night", "socially delinquent youth", "truancy, absenteeism", "drinking", and "fighting" are all about 80%, while the proportion of ordinary middle school students with these behaviors is very small, not more than 10%.

(3) From the perspective of the high incidence of juvenile offenders, the incidence of "not returning home at night", "skipping school, absenteeism", "socially delinquent youth", "fighting", "playing violent games on the Internet" and

so on are also relatively high among ordinary middle school students, and the commonality of this trend indicates that the correction of such bad behaviors is very important for the prevention of juvenile crime.

Table 2: Comparison of the bad behavior of minors (%)

Bad behavior	Juvenile delinquents	Middle school students
Not returning home at night	84.21	5.16
Run away from home	62.19	2.48
Smoking	99.49	3.17
Drinking alcohol	78.51	8.75
Skipping school, skipping classes	81.63	3.24
Associate with delinquent teenagers	82.87	3.93
Fighting and brawling	79.15	4.52
Watching pornographic videos	54.32	2.18
Read pornographic books	40.64	1.53
Browse pornographic websites	52.39	2.06
Play cyberviolent games	69.51	8.56
Play online pornographic games	26.48	1.27
Gambling	44.57	1.46
Petty theft	30.11	1.35
Forcibly demanding property	46.48	1.12
Overall average percentage	62.17	3.39

In addition, the age at which juvenile delinquency begins has the following salient characteristics:

The youngest age at which undesirable behaviors begin is basically the age at which they have just entered elementary school, with the highest age being 7 years old. But in fact, the proportion of bad behavior of children in this age group is very small, which also shows that school is a major turning point in their lives. The average age at which bad behaviors begin is fixed between 11~15 years old, that is, the age group of junior high school students, and the most is between 12~14 years old. The high incidence age of bad behaviors is between 11 years old ~ 15 years old, and the proportion of 14-year-old is the highest in the second year of junior high school, and among the 15 kinds of bad behaviors, the proportion of 14-year-olds ranks first as high as 12 kinds. This is the age at which adolescence is the most troubled. "Truancy, absenteeism" and "petty theft" are the lowest in the ranking of average age at onset of bad behaviour and age at high incidence, at over 11 years or 11 years old, and are students in the final year of primary school or just entering junior high school.

IV. B. Analysis of model baseline regression results

IV. B. 1) Analysis of baseline regression results

In this paper, we will focus on the effects of severe punishment policies and regulations (YL) and the rate of regulation of bad information on the Internet (JG) on the juvenile delinquency rate (CR) when conducting the benchmark regression analysis. At this stage, in order to simplify the model for preliminary analysis, possible endogeneity problems are not considered for the time being, and these problems will be further dealt with and solved in the subsequent model. After regression analysis, the results are shown in Table 3. In the table, *,**,*** denote significant at the 10%, 5% and 1% levels, respectively, with t-values in parentheses, below.

The effects of harsh punitive policies and regulations (YL) and the rate of Internet bad information regulation (JG) on the juvenile delinquency rate (CR) are significant when only the harsh punitive policies and regulations (YL) and the rate of Internet bad information regulation (JG) are included as the core explanatory variables in the first column, without adding other control variables and fixed effects. Specifically, the regression coefficients of severe punishment policies and regulations (YL) and the rate of network bad information supervision (JG) are -0.614 and -0.827 respectively, and the significance test level of this coefficient reaches 1%, so it can be inferred that severe punishment policies and regulations (YL) and the rate of network bad information supervision (JG) have a significant negative impact on the juvenile delinquency rate. That is, the stronger the effect of severe punitive policies and regulations as well as the rate of Internet bad information regulation, the lower the juvenile crime rate will be.

After adding time and province controls in the second column, although the regression coefficients are slightly narrowed and the facilitating effect is reduced, they still reach the 1% significance level, which indicates that the severe punishment policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) have a significant facilitating effect on the lowering of juvenile delinquency rate.

With the inclusion of control variables in the third column, each control variable shows a significant inhibitory effect on the juvenile delinquency rate (CR). The regression coefficients of severe punishment policies and regulations (YL) and the rate of Internet bad information regulation (JG) on the juvenile delinquency rate (CR) become larger, showing a significant inhibitory effect.

The fourth column, based on the third column, with the fixed effects of time and province, the coefficient becomes smaller, but still shows a strong negative effect.

According to the data in the table, it can be seen that, regardless of whether the control variables are included or not, and regardless of whether the time and province fixed effects are added or not, the harshness of punitive policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) show a negative effect on the juvenile delinquency rate (CR) at the 1% level of significance, a finding that coincides with the theoretical analyses in this paper, thus verifying the correctness of H1 and H2. The explanatory power of the model $R2$ also increases with the increase in the number of control variables, which further confirms that the inhibitory effects of the harshness of the punitive policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) on the juvenile delinquency rate (CR) are significant and stable.

Table 3: Analysis of benchmark regression results

Variable	Model (1)	Model (2)	Model (3)	Model (4)
YL	-0.614***(7.624)	-0.527***(6.438)	-0.638***(6.127)	-0.416***(5.994)
JG	-0.827***(8.941)	-0.735***(7.527)	-0.849***(5.941)	-0.602***(5.462)
ADO	-	-	-0.052***(4.812)	-0.043***(4.379)
TR	-	-	-1.914**(4.518)	-1.263**(4.058)
HS	-	-	-0.036*(1.743)	-0.029*(1.536)
ECO	-	-	-0.291***(6.458)	-0.228***(6.173)
EDU	-	-	-0.016***(1.342)	-0.015***(1.265)
(Cons)	0.157***(7.123)	0.136***(5.932)	0.827***(9.713)	-1.108***(5.127)
R^2	0.7315	0.8941	0.8519	0.9815
Adj.R^2	0.7208	0.8859	0.8342	0.9723
Province	NO	YES	NO	YES
Time	NO	YES	NO	YES

IV. B. 2) Benchmark model validity test

After the completion of the model design and benchmark regression analysis, the validity test is carried out for the multivariate linear regression model established in this paper, which is mainly carried out from the two dimensions of goodness-of-fit and F-test. Table 4 shows the validity test results of the benchmark model.

In the model summary, the adjusted R² value can better reflect the degree of explanation of the explanatory variables on the changes of the explained variables compared with R². Generally speaking the adjusted R² value above 50% is better, in this table the adjusted R² value also i.e. the goodness of fit is 0.8415, then it can be assumed that the explanatory variables severity of punishment policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) can explain 84.15% of the change situation of the juvenile delinquency rate (CR), that is to say, the juvenile delinquency rate (CR) 84.15% of the change situation is caused by the harshness of the punishment policy and regulations (YL) and the rate of regulation of bad information on the Internet (JG), and the result has more credibility. In addition, in the result of ANOVA (analysis of variance) of F-test, the statistic F is 48.271, and the significance Sig. value is much less than 0.05, which indicates that the explanatory variables of harsh punitive policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) have a relationship of influence on the explained variable of the juvenile delinquency rate (CR).

Table 4: Validity test of the benchmark model

Model	*R*	R^2	Adj.R^2	S.T. Err	D-W
1	0.9327	0.8699	0.8415	0.0143	1.127
Model	-	Sum of squares	Mean square	*F*	Sig.
1	Return	0.031	0.015	48.271	0.002
	Residual	0.006	0.000	-	-
	Total	0.037	-	-	-

IV. B. 3) Robustness and Heterogeneity Tests

(1) Robustness test

In this paper, the endogeneity problem is also considered, if only a single model is used for analysis, without considering the endogeneity problem its regression results have a large bias. Based on the existing research samples, this paper selects the deterministic penalty policy (QD) and the lagged period (Ln-1) of the regulation rate of online bad information as instrumental variables. And also proposed the replacement of the explanatory variables to conduct the robustness test by replacing the juvenile delinquency rate (CR) with the number of crimes committed by minors (CN) and using the value of the number of crimes committed by all minors from 2012 to 2022 divided by the year for calculation. Table 5 shows the results of the robustness test.

From the table, it can be found that the p-value of the KM-LM statistic of the lagged period of the rate of regulation of bad information on the Internet and the deterministic punishment policy (QD) as an instrumental variable are both 0.000, which rejects the hypothesis of "insufficient identification of instrumental variables". Meanwhile, the value of KP Wald F is much larger than the critical value at the 10% significance level, which rejects the hypothesis that the instrumental variable is a weak instrumental variable, and indicates that the one-period lag of the rate of regulation of undesirable information on the Internet and the certainty of the punishment policy (QD) can be effectively used as instrumental variables. From columns (1) and (2), we can find that both the severe punishment policy (YL) and the rate of juvenile delinquency (CR) are negatively correlated with the rate of Internet bad information regulation (JG) at the 1% level of significance, which further validates the hypothesis in the previous section. In addition, after replacing the explanatory variables, the effects of harsh punitive policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) on the number of crimes committed by minors (CN) are still negatively correlated at the 1% level of significance. This fully demonstrates the robustness of the baseline regression results, i.e., the stronger the punitive policies and regulations of severity and the rate of regulation of undesirable information on the Internet, the significantly lower the juvenile delinquency rate will be.

Table 5: Robustness test results

Variable	Model (1)-Ln-1	Model (2)-QD	Model (3)-CN
YL	-0.372***(4.163)	-0.319***(3.824)	-0.281***(3.742)
JG	-0.538***(6.271)	-0.463***(5.359)	-0.495***(6.163)
Control	YES	YES	YES
(Cons)	0.035***(3.276)	0.624***(5.683)	0.549***(4.816)
R^2	0.8721	0.9237	0.8953
Adj.R^2	0.8642	0.9205	0.8927
KP-LM	50.413(0.000)	93.216(0.000)	-
KP Wald F	672.914(18.273)	127.458(13.637)	-

(2) Heterogeneity test

The above analysis mainly focuses on the direct effect of severe punishment policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) on the juvenile delinquency rate (CR), however, there is a large degree of regional variability in terms of the degree of economic development and the level of education in different regions of China, and it remains to be analyzed whether these factors play a role in influencing the effect on juvenile delinquency rate, therefore, this paper subdivided the full sample of regions into three groups: eastern, central, and western for the classification regression. Therefore, this paper subdivided the whole sample area into three groups of east, central and west for categorical regression, and the results are shown in Table 6.

It can be found that the regression coefficients of severe punishment policies and regulations (YL) and the rate of regulation of bad information on the Internet (JG) in the eastern, central and western regions are all negative, and pass the significance test at the 1% confidence level. This suggests that even when examined in groups, regions with different locational characteristics are able to significantly suppress the juvenile delinquency rate (CR) in terms of the harshness of punitive policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG). Further, observing the values of the regression coefficients, it can be seen that the suppression of juvenile delinquency rate (CR) by severe punitive policies and regulations (YL) and the rate of regulation of undesirable information on the Internet (JG) is the largest in the eastern region, followed by the central region, and the smallest in the western region. The reason for this may be that the eastern regions, especially some southeastern coastal cities, started early, seized the opportunity and developed their economy rapidly, opened up to the outside world first by virtue of their location, and raised their education level and the binding force of local policies and regulations sufficiently, which made it possible to reduce juvenile delinquency rates. The central and

western regions, on the other hand, still have much more room for development, ultimately showing a certain degree of regional heterogeneity.

Table 6: Heterogeneous regression results

Variable	Model (1)-Eastern	Model (2)-Central	Model (3)-Western
YL	-0.512***(6.491)	-0.427***(6.021)	-0.129***(3.147)
JG	-0.764***(8.716)	-0.638***(8.153)	-0.305***(4.279)
ADO	-0.035***(5.131)	-0.069**(6.336)	-0.027***(5.128)
TR	-0.127**(3.283)	-0.138***(4.015)	-0.093**(3.735)
HS	-0.035**(4.789)	-0.028**(4.173)	-0.022**(3.835)
ECO	-0.107***(5.032)	-0.121***(4.348)	-0.094***(3.249)
EDU	-0.089**(3.941)	-0.072**(3.581)	-0.036**(2.714)
(Cons)	-0.915***(6.124)	0.051(0.217)	0.074(0.053)
R^2	0.9531	0.9517	0.9028
Adj.R^2	0.9427	0.9482	0.8975
Province	YES	YES	YES
Time	YES	YES	YES

IV. C. Intervention strategies for juvenile delinquency

IV. C. 1) Reasonable application of educational disciplinary measures

Article 17 of the Criminal Law stipulates: "Where a person is not subject to criminal punishment because he is under the age of 16, his parents or other guardians shall be ordered to discipline him/her, and when necessary, special correctional education shall be carried out in accordance with the law." The 11th Amendment to the Criminal Law has changed "custody and reeducation" to "special correctional education", which echoes the relevant contents of the Law on the Prevention of Juvenile Delinquency and the Law on the Protection of Minors promulgated by China. There are usually two ways to deal with juveniles when they commit a crime, namely guardian discipline and special correctional education. The reason why custody and re-education has been revised to special correctional education is that China's legal provisions on custody and re-education are too vague, resulting in the simplification of judicial practice and the fact that relevant departments in different regions have their own ways of doing their own thing, seriously affecting the normal development of custody and re-education work, and even more so affecting the effectiveness of the prevention and treatment of juvenile delinquency.

The acts committed by the targets of specialized correctional education already satisfy the constituent elements of the offence, but they cannot be held criminally liable and cannot be punished by criminal penalties because they have not reached the appropriate age of criminal responsibility. Specialized correctional education, as a type of security disciplinary measure, is aimed at special prevention and is based on the personal risk of a particular young person, and is an individualized treatment for different targets. Specialized correctional education embodies the basic stance of combining education and punishment, and targeted measures are taken in accordance with the age and psychological characteristics, developmental needs, upbringing, reasons for committing crimes, family supervision, educational conditions and other circumstances of the specific target of correctional education. Minors who are not criminally punishable because they are under 16 years of age have already committed a criminal misdemeanour of a substantive unlawful nature, at which point preference should be given to “ordering their guardians to discipline them”. If the guardian is negligent in fulfilling his or her obligation to supervise and educate the minor, the public authorities of the State will intervene to provide corrective treatment and education. If the perpetrator commits an act that is cruel in its methods and aggravating in its circumstances, and if the perpetrator has a greater likelihood of recidivism, the act may be referred directly to the relevant authorities for specialized corrective education.

IV. C. 2) Integration of protection and crime prevention and control mechanisms

First, a data exchange platform has been established to share the results of the work. The newly amended Criminal Procedure Law and its judicial interpretations provide for special procedures and mechanisms for social investigation, psychological intervention, misdemeanor sealing, and community correction in criminal proceedings involving minors. Through this public-prosecution and law-enforcement data exchange platform, the reports formed by the Corrections Bureau commissioned by the public prosecution and law-enforcement agencies to carry out pre-trial social investigations of minors, and community corrections for probationers can be transmitted to the courts on a daily basis, and the court's adjudicative documents and tracking of help and education can be transmitted to the Bureau on a daily basis, so that the two departments can share the status of the education and correctional work

of minors who have been out of order. In the era of big data, a platform for the exchange of data on minors shared by the public prosecutor, the judiciary and the department for the protection of minors can be set up as soon as possible, so as to realize real-time sharing of information on the protection of minors and on crime prevention and control work.

Secondly, it attaches importance to family parental education, and builds the first line of defense. Generally speaking, there are three lines of defense for the protection of minors and the prevention and control of crime, namely, the family, the school and the society, of which the family is the first line of defense, and parents are not naturally equipped to raise and educate their children, so if the family is negligent in educating and caring for their children, or even abandons them, then the education and management of them by the school and the society will seem pale and powerless. Therefore, guiding parents in the proper discharge of their guardianship duties and effective family education, i.e., providing parental education to parents or compelling delinquent parents to receive parental education, is fundamental to the protection of minors' healthy growth.

IV. C. 3) Actively improving the online media environment

Surveys show that the worse the minors' learning situation is and the more they are rejected by their families and schools, the stronger their fascination with and dependence on television and the Internet. When school learning fails to attract them and parental preaching is not acceptable to them, the more they are interested in all kinds of information in the mass media, the more they believe in the media, the more they utilize the media, and the more likely they are to become addicted to them. When confronted with media information that is not suitable for children, the more incapable schools and families are of filtering and positively guiding minors, the deeper the intrusion of undesirable content will be.

In recent years, China has attached great importance to the influence of the mass media on minors, from laws and documents to comprehensive governance and crime prevention practices, and the development of software for Internet safety and anti-addiction, as well as the enhancement of the governance and management of unscrupulous Internet cafes, have indeed played a role. However, if the problems of families and schools themselves still exist, and the environment in which they live does not change or changes very little, the effect of external governance can only be temporary. As to how to improve media literacy, for adults, the first is to improve their ability to judge the media, to understand correctly and to use the information and cultural resources of the mass media positively, so as to understand society more comprehensively, to improve themselves and to serve themselves, and to lay a good foundation for influencing and educating minors. The second is to improve the ability to guide minors, i.e., to help them use the media correctly, form correct value judgments, improve their immunity to negative information, learn to make choices when they are under the influence of the mass media, and act as a “filter” for their exposure to the influence of the media. This is the key to reducing and avoiding the negative impact of the mass media on minors.

V. Conclusion

The article explores the social factors of juvenile delinquency based on the multiple regression model, which mainly includes the legal regulation effect and the network bad information. The effect of legal regulation and Internet bad information are quantified by the effect of severe punishment policies and regulations and the supervision rate of Internet bad information, respectively, and both of them have a significant negative impact on the juvenile delinquency rate, i.e., the stronger the effect of severe punishment policies and regulations and the supervision rate of Internet bad information are, the lower the juvenile delinquency rate will be. In order to further reduce the juvenile delinquency rate, it is necessary to reasonably apply educational and disciplinary measures, build an integrated mechanism of protection and crime prevention and control, and actively improve the network media environment, so as to promote the healthy and happy growth of minors.

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References

[1] Young, S., Greer, B., & Church, R. (2017). Juvenile delinquency, welfare, justice and therapeutic interventions: a global perspective. BJPsych bulletin, 41(1), 21-29.

[2] Ademi, A. M. (2023). Fundamental characteristics of juvenile delinquency. European Journal of Economics, 7(2).

[3] Taşkıran, S., Mutluer, T., Tufan, A. E., & Semerci, B. (2017). Understanding the associations between psychosocial factors and severity of crime in juvenile delinquency: a cross-sectional study. Neuropsychiatric disease and treatment, 1359-1366.

[4] Bekbolatkyzy, D. S., Yerenatovna, D. R., Maratuly, Y. A., Makhatovna, A. G., & Beaver, K. M. (2019). Aging out of adolescent delinquency: Results from a longitudinal sample of youth and young adults. Journal of Criminal Justice, 60, 108-116.

[5] Leenarts, L. E. W., Dölitzsch, C., Pérez, T., Schmeck, K., Fegert, J. M., & Schmid, M. (2017). The relationships between gender, psychopathic traits and self-reported delinquency: a comparison between a general population sample and a high-risk sample for juvenile delinquency. Child and adolescent psychiatry and mental health, 11, 1-9.

[6] Gungea, M., Jaunky, V. C., & Ramesh, V. (2017). Personality traits and juvenile delinquency. International Journal of Conceptions on Management and Social Sciences, 5(1), 42-46.

[7] Poyraz Fındık, O. T., Rodopman Arman, A., Erturk Altınel, N., Durlanık, E. G., Ozbek, H., & Semerci, B. (2019). Psychiatric evaluation of juvenile delinquents under probation in the context of recidivism. Psychiatry and Clinical Psychopharmacology, 29(4), 427-434.

[8] Gearhart, M. C., & Tucker, R. (2020). Criminogenic risk, criminogenic need, collective efficacy, and juvenile delinquency. Criminal justice and behavior, 47(9), 1116-1135.

[9] Kroska, A., Lee, J. D., & Carr, N. T. (2017). Juvenile delinquency and self-sentiments: Exploring a labeling theory proposition. Social Science Quarterly, 98(1), 73-88.

[10] van der Laan, A. M., Rokven, J., Weijters, G., & Beerthuizen, M. G. (2021). The drop in juvenile delinquency in the Netherlands: Changes in exposure to risk and protection. Justice quarterly, 38(3), 433-453.

[11] Schepers, D. (2017). Causes of the causes of juvenile delinquency: Social disadvantages in the context of Situational Action Theory. European journal of criminology, 14(2), 143-159.

[12] Chung, Y. R., Hong, J. W., Kim, B. B., Kim, J. S., Noh, I. S., Wee, J. H., ... & Lim, M. H. (2020). ADHD, suicidal ideation, depression, anxiety, self-esteem, and alcohol problem in Korean juvenile delinquency. Medicine, 99(11), e19423.

[13] Bobbio, A., Arbach, K., & Illescas, S. R. (2020). Juvenile delinquency risk factors: Individual, social, opportunity or all of these together?. International journal of law, crime and justice, 62, 100388.

[14] Berna Aygun & Nusret Soylu. (2025). Factors linked to juvenile delinquency among forced migrant children. Journal of forensic and legal medicine,111,102829.

[15] Rachel Murphy. (2024). A pilot study: Exploring suicidal ideation among non-offending adults with sexual attraction to minors, through their online forum posts. Journal of Social Work,24(6),777-794.

[16] Yoisdel Castillo Alvarez,Yorlan González González,Reinier Jiménez Borges,Luis Angel Iturralde Carrera,José M. Álvarez Alvarado & Juvenal Rodríguez Reséndiz. (2024). Energy Efficiency and Mathematical Modeling of Shrimp Pond Oxygenation: A Multiple Regression Experimental Study. Eng,5(4),2862-2885.