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ARTICLE

The Role of Social Change Factors in the Criminal Saturation Law

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ABSTRACT

In the crime saturation law, the crime rate of a country depends on the specific time and space conditions of the country, and its distribution and size are limited to the "saturation" of social conditions. Therefore, the process of social change is the process of the criminial rate change. First, based on the regression analysis of the longitudinal crime rate data and relevant social development data in China from 1981 to 2015, this paper searches for the cointegration relationship between the variable sequences. Second, by the Quandt-Andrews breakpoint test, this paper finds the potential structural breakpoints within the sample interval. Finally, based on the structural breakpoints, this paper compares and analyzes the regression results between the sub regions, the sub intervals and overall sample intervals. The study finds that the increase of per capita GDP level, the widening income gap between urban and rural areas, the decline of social education level and the increase of unemployment rate all contribute to the growth of crime rate. China's relevant departments should implement measures to maintain stability in the period of rapid economic growth, pay attention to social equity problems, increase investment in education, and reduce social unemployment rate.

Keywords: Crime Saturation Rule; Social Change; Cointegration Model; Quandt-Andrews Segmentation Point Test

1. Introduction

Crime is closely related to the development of human society. As a special social behavior, crime brings negative externalities to the residents. According to the criminal saturation law (Enrico Fer-

ri, 1990), there are different criminal behaviors in different social stages. The size and distribution of criminal behaviors depend on various factors in one period. For example, crime can be regarded as a substance dissolved in solution. Under constant external

conditions, this dissolution is limited to saturation. If the criminal behaviors continue to grow in a certain period, it means that the external environment has changed, that is, the changes in social conditions have promoted the "dissolving" of criminal behavior, and we can observe this change directly from the crime rate data.

Exploring the statistical data of crime rate in China over the past thirty years, we can find that the crime rate in China has maintained a gradually increasing trend. In 1980s, the "Strike Hard" policy didn't get the expected inhibition effect. The absolute amount of the crime increased from about five hundred thousand in 1978, to two million in 1990, and exceeded four million in 2001 (Li Xiaomeng, 2011). The crime rate continues to fluctuate. From the perspective of the criminal saturation law, the change of external factors increases the "saturation" for criminal acts. It is assumed that crime is a kind of probable nature, and we can use econometric methods to study the relationship between criminal behaviors and many factors, to analyze the internal relations between criminal behavior and social change, which can help managers to make more appropriate crime-controlling policies, and also help us to understand the unbalance behind the crime.

The rest of this paper is arranged as follows: (1) literature review, summarize the internal relationship between the crime rate and the social environment change based on the abroad and domestic researches; (2) variable setting and sample data, introduce independent variables and dependent variable, show descriptive statistics of the crime rate and the social environment development factors in our country, and analyze the stability and cointegration relationship of the data; (3) Quandt-Andrews segmentation point test, explore the effect of major events on the fluctuation of crime rate; (4) empirical analysis, divide the samples into two sub-samples to explore the long-term stable relationship between the variables, and analyze the effect of social environmental factors on the crime; (5) conclusions and suggestions, provide feasible advice for maintaining the social stability based on the empirical regression results.

2. Literature Review

2.1 Theoretical Study

In view of the crime rate in the social environment, foreign scholars have conducted in-depth qualitative research in nineteenth century, and concluded that natural factors, social factors and anthropological factors are the three major factors that affect the crime. These three factors work together to produce the criminal phenomenon in the whole society. Among them, social factors are the most important. American scholar Siegel (1989) divides modern criminal sociology theory into social structure theory, social process theory and social conflict theory. Wu Zongxian (2006) summarized this theory. He believed that criminal behavior was caused by the social factors. Among these factors, the irrational distribution of wealth and the intensification of social inequality were most obvious. These factors would break the original balance and led to a series of anti social behaviors.

2.2 Empirical Study

Under the established factors, the crime rate of a country will periodicy fluctuate around a certain number. Once the factors change, the "saturation" of the crime rate in the social environment will change accordingly, thus promoting the fluctuation of the crime rate. In the study of crime rate and social environment, different scholars choose different explanatory variables that can reflect the social changes, and use a large amount of data to carry out quantitative regression analysis. A series of conclusions drawn by these scholars provide valuable reference and inspiration for policy-makers to search for the crime rule and make criminal control measures. Among them, the most common explanatory variables include per capita GDP, social wealth distribution, gender factors, education level, unemployment rate and population mobility.

In the past 30 years, due to the continuous years of high economic growth, China's society has rapidly changed into a new and open modern society from the

traditional and conservative state. The original culture, customs and concepts have been strongly impacted, and traditional barriers have been broken. The social gap between the rich and the poor has gradually widened, the proportion of sex has changed, the level of education has been promoted, the unemployment rate has undergone great fluctuations, the population flow has become more frequent, and the social relations between different classes, different groups and different individuals are more complex. Under the new social environment, the competition among different interest groups is more intense, which provides excellent housing for criminal offences.

The empirical research on this topic aims at exploring the specific relationship between crime rate and various social change factors. Fleisher (1966) has studied the relationship between income level and criminal behavior for the first time in history. Around 1990s, people began to make more use of economics to analyze the occurrence of criminal behavior. Huang Shaoan and Chen Yili (2007) explored the internal relationship between the multiple macroeconomic factors and the crime rate in China, and found that the expansion of the income gap would increase the crime rate significantly. Chen Chunliang and Yi Junjian (2009) have found that once the expansion of the relative income gap increased by 1% and the crime rate would increase significantly by 0.37%. Of course, some scholars have drawn different conclusions: Neumayer (2005), based on the study of robbery and violent theft, concluded that there is no significant relationship between income inequality and the occurrence of violent crime.

In the empirical analysis, the analytical models can be divided into multiple regression and time series analysis, and scholars have further developed these two basic models from different perspectives in order to reduce the empirical error. Yan Xiaobing (2013) used provincial crime rate data to explore the impact of floating population and income gap from the perspectives of time and space. Zhang Xiangda and Zhang Jiaping (2016) explored the impact of the income gap between urban and rural areas on property crime rate based on the nonlinear model. Qi Liyun

and Yang Xiaowei (2015) mainly adopted the stepwise regression method, eliminating the variables that have little influence on the crime rate ot may lead to the collinearity, to construct a suitable multi-variable linear model. Chen Yili (2010) used simple linear models to explore the influence of various factors in China's urbanization process on crime rate. Li Yanjun and Wang Yu (2017) used the generalized moment estimation to overcome the endogeneity of the model and investigate the relationship between crime rate and social welfare. Chen Lipeng, Xu Jianbin and Wei Juan (2014) made use of provincial panel data to study the relationship between Internet factors and crime rate. Fu Yanru (2013) used factor analysis algorithm to innovatively make mathematics practice and cognition of crime rate. Li Shuqi and Liu Qinggang (2009) mainly explored the crime rate from the perspective of urban and rural income inequality, per capita income and unemployment rate. Shi Jinchuan and Wu Xingjie (2009) mainly explored the impact of China's regional income gap and the floating population. Zhang Dandan, Wang also, Xin Meng and Lisa Cameron (2015) analyzed the various factors affecting the crime of migrant workers based on prison survey data. Zhang Yuan, Liu Shijing and Liu Liang (2011) mainly used the urban-rural income gap and the unemployment of migrant workers as independent variables to study their internal relationship with the crime rate.

Although the existed literature research has deeply explored the impact of social and economic factors on the crime rate, the explanatory variables of the study are relatively single, including income level, income gap, gender factors, education level and so on, and there are few empirical studies about major social events or changes. Zhang Yuan, Liu Shijing and Liu Liang (2011) pointed out that the "iron rice bowl" of a large number of workers has been broken since 1990s. The rise of unemployment rate is an important force to promote the fluctuation of the crime rate since the ninetieth century, but this research does not directly analyze the influence of the political decision of China's reform. This paper will focus on this special period and improve the

econometrical model.

2.3 The Main Contribution

First, the previous scholars did not make a clear study of the criminal saturation theory, such as Qi Liyun and Yang Xiaowei (2015) using stepwise regression to filter variables to construct the model. In fact, the explanatory variables used in the research are mostly from the previous literature and their hypothesis, which are lack of theoretical basis and more biased to the simple empirical analysis. The empirical study lacks the support of the theoretical framework. However, this paper is based on Ferri 's criminal saturation law, that is, a certain social condition corresponds to a certain crime rate, and the change of social conditions will lead to the change of the "saturation" of the crime rate. Under the theoretical framework of sociology, this paper analyzes the internal relationship mechanism of the criminal rate and social conditions in China, and puts forward a proper econometric model for specific quantitative research.

Second, few scholars have used empirical analysis methods to study the influence of national policy. Most of the literature only qualitatively analyzes the policy measures of the reform of state-owned enterprises. From the crime rate data of 1981-2015 years in China, it is found that in 1990s, the crime rate has been greatly fluctuated, and this trend of fluctuation continues until the beginning of twenty-first century. Based on this fact, this paper uses the Quandt-Andrews segmentation point test method to find out the profound impact of special events on crime rate. The segmentation point test method can find one or more unknown structural segmentation points that may exist in the specified range of observation, which can be regarded as an extension of Chow test.

Third, with reference to previous literature research, this paper selects the per capita GDP level, income gap, education level, and unemployment rate as explanatory variables. Social change is a dynamic process, and the change of crime rate also goes through the path of dynamic development. Because of various factors in the data collection, such as the change of the standard of setting up cases, the con-

cealment of relevant departments, it is undoubtedly that there exists the dark number of crime. Therefore, this paper takes the equilibrium crime rate into consideration when constructing the model, that is, the change of the crime rate reflected in the statistical data is only a part of the expectation, thus adding the analysis of the lagging term and improving the fitting degree of the econometrical model to the reality.

3. Variable Setting and Sample Data

3.1 Variable Setting

3.1.1 Dependent Variables

The explanatory variable is the logarithm of China's crime rate (lnCrime). In particular, the crime rate refers to the number of criminal cases or the number of crimes per one hundred thousand population, which is mainly to avoid the impact of the differences in the population base of different periods. Further logarithm of the sequence is to stabilize the fluctuation of the time series itself. According to the criminal saturation law, this paper uses cointegration test to analyze the long-term stable quantitative relationship between non stationary variables, and do not need to use differential data, so as to avoid the loss of the long-term information. As shown in **Figure 1**, it is found that in the 1990s, the criminal rate was greatly fluctuated, showing a similar shape of a parabolic line, and there might be one or more structural breakpoints. This paper will also discuss the fact.
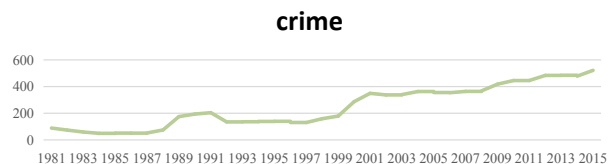

Figure 1. Changes in the criminal offences rate in China in 1981-2015.

3.1.2 Independent Variables

Based on the criminal saturation law, this paper selects 4 social condition factors as explanatory variables of the regression model. In order to reduce

the absolute value of the statistical data and to avoid heteroscedasticity of the explanatory variable data, the logarithm process is carried out in this paper. The explanatory variables are as follows:

(1) The per capita GDP level (GDP). The per capita GDP level can be used to measure the overall income level of our residents. This paper will take the logarithm of GDP data (lnGDP).

(2) The income gap between urban and rural areas (IncomeGap). This paper takes the ratio of per capita disposable income of urban households to the per capita net income of rural residents to represent the income gap between urban and rural areas. The higher the ratio, the greater the income gap between urban and rural residents in China. Because the sequence of urban-rural income gap adopted in this paper is a proportional data, we will not take logarithm of this sequence.

(3) The level of Education (Edu). This paper takes the annual graduation rate of junior school as an indicator to show the level of education in China. Similarly, the absolute value of the sequence is between 0-1, so there is no logarithmic processing.

(4) The unemployment rate (Unemploy). This paper takes the number of registered unemployed population in urban areas to measure the unemployment rate in China. Because the absolute value of the data sequence is large and there is a rising trend, this paper takes logarithm of the sequence and gets lnUnemploy.

3.2 Sample Data

The data related to criminal cases used in this paper is from the Chinese Law Yearbook. The Chinese Law Yearbook, sponsored and led by the China Law Society, is the most authoritative and comprehensive Yearbook in the relevant legal fields of legislation, justice, law education and research in China. This paper adopts the criminal cases data from 1981 to 2015. In addition, we should also recognize the objective existence of the dark number of crime. The dark number of crime is the number of criminal cases that can not be covered in official statistics because of various institutional and statistical factors. Therefore, when selecting data, we should reduce the

gap between statistical crime rate and actual crime rate as far as possible (Bai Jianjun, 2010).

The data related to the calculation of the criminal rate in Chinese legal Yearbook include the statistical data of trial cases, the statistical data of the case investigation by the procuratorial organs, and the statistical data of the criminal cases of the public security organs. After judging from the dark number of crime mentioned above, the crime rate calculated by statistical data of criminal cases of public security organs is the closest to the actual crime rate. In particular, the statistical data of trial cases, the statistical data of the case investigation by the procuratorial organs only include the criminal cases that have been solved, which are closer to the reaction of the state organs to the crime. While the crime calculated by the statistical data of the criminal cases in the public security organs is a relatively real reflection of social crime rate.

The data related to social changes in this paper, including the per capita GDP level, the per capita disposable income of urban households, the per capita net income of rural residents, the annual graduation rate of junior school and the number of registered unemployment in urban areas, are all from the official annual data published by the National Statistics Bureau. The source of data is quite reliable, which provides micro data of high quality for the analysis of this paper, and greatly avoids the effect of data deviation on the research conclusions.

It should be noted that, in the calculation of the income gap between urban and rural areas, the National Statistics Bureau has adopted a new caliber to make statistics on the income of the residents since 2013. Therefore, in 1981-2012, this paper uses the per capita disposable income of urban households / the per capita net income of rural residents to show the income gap between urban and rural areas, and in 2013-2015, this paper uses per capita disposable income of urban residents / per capita disposable income of rural residents under the new caliber. In addition, this paper uses the number of registered unemployed population to reflect the unemployment situation in China, thus there will be potential deviations in the empirical analysis.

3.3 Descriptive Statistics

Since 1981-2015, China has undergone profound changes in the economic system, making the social change in this interval particularly intense, and the conditions of criminal offences are constantly fluctuating. In the empirical study, we selected 1981-2015 as the sample interval, total 35 annual data. The descriptive statistical analysis of the five independent variables examined in this paper is shown in **Table 1**. From skewness data, skewness is negative, indicating that the distribution is negative. From the kurtosis data, the numerical values are less than 3, indicating that the selected data distribution is relatively stable and there are few extreme values. It is also partly attributed to the previous logarithmic operation. In addition, from the first four statistics of the table, it can be seen that the specific values of the macro variables are relatively close, and can effectively avoid the large difference in the regression parameters.

3.4 Stability Test

The data sequences taken in this paper are all time series. Usually, when analyzing the time series, we first pay attention to whether there are similar trends among different sequences. If there is a similar trend between several sequences, there may be a "pseudo regression" situation when the regression analysis is carried out directly, that is, there is no significant correlation between the variables, but the results of the regression show that the correlation is significant. Generally speaking, before performing regression analysis on time series data, ADF test will be performed first. Therefore, as shown in **Table 2**, this paper uses the ADF model to test the stability of the five variable data of lnCrime, lnGDP, IncomeGap, Edu and lnUnemploy, all of which are nonstationary.

Table 1. Descriptive Statistics.

Statistics	lnCrime	lnGDP	IncomeGap	Edu	lnUnemploy
Mean	5.2565	8.6356	2.6753	58.1086	6.3064
Median	5.2674	8.8126	2.7311	50.7	6.3544
Maximum	6.2575	10.8185	3.3328	95.1	6.8732
Minimum	3.8977	6.2005	1.82	31.5	5.4626
Std	0.7739	1.4488	0.4760	20.4736	0.4667
Skewness	-0.4174	-0.4125	-0.2317	0.5625	-0.3647
Kurtosis	1.8670	1.8043	1.8864	1.8529	1.7688

Table 2. Test of Variable Stability.

Variables	p	ADF	10% Critical Value	5% Critical Value	1% Critical Value	Stationarity
lnCrime	0.6603	-1.231	-2.620	-2.978	-3.696	No
lnGDP	0.4644	-1.636	-2.620	-2.978	-3.696	No
IncomeGap	0.2699	-2.039	-2.620	-2.978	-3.696	No
Edu	0.9834	0.453	-2.620	-2.978	-3.696	No
lnUnemploy	0.7381	-1.041	-2.620	-2.978	-3.696	No

Next, as shown in **Table 3**, this paper takes the first order difference (dlnCrime, dlnGDP, dIncomeGap, dEdu, dlnUnemploy) for the 5 variables, and then carries out ADF test. All the difference sequences show stability. Engle and Granger (1987) propose that, for the modeling of nonstationary sequences, although some variables are nonstationary, their linear combinations may be stable when they have the same integer order. If the linear combination residuals are stationary sequences, then we can find out the long-term stable relations among variables. According to this test result, this paper will draw a stable internal relationship between the criminal rate and social change factors through testing the cointegration relationship.

Table 3. Test of Stability of First-order Difference Variable.

Variables	p	ADF	10% Critical Value	5% Critical Value	1% Critical Value	Stationarity
dlnCrime	0.0056	-3.608	-2.622	-2.980	-3.702	Yes**
dlnGDP	0.0151	-3.294	-2.622	-2.980	-3.702	Yes**
dIncomeGap	0.0160	-3.275	-2.622	-2.980	-3.702	Yes**
dEdu	0.0067	-3.552	-2.622	-2.980	-3.702	Yes**
dlnUnemploy	0.0000	-6.301	-2.622	-2.980	-3.702	Yes***

Note: * indicates significance at 10% significant level, ** indicates significance at 5% significant level, *** indicates significance at 1% significant level.

3.5 Johansen Cointegration Test

In this paper, five first-order-differential variables are tested by cointegration test. Engle and Granger (1987) first gave the Engle-Granger two-step method to explore the cointegration relationship among variables. This method mainly tests whether the residual terms of linear equations are stationary. If the residual terms are stable, the cointegration relationship can be determined. However, there is a shortage of this method: EG test is generally applicable to large-sized samples, and the error depends largely on the size of data samples. The smaller the size of data sample, the greater the error. In addition, the EG test method can not estimate multiple cointegration relationships. In the regression test, the sample interval is small, the annual data is used, and the requirements of the large-sized sample are not satisfied. At the same time, there may be multiple cointegration relationships among the multiple variables. Therefore, the EG test should not be used.

In this paper, Johansen test is used instead of Engle-Granger two-step test. The Johansen test mainly uses the maximum likelihood estimation (MLE) method to find out whether there is a long-term stable relationship among the variables, and the requirement of the data sample size is not that strict and the multiple cointegration relationship can be estimated effectively. As shown in **Table 4**, there are 2 cointegration relationships according to the Johansen eigenvalue trajectory test. Therefore, there is a long-term stable relationship between variable sequences. In the following empirical analysis, this paper will further explore the long-term stable relationship between crime rate and social change factors.

Table 4. Johansen Eigenvalue Trajectory Test.

Rank	Parameters	Likelihood Ratio	Eigenvalue	Trajectory Value	5% Critical Value
0	30	75.6279	.	97.6300	68.52
1	39	98.9840	0.7572	50.9177	47.21
2	46	111.8091	0.5403	25.2676*	29.68
3	51	118.4399	0.3309	12.0060	15.41
4	54	123.0364	0.2431	2.8129	3.76
5	55	124.4429	0.0817		

Note: * indicates that there are 2 cointegration vectors, that is, there are 2 cointegration relationships.

4. Quandt-Andrews Segmentation Point Test

Since 1980s, China has undergone profound changes, and structural changes have taken place in the social environment, making it possible for us to encounter structural breakpoints in empirical analysis. In this paper, the Quandt-Andrew segmentation point test is adopted to explore one or more breakpoints in 1981-2015, and then to verify the universality of the criminal saturation law. In the analysis of structural breakpoints, Chow test (1960) is one of the most basic and common methods. The main principle is to compare whether the structure of the two interval is significant. But its shortage is clear. It only aims at the known condition of the breakpoint, but

can not find the unknown breakpoint directly, and can only test one structural breakpoint in the sample interval, but can not study the potentially multiple structural breakpoints.

Quandt and Andrews (1993) has further developed this test based on the principle of Chow test, and proposed a test method for unknown structural breakpoints. Unlike the Chow test, this method can make tests under the unknown segmentation point, and observe whether there exists one or more unknown structural segmentation points in a certain interval. It can be said that the Chow test is the base of Quandt-Andrews segmentation point test. In the sample interval, we apply Chow test for n times, get n groups of test statistics, collate and calculate the new statistics. A single Chow test is used to determine whether there are significant breakpoints by calculating F- statistics. The formula for F- statistics is as follows:

$$F = \frac{(RSS_N - RSS_{n_1} - RSS_{n_2})/k}{(RSS_{n_1} + RSS_{n_2})/(N-2k)} : F(k, N-2k)$$

(3.1)

Among them, N, n_1, n_2 are the total number of samples and the number of observations respectively after the sample is divided. The RSS is the sum of the squares of residuals, and the K is the number of parameters including the constant term.

In this paper, the n groups of F- statistics are aggregated into three different statistics (Andrews, 1993 and Andrews and Ploberger, 1994):

(1) the Sup or Maximum statistic, that is, the maximum value of n F- statistics: $\max F = \max\limits_{t_1 < t < t_2} F(t)$

(2) the Exp statistic is calculated as follows:

$$\exp F = \ln(\frac{1}{k} \sum_{t=t_1}^{t_2} \exp(\frac{1}{2} F(t)))$$

(3) the Ave statistic, namely the arithmetic mean of n F- statistics: $AveF = \frac{1}{k} \sum_{t=t_1}^{t_2} F(t)$

In the Quandt-Andrews test, this paper eliminates part of the sample data symmetrically, and only carries out the structural breakpoint test in 1986 - 2009, in order to ensure the adequacy of the sample capacity for the regression. As shown in **Table 5**, the likelihood ratio F- statistics in 1990 -1994 were larger, the largest in 1993, then rapidly decreasing. F (5, 25) =2.60, so in 1988 and 1990-1995, we accepted the hypothesis of structural mutation. Therefore, the likelihood ratio F- statistics increased gradually, dropped sharply after reaching the peak in 1993, and then converged to nearly 0 after 2001.

Table 5. The Likelihood Ratio F Statistics of the Symmetrical Samples.

Year	Likelihood Ratio F Statistics	Year	Likelihood Ratio F Statistics	Year	Likelihood Ratio F Statistics
1986	0.9921	1994	6.8365	2002	0.7174
1987	2.3193	1995	2.6873	2003	0.6909
1988	2.8953	1996	1.5947	2004	0.6192
1989	2.4931	1997	1.4994	2005	0.5675
1990	3.3745	1998	1.5383	2006	0.5497
1991	8.5073	1999	1.9550	2007	0.5327
1992	12.7220	2000	1.5162	2008	0.5418
1993	12.8275*	2001	0.9613	2009	0.5067

Note: * indicates that F-statistics is significant at 95% confidence level.

As shown in **Table 6**, we use the likelihood ratio F- statistics derived from **Table 5** to calculate the three statistics of Quandt-Andrews. It is noteworthy that these three statistics do not follow the standard distribution. Hansen (1997) calculates approximate asymptotic P value (also known as Hansen P value), which is used to judge the significance of Quandt-Andrews's F statistics. In this paper, we compare the statistics with the corresponding Hansen P values, and we can find that all of them are significant. According to the segmentation test, this paper takes 1993 as the boundary, and makes an empirical analysis of the two sub regions respectively.

Table 6. Quandt-Andrews Stability Test Results.

Statistics	Test results
Sup F-statistics (1993)	12.8275*
Exp F-statistics	63.5871*
Ave F-statistics	2.8936*

Note: * indicates that F-statistics is significant at 95% confidence level.

Therefore, this paper takes 1993 as the breaking point, divides the sample interval into 1981-1992 and 1993-2015. Tracing back to the 1992-1993, we can find that the most profound changes in China must be Deng Xiaoping's "Southern Talk" at the beginning of 1992. It has opened the second stage of China's reform and opening up, and it is the biggest driving force for the change of social environment since the end of last century. In the second sample interval, the transformation from planned economy to market economic system is imperative. Contradictions and collisions are unavoidable. After the Southern Talk, the social trend of thought was changed from relatively conservative to positive and innovative, and the imbalance of the economic system and social order was adjusted and amended. Therefore, it is of practical significance to test the breaking point by using the Quandt-Andrews segmentation point test.

5. Empirical Analysis

5.1 Overall Sample Analysis

By examining the cointegration relationship, we can directly make regression analysis, to explore the long-term stable relationship between these variables. Specific regression results are shown in formula (4.1) and **Table 7**. The four explanatory variables selected in this paper are all significant.

$$\ln Crime_t = 0.1958 \ln GDP_t + 0.1695 IncomeGap_t -$$
$$0.0026 Edu_t + 0.9310 \ln Unemploy_t + \varepsilon_t$$
$$(4.1)$$

As shown in **Table 7**, from the analysis of the overall sample, the rise of per capita GDP level leads to a rise in crime rate; the rise of the income gap between urban and rural areas leads to a rise in crime rate; the rise of education level leads to the decline in crime rate; the rise of unemployment rate leads to the

rise of criminal rate. The deepening of China's market economy reform also exerts a subtle influence on people's sense of worth. The rapid increase of per capita GDP level will gradually catalyze people's pursuit of material desires, thus bringing about a new round of crime peak. In the classification statistics of the criminal cases of public security organs in Chinese Law Yearbook, the growth of cases with core of property such as robbery, fraud, theft and other cases is far beyond the cases about personal injury such as murder, rape and other cases.

Table 7. The Result of the Impact of Social Change Factors on Crime Rate.

Variables	Parameters	Std Error	t
lnGDP	0.1958	0.1451	1.35*
IncomeGap	0.1695	0.2190	0.77*
Edu	-0.0026	0.0072	-0.36*
lnUnemploy	0.9310	0.3355	2.77*
_Cons	-2.6095	1.3134	-1.99

5.2 Analysis of Sub Sample Interval 1981-1992

According to the analysis of the previous paper, this paper divides the sample interval into two stages: 1981-1992, 1993--2015, and makes regression analysis of the two sub - sample intervals respectively. The specific results of the 1981 -1992 sample are shown in **Table 8**. In 1981 -1992, the logarithmic GDP level (lnGDP), the income gap between the rural and urban areas (IncomeGap), the education level (Edu) and the unemployment rate (lnUnemploy) coefficient are all significant. The specific equations are as follows:

$$\ln Crime_t = 0.6936 \ln GDP_t + 1.5142 IncomeGap_t -$$
$$0.0515 Edu_t + 3.0533 \ln Unemploy_t + \varepsilon_{1t}$$
$$(4.2)$$

Table 8. The Impact of Social Conditions on China's Crime Rate in 1981-1992.

Variables	Parameters	Std Error	t
lnGDP	0.6936	0.3330	2.08*
IncomeGap	1.5142	0.5873	2.58*
Edu	-0.0515	0.0440	-1.17*
lnUnemploy	3.0533	06079	5.02*
_Cons	-16.6783	3.2905	-5.07

Note: * indicates significance at 95% confidence level.

This paper analyzes the regression results of the sample interval of 1981-1992. From the regression equation, the per capita GDP level is positively correlated with the criminal rate. The per capita GDP level increases by 1%, and the crime rate will increase by 0.7%. In the previous analysis, this paper has explained that with the promotion of the reform of the market economy and the growth of national income, the social structure has changed from the traditional state to the modern state, and the more complex social relations provide a better training condition for the development of the criminal behaviours. The social trend of thought brought by the rising of economy level has distorted people's pursuit of material mentality, which is indirectly reflected in the criminal rate.

There is a positive correlation between the income gap and the criminal rate. The proportion of income gap increases by 1 unit, and the criminal rate will increase by 1.5%. The widening of the income gap is an important factor that leads to the frequent occurrence of crimes. With the deepening of China's reform and opening up, the phenomenon of "Eating the Big Pot" has disappeared for a long time. Due to the differences of circumstances, background and ability, the income gap of the whole society has been gradually enlarged, which has replaced the past absolute fairness. Income inequality has become a more and more severe social problem. This phenomenon will distort the individual psychology, and the contradictions between different social ranks will become more acute, which will lead to the rise of the number of criminal cases.

The level of education in China has a certain inhibitory effect on criminal offences, and the two are negatively correlated. When education level increases by 1 unit, the crime rate will decrease by 0.05%. The negative correlation between education level and criminal rate shows that a country's active education is conducive to the suppression of crime. Good education can help us to set up a correct outlook on life and values, so that we have a clear concept of crime, so as to improve our own self-control and resist the bad temptation. With the promotion of

reform, China's society has entered a stage of rapid development. If the level of education at this time cannot match the process of social development, it is likely to lead to the frequent occurrence of blind crime and impulsive crime.

The rise in crime rate is also accompanied by an increase in unemployment rate. If the unemployment rate increases by 1%, the crime rate will increase by 3.05%. The rising unemployment rate means that more people lose their economic resources, which may lead to emotional disorder and psychological distortion, indirectly catalyzing the occurrence of criminal acts. With the reform of the economic system in China, the reform of the state-owned enterprises has forced a large number of workers to leave their jobs and lose their economic sources. The "tide of unemployment", in fact, has also brought the "tide of crime" together. We can draw the conclusion from the statistical table of the criminal cases of the Chinese Law Yearbook every year. As the unemployment rate rises, property crimes such as fraud, theft, and robbery have increased, which also confirms the results of the empirical analysis.

5.3 Analysis of Sub Sample Interval of 1993-2015

The specific results of the 1993 -2015 sample are shown in **Table 9**. In 1993-2015, the logarithmic per capita GDP level (lnGDP), income gap (IncomeGap), and the education level (Edu) coefficients are all significant. The specific equations are as follows:

$$\ln Crime_t = 1.0269 \ln GDP_t + 0.5739 IncomeGap_t - 0.0310 Edu_t + \varepsilon_{2t}$$

$$(4.3)$$

Table 9. The Impact of Social Conditions on China's Crime Rate in 1993-2015.

Variables	Parameters	Std Error	t
lnGDP	1.0269	0.2910	3.53*
IncomeGap	0.5739	0.1792	3.20*
Edu	-0.0310	0.0098	-3.15*
lnUnemploy	0.1883	0.5307	0.35
_Cons	-4.9229	1.6969	-2.90

Note: * indicates significance at 95% confidence level.

We analyzed the regression results of the sample

interval in 1992 -2015. From the regression equation, the increase of criminal rate is also accompanied by the increase of per capita GDP level. The per capita GDP level increases by 1 percentage points, and the crime rate will increase by 1%. By comparing with the results of the previous sample interval, we can see that the increase in per capita GDP level has increased the impact on criminal offences. This paper gives an explanation. In this sample interval, the reform measures that have been hesitant in the past are more drastic, and the market economic system is developing more rapidly, the contradictions between different systems are becoming more and more intense, and the development of the economy has more profound influence on people's behavior. Therefore, the influence of the GDP level on the criminal behavior has been enhanced.

The income gap between urban and rural areas is positively related to the criminal rate. Specifically, the income gap increases by 1 unit,, and the crime rate will increase by 0.6%. Compared with the previous sample interval, we can see that the impact of income gap between urban and rural areas on criminal rate has declined. This paper explains that in the stage of deepening the reform of the economic system, the income of rural residents and the disposable income of urban households have increased considerably. Although the income gap between urban and rural areas is still fluctuating around a certain value, the increase of absolute income inhibits the occurrence of criminal offences to a certain extent. Therefore, the influence of income gap between urban and rural areas on criminal rate will be relatively weakened.

Education level still has a restraining effect on the criminal rate. When education level increases by 1 unit, the crime rate will decrease by 0.03%. This conclusion is close to the previous sample interval, that is, the promotion of education level has a restraining effect on criminal offense. Moreover, at 1992-2015, the unemployment rate had little effect on the criminal rate. This paper explains that in the case of empirical analysis, the urban registered unemployed people are used to represent the state of unemployment, and the data itself has an error. In particular, in the second sample interval, the promotion and deepening of the reform of the state-owned enterprises has caused the "laid-off tide". The unemployment rate of the urban unemployed is only one-sided, which can not cover the unemployment of the whole people in China.

In addition, the regression results are compared and analyzed with the whole sample interval regression results. In the regression analysis of the whole sample interval, it is found that although the positive and negative of the parameters of each variable are consistent, there is a difference in the specific value: the overall sample parameters show that the level of the per capita GDP level has a higher degree of influence, the impact of the income gap between urban and rural areas is weakened, and the effect of educational level is also weakened, and the effect of unemployment rate are in the middle. Although the two empirical methods have verified the criminal saturation law, there are still many differences in the specific analysis of the extent of the impact. It can be seen that the Quandt-Andrews breakpoint analysis method actually matters.

6 Conclusions and Suggestions

In the regression analysis above, based on the purpose of exploring the role of social change factors in the criminal saturation law, this paper uses the cointegration relationship between variables to explore the long-term stability relationship. At the same time, the Quandt-Andrews segmentation point test is used to explore the unknown potential structural breakpoints, and the existence of the breakpoints is determined. After finding the major impact events at the breakpoint, the sample interval is divided into two subsections, and the criminal saturation rule is analyzed, and the similarities and differences between the subinterval, the subinterval and the overall interval are compared. Based on the test and analysis, the following four points are drawn:

First, the growth of per capita GDP level will promote the growth of criminal rate. According to the results of the regression, the per capita GDP

level increases by 1%, which correspondingly leads to the increase of the criminal crime rate by 0.7% (1981 -1992), and the increase of 1% (1993 -2015). The growth of GDP brings not only the increase of wealth, but also the transformation of society, intensifying the fluctuation of social classes and injecting more instability for people's life, which leads to the increase in the number of criminal cases. In addition, this empirical result is also consistent with the fact that the number of property crimes has risen rapidly in recent years.

Second, the income gap between urban and rural areas increases, then the crime rate will also increase. According to the results, the income gap between urban and rural areas rises by 1 unit, and the criminal crime rate will rise by 1.5% (1981-1992) and 0.6% (1993 -2015). The uneven distribution of total wealth will arouse contradictions among different stakeholders and lead to an increase in criminal rate. With the development of China's economic reform, the income gap between urban and rural areas has been rapidly widen, and the criminal rate has also increased significantly. At the end of the twentieth century, since the per capita net income of rural residents has been greatly improved, the increase of absolute value has reduced the probability of the occurrence of criminal offences to a certain extent.

Third, the improvement of education level can restrain the increase of criminal rate to a certain extent. According to the results, when the education level increases by 1 unit, the rate of criminal crime will decrease by 0.05% (1981 -1992) and 0.03% (1993, 1993). Education can improve the moral standards of residents, and can increase the psychological burden of crimes. In addition, the improvement of education level can enhance people's aversion to crime risk, that is, people will be more cautious before they commit criminal acts. From this empirical results, we can learn that the improvement of education level is an effective inhibitor for reducing the criminal rate.

Fourth, the unemployment rate rises, and the criminal rate will also rise. According to the regression results, the rate of criminal offense will rise by 3.05% (1981 -1992) and 0.9310 % (the whole sample interval) for each unit of unemployment rate. In a social environment where unemployment is relatively high, economic development usually suffers from a severe winter. Under the condition of unhealthy economy, the opportunity cost of crime is relatively low, which will bring crime incentives to some people. At the same time, the rise of the unemployment rate will enhance the social negative emotion, and some of the residents may lose the main economic source, the material demand can not be met, the social class contradiction intensifies, which all lead to criminal acts.

According to the previous empirical results, the following four suggestions are given in order to help managers to formulate more appropriate crime control policies and reduce the probability of crime: (1) in the case of high economic growth, the Economic Management Departments should pay attention to the problems behind and formulate a series of stability measures; (2) the Ministry of Finance needs to pay attention to social income equity, adjust social welfare policies, and try to make the results of economic development benefit social residents as much as possible; (3) the Ministry of Education should increase investment in basic education, and try to improve the level of social education, in order to inhibit the growth of criminal behavior; (4) the Ministry of Labor should speed up the reform and development of the labor market to reduce the level of social unemployment. The specific policy recommendations are as follows:

First, based on the positive correlation between the per capita GDP level and the criminal rate, the policymakers should not only focus on the benefits of the national economic development, but should pay more attention to the negative effects behind them. The rise of the criminal rate is an inevitable trend in the process of reform and development of a country. We can not suppress the economic development only to force the crime rate down, which will be insolvent. In the social stage of rapid economic development, the policy makers should have a series of measures to maintain social stability, thus better helping our society to survive in the stage of institu-

tional transformation. In the mature stage of social development, the rapid growth of criminal rate can also be alleviated. Therefore, speeding up the modernization process is also the direction for managers to make efforts.

Second, based on the positive correlation between the urban-rural income gap and the criminal rate, the policymakers should pay attention to the problem of social equity while pursuing economic development. Reducing the degree of unfair distribution can save the cost of related institutions to a certain extent. From the macroscopic view, the government should make use of social welfare means to provide living allowance for people, formulate appropriate tax system and commit to the absolute income gap of the high and low income groups. From the micro point of view, the government should accelerate the wage growth mechanism, and promote the improvement of the wage payment guarantee mechanism. The growth rate of per capita income and gross national income has been raised synchronously, so as to arouse the enthusiasm of national work.

Third, based on the negative correlation between the educational level and the criminal rate, the policymakers should recognize the inhibitory effect of social education on criminal offences. The educational level of a country is matched with the level of social development, and it can set up a correct moral legal concept, thus reducing the space for the breeding of criminal offences in the process of social development. In addition, the improvement of education level will increase the psychological cost and risk cost of residents' criminal offenses, thereby reducing the incidence of crime. This paper uses the annual rate of junior high school to measure the level of education in China. The managers should increase investment in basic education, establish the mechanism of teacher training, improve the degree of education popularization, and thus effectively improve the education level.

Fourth, based on the positive correlation between the unemployment rate and the criminal rate, the policymakers need to pay more attention to the unemployment problem. The unemployment rate in our country is maintained at a high level, which makes some residents unable to enjoy the results of economic development. It has buried potential dangers for the future development of our country, and it is also an inevitable contradiction. Managers should improve the social welfare security system, promote the reform and opening of the employment market, increase employment opportunities and promote the reemployment of the unemployed. In addition, managers should enhance the transparency of information disclosure, eliminate information asymmetry as far as possible, and perfect employment laws, so that everyone can get equal opportunities to become rich.

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