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Modernization and crime patterns in China

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Abstract

Existing research on modernization and crime patterns largely focused on the volume of crime and its variation over periods of modernization. The empirical studies predominantly used cross-national data based on Western advanced capitalist societies and developing countries. To further discover patterns of crime during the modernization process in non-Western settings, the present study took a different approach. It examined the rate of change for property and violent crimes in China; and it employed longitudinal methods to analyze the crime series. The findings extended the conclusions of modernization theories regarding general crime patterns during modernization. Theoretical implications of the findings are discussed.

Introduction

Crime patterns during the modernization process have been an important topic of research in the literature on modernization and crimes. Discovery of features of changing crime patterns provides important knowledge about modernization and crime, and provides important insights and empirical bases for different perspectives.

Different perspectives have described patterns somewhat differently, with references to different underlying social processes. Durkheim's classic work on crime and deviance during nineteenth century French industrialization has had long lasting influences. Among many contemporary scholars, Louise Shelley (1981) conducted the most systematic synthesis and provided the most elaborate modernization theory describing crime patterns during the modernization process. A sizable empirical literature examining crime patterns during modernization emerged, especially in the 1970s; the results were mixed (see Lafree, 1999; Lafree & Kick, 1986; Liu & Messner, 2001; Neapolitan, 1997; Neuman & Berger, 1988 for reviews of the literature).

Existing empirical studies generated important findings regarding the patterns of violent and property crimes during modernization; however, there were major limitations in their scope and methods. First, all existing studies focused on examining the levels of violent and property crimes during the period of modernization. No study examined the rate of change, which is an important aspect of crime patterns that can produce significant insights in understanding the impact of modernization on crime patterns. Second, with a few exceptions, most studies use cross-national data and designs. Besides the well-known data compatibility problems due to cross-national differences in definition, procedure, and criminal justice practices, cross-national data do not reflect the intrinsic longitudinal nature of the modernization process under political, economical, and historical contexts. Longitudinal analyses of crime patterns are essential in providing knowledge of patterns of violent and property crimes during modernization processes, but are rarely used. Third, empirical studies largely neglected socialist countries or previously

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socialist countries such as China, which has been experiencing a rapid modernization process since economic reform began in the later 1970s. Modernization theory has yet to be revised and new research conducted to better explain crime patterns in these previously socialist countries during their modernization processes.

The rapid modernization process in China, especially over the last two and one-half decades, brought about profound social consequences. China achieved very fast economic growth while engendering large increases in crime. From 1990 to 2002, China's real GDP increased an average of 9.05 percent annually. China's 2002 GDP was $1.23 trillion, making China's the sixth largest economy in the world (PRC State Statistical Bureau, 1991, 2003), while the total official crime rate reached 337.5 per 100,000 people in 2002 from a rate of 55.91 per 100,000 people in 1978 (Press of Law Yearbook of China, 1988, 2003). China's rapid modernization and its special political, economic, and cultural contexts make China one of the most important sites for the examination of the impact of modernization on crime patterns.

Although some theoretical explanations for crime and modernization in China have been proposed, (e.g., Liu, 2004, 2005; Messner, Liu, & Karstedt, in press), further in depth discovery of new features of crime patterns continues to be an important research task. Descriptive studies are an important basis for developing and testing theoretical models when more data becomes available in the future. The present study used time series methods to analyze the patterns of crimes during China's recent modernization to discover and describe some important features of the crime patterns over the past two and one-half decades of China's modernization process.

By focusing on the rates of change for violent and property crimes, the present study extended the scope of the research beyond the conventional focus on the level or volume of crime. The analyses and findings extended the modernization theory's predictions and conclusions for both general patterns of crimes and for patterns in socialist countries during modernization. These findings suggested important insights about the impact of the modernization process on patterns of violent and property crimes.

Modernization theory and its conclusions on crime patterns

The literature on crime patterns during the modernization process was based on theories of modernization. Different explanations derived somewhat different predictions and conclusions. The focus of the present study was to discover new features of crime patterns during China's modernization process. The meaning and value of the discovered features can only be better understood after reviewing the theories of modernization and summarizing their predictions and conclusions on the patterns of crimes.

Durkheim's classical examination of the impact of the nineteenth century French industrial revolution on deviance and crimes laid a foundation for contemporary modernization theory and research (Huggins, 1985). Durkheim argued that in the process of modernization, rapid social changes disrupt the integrative force of the collective conscience, and consensus on social values associated with traditional society breaks down, resulting in social disintegration—a normless condition he termed anomie. He maintained that anomie is the social source of deviance and crime (Durkheim, 1893/1933, 1897/1950). The pattern of crime predicted by Durkheim was that violent and property crime will generally increase.

Continuing from Durkheim, contemporary scholars proposed several theoretical theses predicting the patterns of crime and deviance. Elias (1978) proposed a thesis of the civilizing process. His theory argues that as a society modernizes, capitalist economies reduce interpersonal violence since violence and crime undermine the mutual trust upon which markets are based. Modern nation-states also become more monopolized and powerful, creating a relatively stable framework for social interaction (Neapolitan, 1997, p. 71). At the micro-level, individuals' personality structures become more civilized as customs and manners are refined. This thesis implies decreased violence and other crimes as the modernization process develops. Kick and Lafree (1985) proposed an "opportunity" theory. Their theory proposes that modernization and development enhances urbanization, which decreases interpersonal ties and contact among intimates and acquaintances, thereby reducing interpersonal violence, while development increases opportunities for theft by providing a vast supply of readily available commodities in a time where surveillance and social control is lower (Kick & Lafree, 1985; Lafree & Kick, 1986). Other relevant theses include recent work on globalization and crime. Messner and Rosenfeld (2000) discussed the impact of globalization on crime. They argued for a need to restrain the market and prevent the economy from dominating other institutional realms, with reference to their institutional-anomie theory. Findlay (1999) comprehensively reviewed criminogenic

conditions during globalization processes, especially in developing countries.

The most influential work in this field is Louise Shelley's modernization theory. In her renowned book, "*Crime and Modernization*" (Shelley, 1981), she proposed a comprehensive research program for research on crime patterns as a consequence of modernization. The major questions for the research include: "What is the effect of modernization on rates of crime both in the initial stages of the developmental process and after the transition to development has been made? Does the process of modernization affect the relative rates of the two fundamental forms of crime–crime against the person and crimes against property? Does the process of development affect the relationship between crimes against property and crimes of violence against the person?" (1981, p. xv). Her analyses divide countries into three groups: developing countries, developed countries, and socialist countries. She concludes that a general pattern exists for the impact of modernization on the levels of violent and property crime. At early stages of modernization, urban and industrial growth undermines the traditional way of life in urban areas. The concomitant social disorganization, anomie, and weak control promote increases in property crimes. Newly arriving migrants from the countryside bring with them the traditions of violence associated with rural life, which leads to increases in violent crime. At later stages of development, patterns of crime change. Property crimes continue to rise, becoming the most prominent type of criminal activity. In contrast, the growth in criminal violence subsides as rural migrants become adjusted to urban life. She predicts that future crime patterns will evolve further in a manner dictated by modernization theory.

While concluding there is a general crime pattern during modernization, Shelley (1981, p. 110) also synthesized many studies and generalized the crime patterns of socialist countries. She concluded that crime rates are lower than the average rates of capitalist societies at comparable levels of economic development. She attributed the lower levels of crime to strong institutional controls and citizen participation in the criminal justice system.

In the 1970s, criminologists began to recognize the importance of comparative studies of patterns of crime during modernization and development (Clinard & Abbott, 1973, p. 3). There has been a surge of interest in empirical studies with cross-national data. A large number of studies had been conducted (e.g., Avison & Loring, 1986; Braithewaite & Braithwaite, 1980; Conklin & Simpson, 1985; Groves, McCleary, & Newman, 1985; Hansmann & Quigley, 1982; Hartnagel, 1982; Krohn, 1976, 1978; Krohn & Wellford, 1977; Lafree & Kick, 1986; MacDonald, 1976; Messner, 1980, 1982, 1985; Neuman & Berger, 1988; Wellford, 1974). With a few exceptions, most empirical studies employed cross-national data (Bennett, 1991). Earliest studies found that modernization and development were associated with increases in property crime (mostly measured by theft), and decreases in violent crime (mostly measured by homicide). Others found opposing results (Bennett, 1991; Ortega, Corzine, Burnett, & Poyer, 1992). Comprehensive reviews of cross-national studies can be found in Lafree (1999), Messner (2003), Neapolitan (1997), and Neuman and Berger (1988). A recent empirical study was that of Liu and Messner (2001). Their study performed time series analyses on crime data from China. The results revealed that all crimes except rape showed statistically significant trends of increase from 1978 to 1998.

Theories of and empirical studies on crime patterns during modernization had achieved valuable results. They provided important knowledge about the levels of crimes during modernization for criminology and policymaking. Since obtaining comprehensive data from many countries to rigorously test the etiology of crime is difficult, studying crime patterns is the most important approach for gaining insights into the etiology of crime. Shelley (1981, p. 145) characterizes her theory as a more descriptive rather then predictive theory. Her theory of modernization synthesized studies to generalize patterns of violent and property crimes. Discovering and describing new features of crime patterns offers fuller pictures of crime patterns and can provide more insights into the etiology of crime during the process of modernization.

The present study moved beyond the existing research describing crime patterns in several aspects. First, all currently existing studies had focused on levels of violent and property crimes. Generally, studies had found property crimes always occur at a higher volume than violent crimes during modernization. Theories largely predict that both property crimes and violent crimes increase during the early stages of modernization, but say virtually nothing about the rates of the increases. Given that both property crimes and violent crimes increase in early stages of modernization, which type of crime increases faster? Some scholars had pointed out that the natures of property crimes and violent crimes differ; that they reflect different social processes. For example, Chambliss (1975) had proposed that property crimes were "instrumental" offenses, while

violent crimes were generally "expressive." Different rates of increase in crimes suggest different underlying crime production processes for property crimes and violent crimes. Theories and research have not rigorously examined which crimes increase faster than others if they all increase in the early stages of modernization. The relative rate of increase of property crimes to violent crime reflects an in-depth feature of crime patterns. The present study will focus on examining the rates of change of property crimes relative to violent crimes, to test whether or not property crimes increase faster than violent crimes. The study will discuss the theoretical implications of the findings and insights into understanding these patterns.

Second, most studies had employed cross-sectional designs and used cross-national data. The modernization process is intrinsically a temporally sequenced historical process; all theories of modernization describe the historical development of modernization from earlier stages to later stages. The cross-national design does not adequately reflect this conceptual essence of the theories and the temporal continuity of the process. Statistically, data reflecting sequentially occurring process are expected to be serially correlated, while analyses employing cross-national design assume data are independently and (often identically) distributed (i.i.d), ignoring the autocorrelation among sequentially occurring historical events and observations. The present study employed time series methods to analyze crime series data, overcoming the deficiency of cross-national design and also avoiding well-known problems of data incompatibility due to differences in definitions and criminal justice practices in different cross-national social and political contexts.

Third, the existing research had mostly used data from advanced Western capitalist societies and some developing countries. Neapolitan (1997) had criticized that most cross-national research had included small samples of nations that had been geographically imbalanced and heavily weighted toward the developed nations. He questioned the suitability of models developed for modern industrialized nations when applied to developing nations. Socialist countries or previously socialist countries were largely ignored in the empirical literature. Shelley's theoretical work (1981) summarized the scattered information about socialist countries available a quarter of a century ago to generalize patterns of violent and property crimes in socialist countries. The present study overcame this limitation of the literature and extended the research to China, which has been transiting from a socialist country to a "socialist market economy" during its modernization process over the past two and one-half decades, and revealing new features of crime patterns during the modernization process.

China is one of the largest countries in the world, representing about 20 percent of the world's population. No generalized knowledge of crime patterns and modernization should ignore China. In the late 1970s, China started a modernization program to reform its socialist economy. The reforms involved have lead to profound social changes and rapid modernization. These changes are so profound, complex, and far-reaching that the basic characteristics of China have been permanently altered (Anderson & Gil, 1998; Deng & Cordilia, 1999; Liu, Zhang, & Messner, 2001). Along with rapid economic growth and modernization, crime rates have increased greatly in China. Some Chinese scholars have proposed that modernization inevitably causes crime to increase (Xiao, 1988). Studies had generally agreed on an observed association between modernization, social transition, and rising crime in China.

China offers a great context for examining crime patterns during the modernization process. Shelley (1981, p. 145) had pointed out that her modernization theory has less explanatory capabilities for those societies that have already achieved a high degree of development. China is a developing country, and still in its early stages of modernization, thus constituting an ideal site for studying the topic. The present study extended the existing research, particularly Shelley's analyses on both general patterns of crime during modernization and on patterns of crime in socialist countries. China represents a new category of countries, those that have transited from a socialist economy to a market economy. This is a new development that did not exist when Shelley developed her modernization theory. The study will also discuss the implications of patterns of crime during China's modernization for the etiology of crimes.

In sum, the existing research on crime patterns during modernization had focused on levels or volumes of property and violent crimes, using predominantly cross-national data from mostly Western advanced capitalist societies and developing capitalist societies. The existing research had largely ignored socialist societies and societies transiting from socialist economies to market economies. The present study extended the existing research by focusing on testing whether or not property crimes increased at a faster rate than violent crimes in China's rapid modernization process, since both types of crimes had increased dramatically in China (Liu & Messner, 2001).

Data

The present study used annual time series data from 1978 to 2002 on major crimes in China. Crime rates per 100,000 people were calculated for these crimes. In China, the police departments that cover all areas of China are required to follow a standardized national procedure to recode crimes and compile and report the data to the provincial Public Security (police) Statistical Bureau, which then compiles the data covering the province and reports them to the (national) Ministry of Public Security, which publishes these data in the Law Yearbook of China (1987–2002) and other internal publications. Unlike in the U.S., where there are important variations across state laws, China has only one unified national criminal law and criminal procedural law. These laws are enacted by the National People's Congress and issued by the national government. Local police departments record and report the data according to the unified national law and policy directives (Feng, 2001). Crimes for which data are available include larceny, grand larceny, fraud, homicide, assault, rape, and robbery. Grand larcenies are defined as thefts where more than 3000 Yuan or property with equivalent value is stolen. Fraud is defined as illegally obtaining money or property through cheating and is an independent category from larceny. Other crimes are defined similarly in other countries.

Difficulties in obtaining crime data in China are well known. Official statistics are largely the only available data. The limitations of official statistics in international research have been amply documented (Biderman & Lynch, 1991; O'Brian, 1985; Shelley, 1981). A large literature has been developed to deal with problems with official statistics. Major problems include changes in crime definitions and different reporting rates by citizens and recording standards by police. These concerns also apply to Chinese statistics. Before credible analyses can be conducted, the problems with the data must be dealt with, and the analyses and interpretation of the results must take into account the direction of potential bias existing in the data. Studies have reported that Chinese official data have underreporting problems, especially for less serious property crimes (Dai, 1995; Dutton & Lee, 1993; He & Marshall, 1997; Yu & Zhang, 1999; Zhu, Wang, Lu, Guo, & Zhou, 1995), as well as a problem of consistent under-recording by the police.[1] This pattern is similar to that in the United States (Maxfield, Lewis, & Szoc, 1980; Yu & Zhang, 1999). The extent of underreporting of crimes has been largely consistent over time (Dai, 1994; Yu, 1993; Yu & Zhang, 1999). The present study took a proper analytical approach to overcome or reduce the impact of these problems on the interpretation of the results.

One problem with official statistics is changes in definitions for certain crimes. This is the case for larceny by Chinese definitions. Considering inflation and growth in income, the Chinese government changed the definition of larceny in 1992. This change led to a lower larceny rate after 1992. Following the method used by Cantor and Land (1985), an adjustment was made to the larceny rates after 1992 to make the pre- and post- 1992 data compatible. The following method was used to calculate a multiplier for larceny rates after 1992:

$$m = \frac{((1990\ \text{rate} + 1991\ \text{rate}) / 2)}{((1992\ \text{rate} + 1993\ \text{rate}) / 2)}$$

The multiplier, which is 1.7026, was used to adjust the larceny rates after 1992 for lower recorded rates due to the change in definition. Although this adjustment seemed reasonable, caution must be exercised in the interpretation of the results for larceny.

The other major problem was underreporting and under-recording. That is, a certain proportion of crimes were regularly not reported or not recorded by the police. To avoid inadequate conclusions, it was important to understand the impact of underreporting and under-recording on the results of the analyses. The focus of the present analyses was to test whether or not property crimes increased faster than violent crimes, given the fact that both types of crimes had been increasing (Liu & Messner, 2001). The approach used was to examine whether or not the differences in the rate of increase between property crimes (larceny, grand larceny, and fraud) and violent crimes (homicide, assault, rape, and robbery) became larger and larger over time.

The effect of underreporting and under-recording was for the data to under-reflect the rate of increase of crimes. This effect can be illustrated by the following hypothetical example. Suppose that due to underreporting and under-recording, 50 percent of crimes are not included in the data and this regular underreporting and under-recording rate remains constant over a period of time. Suppose the "real" crime rate begins at 100 per 100,000 people and undergoes a 20 percent increase to 120 over a period of time, the actual rate of change/increase is 20 per 100,000 people (20 percent increase). Since only 50 percent of actual crimes are recorded, the recorded crime rate begins at 50/100,000 people (50 percent of 100/100,000 people), and increases to 60/

Table 1
Descriptive statistics of crime rate series from 1978–2002

	Larceny	Grand larceny	Fraud	Homicide	Assault	Rape	Robbery
Mean	138.23	17.89	4.64	1.62	4.68	3.46	8.94
Median	145.72	16.21	4.01	1.85	4.96	3.45	7.20
Maximum	390.14	52.45	14.95	2.26	11.05	5.67	27.64
Minimum	37.88	0.58	0.98	0.85	1.39	1.67	0.58
Std. Dev.	101.06	16.95	4.06	0.57	2.95	0.77	8.42
Skewness	1.19	0.52	1.42	−0.24	0.76	0.44	0.92
Kurtosis	3.80	2.06	4.23	1.26	2.68	4.68	2.93
N	25	22	25	25	23	25	25

100,000 people (50 percent of 120/100,000 people)—a recorded rate of change of only 10 per 100,000 people in data. The 20 percent rise in crime was incorrectly recorded as only a 10 percent rise in crime. This illustrates that the effect of underreporting and underrecording is that a rapidly increasing crime rate would be seen to be increasing at a slower speed than in actuality. Let's call this effect the "dampening" effect. The higher rate of the underreporting and underrecording is, the larger the "dampening" effect on the observed rate of crime increases will be.

For these analyses, the important feature of the "dampening" effects was that it was higher for property crimes, (larceny, grand larceny, fraud) than for violent crimes, since it was well known that property crimes had a lower reporting rate than violent crimes (Maxfield et al., 1980). Larceny and fraud tend to be more underreported, one reason is that citizens may feel that it is not worth the trouble to report the crime, since the consequences tend to be less severe than in cases of violent crimes, thus reducing the motivation to report. Courts are often overwhelmed, property crimes take lower priority in court scheduling than violent crimes, thus decreasing the willingness of citizens to resort to the courts for solutions. There are similar situations in other countries, including the U.S.

Taking the higher dampening effects of property crimes into consideration when interpreting the data, the present analyses took the approach of comparing the rate of increase for property crimes (larceny, grand larceny, and fraud) relative to violent crimes. The larger dampening effect on trends of property crimes would lead to smaller observed differences between the rate of increase of property crimes and violent crimes, reducing the likelihood of observing a difference in the rate of change when the rate of increase of larceny and fraud is actually greater than for violent crimes. Given these effects, if significant differences in the rate of increase between property crimes and violent crimes are still

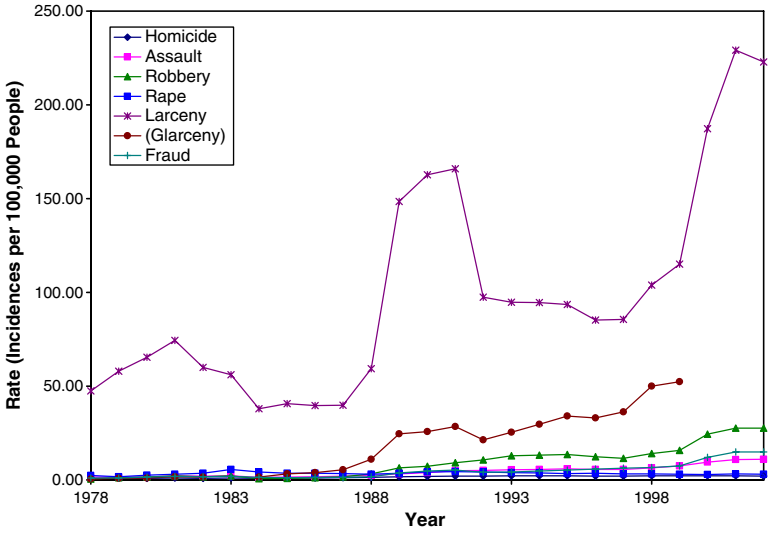

Chart 1. Trend of all crimes.

found, then there is confidence in the finding that property crimes increase faster than violent crimes should increase.

Another issue is that some violent crimes are committed for the purpose of obtaining property. The most important example is robbery, which is very often committed for the purpose of obtaining property. In this sense, robbery in China is a property crime. Due to this reason, robbery was excluded when comparing property crimes with violent crimes.

Table 1 presents the descriptive statistics of larceny, grand larceny, fraud, robbery, homicide, assault, and rape. The statistics show that larceny and grand larceny are at much higher levels and have a larger range of variation than violent crimes, indicating they have higher volumes of occurrences and have changed more in levels of occurrences during the time scope than violent crimes have. Chart 1 shows the trends for all crimes, the details of the violent crimes are obscured due to the significantly lower levels of violent crimes compared to larceny and grand larceny. Chart 2 includes trends of change in all violent crimes only to show the detailed change in levels of violent crimes.

Chart 1 and Chart 2 visually show that crimes had generally increased in China during the period of rapid modernization. The conclusion was consistent with other studies (Liu & Messner, 2001). Given that levels of both property and violent crime were generally increasing, the present study further examined whether or not the rate of increase of property crimes was faster than that of violent crimes.

Statistical methods and results

The objective of the statistical analyses was to compare the trends of the property crime series and the violent crime series to determine whether or not property crimes increased at a faster rate than violent crimes. To examine whether or not one time series increased faster than another time series, a rigorous analysis requires modeling the trends of the two series to see if one series has a statistically significantly different rate of increase relative to the trend of the other series. In comparing the trends of two series, there are three possible situations: first, that property crime increases faster than violent crime, so the two series show a divergent pattern over time. Second, that property crime increases slower than violent crime, so the two series show a convergent pattern over time. The final possibility is where property crime is neither divergent from, nor convergent to a violent crime; rather, they are moving together at the same rate—this is called an equilibrium relation. In time series terminology, the two series are called "co-integrated."

When two series are in equilibrium, they somehow adjust to each other to remain a relatively constant distance to each other. When two series are co-integrated, i.e., in equilibrium, they will maintain a linear relationship with each other over time and will not "wander away" from the linear relationship. Let's briefly explain some central concepts involved in time series analyses to introduce the method used to test the

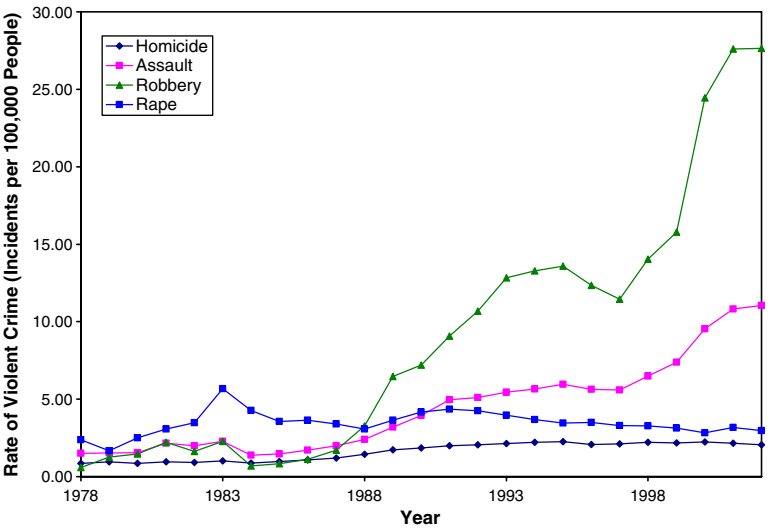

Chart 2. Trend of violent crimes.

differences in trends between property and violent crimes.

When series y_t is generated from the following process:

$$y_t = y_{t-1} + v_t$$

The value of y at time t is its value at the previous time $t-1$ plus a stochastic component, or random error v_t. This kind of series is called a "random walk." Since the coefficient of the right-hand term y_{t-1} is 1, the series has a "unit root." The time series process y_t is a unit root process. Different from usual stationary processes, a unit root process does not have a constant mean and its variance increases infinitely over time; it is a nonstationary process. When the dependent variable in a regression analysis is nonstationary, the usual assumptions for regression analysis are violated. When a unit root process has an intercept α, it systematically "drifts" upward or downward, depending upon the sign of the intercept. That is, a systematic trend is generated by the intercept or drift component α. This process is called "random walk with a drift." This process is written as:

$$y_t = \alpha + y_{t-1} + v_t$$

The most popular test for unit root processes is the Dickey-Fuller test in a form similar to the following:

$$y_t = \alpha + \rho y_{t-1} + \delta_1(y_{t-1} - y_{t-2}) + \delta_2(y_{t-2} + y_{t-3}) + u_t,$$

The test checks whether $\rho = 1$. The lagged difference terms in the equation are used to eliminate autocorrelation. The test with these lagged difference terms is called the augmented Dickey-Fuller test. Since ρ is hypothesized to be 1, the usual critical values for the t-test are no longer valid. Critical values based on MacKinnon (1991) were used in the statistical test.

Taking a first difference of a random walk, or random walk with a drift, the unit root will be eliminated and the series becomes stationary. This kind of series is called "integrated order 1," denoted as *I(1)*. That is:

$$y_t - y_{t-1} = \alpha + u_t,$$

The order of integration is 1, which is the number of differences needed to result in a stationary series. Since the differenced variable on the left in this equation is stationary, the intercept α can be estimated. First, the differenced terms on the right are added to eliminate autocorrelation:

$$y_t - y_{t-1} = \alpha + \delta_1(y_{t-1} - y_{t-2}) + \delta_2(y_{t-2} - y_{t-3}) + u_t,$$

The concept of cointegration is derived from the fact that although each of the y_t and x_t series is nonstationary, their ratio may be stationary. When that is the case, the two series may be in equilibrium, i.e., they are cointegrated. For example, suppose nonstationary processes series y_t and series x_t have a linear relationship:

$$y_t = (\gamma x_t) + u_t$$

Whether this is an equilibrium process can be determined by taking the ratio of y_t to x_t, the expected value of the ratio will be γ at any time t. That is, the ratio of y_t to x_t is a series that does not trend, they are cointegrated. To make mathematical manipulation easier, the log of the ratio is taken. The expected value of $z_t = \log(y_t) - \log(x_t)$ is $\log(\gamma)$, a constant for each t (O'Brian, 1999); showing that the series resulting from the difference of the logs is a stationary series; that is, $\log(y_t)$ and $\log(x_t)$ are cointegrated.

Based on this logic, the unit root test is used to test if any two series y_t and x_t are cointegrated. That is, if the series $z_t = \log(y_t) - \log(x_t)$ has a unit root, then y_t and x_t are not cointegrated. If the series z_t has a unit root and is thus nonstationary, it needs to be further differenced to eliminate the nonstationarity. After the first difference, α can be estimated to see if the series z_t has a systematic trend (Hamilton, 1994, p. 562; O'Brian, 1999). That is, α is estimated in the equation of the form:

$$z_t - z_{t-1} = \alpha + \delta_1(z_{t-1} - z_{t-2}) + \delta_2(z_{t-2} + z_{t-3}) + u_t,$$

If α is positive, z_t systematically trends upward, which indicates that the differences between y_t and x_t systematically increase, so they diverge from each other. That is, the series y_t increases faster than x_t. If α is negative, the series y_t and x_t converge, the differences between them get smaller over time. If α is not significantly different from zero, the situation becomes inconclusive. The additional difference terms in the equation are used to eliminate autocorrelations in the error term.

Table 2 reports the unit root test of the difference of the two log series.

Column 1 lists the difference series, showing the two series being compared. Column 2 reports estimates of ρ in the test equation of the augmented Dickey-Fuller test. Column 3 reports the necessary number of lagged difference terms added to the test equation to eliminate autocorrelation in error terms. Without eliminating the autocorrelation, the test of ρ would be inaccurate. Since there are only twenty-five observations, excepting grand

larceny for which there are only twenty-two observations, and assault, for which there are only twenty-three observations, the power of the test is low, and the estimates of ρ will only help to give a sense of the size of the coefficient. For example, Table 2 row five reports that the series constructed by deducting the log of homicide from the log of the grand larceny series appears to have a unit root, since the augmented Dickey-Fuller test failed even at the 0.10 level to reject the null hypothesis that $\rho = 1$. The estimated coefficient is 0.94 with one lagged difference term added to the equation to eliminate autocorrelation to an acceptable level, as indicated by the Durbin-Watson statistic. Generally, the results indicate that the tests failed to reject the hypothesis that $\rho = 1$; there is a unit root in these series; and the two series in each of the tests are not cointegrated. They may converge to or diverge from each other. These results call for further examination of these series to determine whether or not larceny, grand larceny, and fraud diverge from the less or non-economically motivated crime series.

Since failure to reject the unit root hypotheses indicates that none of the paired series are cointegrated, the series are differenced and α is estimated. Table 3 reports the estimate of ρ for each difference of the log equation.

Column 2 reports the results of the estimates. Column 3 reports the number of lags used to eliminate the autocorrelations in the error term. For example, row 5 reports that the estimated α is 0.17, with no need to add additional terms to the equation for eliminating autocorrelation. The result also shows the α is statistically significant at the 0.05 level, indicating the α is statistically significantly different from zero. Thus, grand larceny diverges from homicide series over time; that is, grand larceny increases faster than homicide over the twenty-two year period of time from 1978 to 2002 in China. As mentioned before, grand larceny is defined as theft where more than 3000 yuan or equivalent property is stolen. Grand larceny is subjected to fewer fluctuations in recording, and it therefore provides a good indicator of changes for property crimes in general. The result comparing fraud with robbery is a negative α, suggesting that robbery increases faster than fraud; this result is not surprising: most robberies are committed for the purpose of obtaining property. Except for the case of fraud versus robbery, all αs are positive, indicating property crimes increase faster than violent crimes during the period of modernization.

Table 2
Dickey-Fuller test for cointegration of property versus violent crimes[a]

	Estimated value of ρ	Number of lagged differences
Log (larceny)-log (homicide)	0.82[b]	1
Log (larceny)-log (assault)	0.45[c]	1
Log (larceny)-log (rape)	0.95[b]	2
Log (larceny)-log (robbery)	0.85[b]	1
Log (grand larceny)-log (homicide)	0.94[b]	1
Log (grand larceny)-log (assault)	0.88[b]	1
Log (grand larceny)-log (rape)	0.95[b]	2
Log (grand larceny)-log (robbery)	0.84[b]	0
Log (fraud)-log (homicide)	0.95[b]	2
log(fraud)-log (assault)	0.51[c]	1
log(fraud)-log (rape)	0.99[b]	1
log(fraud)-log (robbery)	0.79[b]	2

[a] The augmented Dickey-Fuller test was based on the test equation: $z_t = \alpha + \rho z_{t-1} + \delta_1(z_{t-1} - z_{t-2}) + \delta_2(z_{t-2} + z_{t-3}) + u_t$, where equations contain zero, one, or two lagged difference terms, depending upon the number needed to eliminate autocorrelation.
[b] Fail to reject the null hypothesis that $\rho = 1$ at the 0.10 level.
[c] Reject the null hypothesis that $\rho = 1$ at the 0.05 level.

Table 3
Estimating the intercept of differences of log property versus violent crimes[a]

	Estimated value of α	Number of lagged differences
Log (larceny)-log (homicide)	0.05	0
Log (larceny)-log (assault)	1.59**	1
Log (larceny)-log (rape)	0.08	0
Log (larceny)-log (robbery)	0.55*	1
Log (grand larceny)-log (homicide)	0.17**	0
Log (grand larceny)-log (assault)	0.12**	0
Log (grand larceny)-log (rape)	0.20**	0
Log (grand larceny)-log (robbery)	0.06	0
Log (fraud)-log (homicide)	0.07*	1
Log (fraud)-log (assault)	0.01	0
Log (fraud)-log (rape)	0.10**	1
Log (fraud)-log (robbery)	−0.16**	1

[a] The equations were based on the following specifications: $z_t - z_{t-1} = \alpha + \delta_1(z_{t-1} - z_{t-2}) + u_t$, where equations contain zero, one, or two lagged difference terms, depending upon the number needed to eliminate autocorrelation.
* $p < 0.10$.
** $p < 0.05$.

Conclusions and discussions

The statistical results comparing trends of property crimes with violent crimes showed a general pattern that property crimes increased at a faster rate than violent crimes during China's modernization process over the last two and one-half decades. The results extended modernization theory and research on the general patterns of crime during modernization. The findings also expanded the knowledge of crime patterns in

socialist countries in their transition to a market economy—a category of societies that previously did not exist when Shelley developed her modernization theory. Further, possibly important social processes underlying these crime patterns found in the statistical analyses are discussed here. The process of expanding economic motivation brought on by China's institutional change during modernization may be a central social process that generated these crime patterns.

China's rapid modernization process in recent decades was characterized by its profound social transition from a socialist command economy to a market economy, a fundamental institutional change. China was a socialist country with a planned command economy, where the social structure was remarkably homogeneous. Egalitarianism is considered a central feature of socialist society. Government ideology and policy virtually prohibit individual economic ambition. Pursuing personal economic interests is criticized as "bourgeoisie" or "capitalist" thought (Deng & Cordilia, 1999). Under this traditional socialist institutional arrangement, individuals' economic motivation is systematically suppressed.

The transition towards a market economy is a process of fundamental institutional change, which not only eliminated the previous institutionalized suppression of economic motivation for individuals, but also strongly encourages and stimulates it. In contrast with socialist institutional arrangements, pursuit of self-interest and realization of selfish economic motives of individuals and business firms are seen as fundamentally important for the operation and growth of the market economy. Market institutions embody the values orientation that promotes personal economic ambition, achievement orientation, entrepreneurial spirit, and individualism; it rewards and encourages entrepreneurship, which is an essential factor of production, fundamentally important in facilitating the growth of the economy (Hagen, 1962; Inkeles & Smith, 1974; Lerner, 1958, 1968; Levy, 1966; McClelland, 1961).

The introduction of market institutions in China created vast opportunities for individuals to pursue economic success. From the countryside to the cities, individual and family based private businesses (*getihu)* boomed. The get rich examples of early starters further stimulated larger numbers of others. The Communist Party's new ideology encourages the entrepreneurial spirit and condones selfish economic motives for profit. These are considered compatible with a market economy and essential in the development of a market economy. The official media has criticized the traditional orientation as unfit for the modern economy. The institutional change in official ideology contributes critically in stimulating economic motivation. Getting rich by any means has become a national spirit.

Under these social processes, crimes have increased dramatically. It is reasonable to speculate that there is corroboration between the patterns of expanding economic motivation and the patterns of a faster rate of increase in property crimes compared to that of violent crimes. Greatly expanded economic motivation has been a driving force for many social behaviors, including crime. Compared with violent crimes, property crimes are instruments for profit. The findings that property crimes increase at a faster rate than violent crimes mirror the pattern of exploratory expansion in profit motivation. The findings suggest that expanding economic motivation is a generating process for crime patterns. This explanation differs from traditional modernization theory, which mostly cites the breakdown of the traditional way of life, rural-urban migration, social disorganization, anomie, and weakening social control during modernization for explanations of crime patterns. The differential rates of increase in crime seem to corroborate more with the economic motivation explanation.

Finally, caution must be taken in interpreting the results of analyses. The data were limited with only twenty-five observations. Although other data are rarely available in China, official statistics should not be fully relied on in reaching conclusions. More research is needed to increase confidence in these findings. The suggested association between expanding economic motivations is only a clue for further study; other explanations such as Kick and LaFree's opportunity theory could also be compatible. Satisfactory tests of a theory at the macro level are often difficult since rarely are ideal data directly measuring all important theoretical variables available, only a reasonable tentative conclusion can be arrived at.

Note

1. One reviewer had suggested that underreporting might be due to "political influence."

References

Anderson, A. F., & Gil, V. E. (1998). China's modernization and the decline of communitarianism: The control of sex crimes and implications for the fate of informal social control. *Journal of Contemporary Criminal Justice*, *14*, 248−261.

Avison, W. R., & Loring, P. L. (1986). Population diversity and cross-national homicide: The effects of inequality and heterogeneity. *Criminology*, *24*, 733−749.

Bennett, R. R. (1991). Development and crime. *Sociological Quarterly*, *32*, 343−363.

Biderman, A. D., & Lynch, J. P. (1991). *Understanding crime incidence statistics: Why the UCR diverges from the NCS.* New York: Springer Verlag.

Braithewaite, J., & Braithwaite, V. (1980). The effects of income inequality and social democracy on homicide: A cross-national comparison. *British Journal of Criminology*, *20*, 45−53.

Cantor, D., & Land, K. C. (1985). Unemployment and crime rates in the post-World War II United States: A theoretical and empirical analysis. *American Sociological Review*, *50*, 317−322.

Chambliss, W. J. (1975). Types of deviance and the effectiveness of legal sanctions. In W. J. Chambliss (Ed.), *Criminal law in action* (pp. 398−407). Santa Barbara, CA: Hamilton Publishing Company.

Clinard, M. B., & Abbott, D. J. (1973). *Crime in developing countries.* New York: Wiley.

Conklin, G. H., & Simpson, M. E. (1985). A demographic approach to the cross-national study of homicide. *Comparative Social Research*, *8*, 171−186.

Dai, Y. (1994). *On the policies of public security* [lun gongan zhence]. Chongqing, China: Chongqing Press.

Dai, Y. (1995). Expanding economy and growing crime. *Criminal Justice International*, *11*, 9−16.

Deng, X., & Cordilia, A. (1999). To get rich is glorious: Rising expectations, declining control, and escalating crime in contemporary China. *International Journal of Offender Therapy and Comparative Criminology*, *423*, 211−229.

Durkheim, É. (1933). *The division of labor in society.* New York: Free Press. (Original work published 1893)

Durkheim, É. (1950). *Suicide: A study in sociology.* New York: Free Press. (Original work published 1897)

Dutton, M., & Lee, T. (1993). Missing the target? Policing strategies in the period of economic reform. *Crime and Delinquency*, *39*, 316−336.

Elias, N. (1978). *The civilizing process: The history of manners.* New York: Free Press.

Feng, S. (2001). Crime and crime control in a changing China. In J. Liu, L. Zhang, & S. F. Messner (Eds.), *Crime and social control in a changing China* (pp. 123−132). Westport, CT: Greenwood Press.

Findlay, M. (1999). *The globalization of crime: Understanding transitional relationships in context.* Cambridge, UK: Cambridge University Press.

Groves, W. B., McCleary, R., & Newman, G. R. (1985). Religion, modernization and world crime. *Comparative Social Research*, *8*, 59−78.

Hagen, E. E. (1962). *On the theory of social change: How economic growth begins.* Homewood, IL: Dorsey.

Hamilton, J. D. (1994). *Time series analysis.* Princeton, NJ: Princeton University Press.

Hansmann, H. B., & Quigley, J. M. (1982). Population heterogeneity and the sociogenesis of homicide. *Social Forces*, *61*, 206−224.

Hartnagel, T. F. (1982). Modernization, female social roles and female crime: A crossnational investigation. *Sociological Quarterly*, *23*, 477−490.

He, N., & Marshall, I. H. (1997). Social production of crime data: A critical examination of Chinese crime statistics. *International Criminal Justice Review*, *7*, 46−63.

Huggins, M. K. (1985). Approaches to crime and societal development. *Comparative Social Research*, *8*, 17−36.

Inkeles, A., & Smith, D. H. (1974). *Becoming modern: Individual change in six developing societies.* Cambridge, MA: Harvard University Press.

Kick, E. L., & Lafree, G. D. (1985). Development and the social context of murder and theft. *Comparative Social Research*, *8*, 37−58.

Krohn, M. (1976). Inequality, unemployment and crime: A cross-national analysis. *Sociological Quarterly*, *17*, 303−313.

Krohn, M. (1978). A Durkheimian analysis of international crime rates. *Social Forces*, *57*, 654−670.

Krohn, M., & Wellford, C. F. (1977). A static and dynamic analysis of crime and the primary dimensions of nations. *International Journal of Criminology and Penology*, *5*, 1−16.

Lafree, G. D. (1999). A summary and review of cross-national comparative studies of homicide. In M. D. Smith & M. A. Zahn (Eds.), *Homicide: A sourcebook of social research* (pp. 125−145). Thousand Oaks, CA: Sage.

Lafree, G. D., & Kick, E. L. (1986). Cross-national effects of development, distributional and demographic variables on crime: A review and analysis. *International Annals of Criminology*, *24*, 213−236.

Lerner, D. (1958). *The passing of traditional society: Modernizing the Middle East.* New York: Free Press.

Lerner, D. (1968). Modernization—social aspects. In D. L. Sills (Ed.), *International encyclopedia of the social sciences* (pp. 386−394). New York: Macmillan.

Levy, M. J. (1966). *Modernization and the structure of societies* (2 vols.). Princeton, NJ: Princeton University Press.

Liu, J. (2004). Patterns of economically motivated crimes in China. In R. G. Broadhurst (Ed.), *Crime and its control in the People's Republic of China: Symposia proceedings of the University of Hong Kong Centre for Criminology* (pp. 107−125). Hong Kong: University of Hong Kong Centre for Criminology.

Liu, J. (2005). Crime patterns during the market transition in China. *British Journal of Criminology*, *45*, 613−633.

Liu, J., & Messner, S. F. (2001). Modernization and crime trends in China's reform era. In J. Liu, L. Zhang, & S. F. Messner (Eds.), *Crime and social control in a changing China* (pp. 3−22). Westport, CT: Greenwood Press.

Liu, J., Zhang, L., & Messner, S. F. (2001). *Crime and social control in a changing China.* Westport, CT: Greenwood.

MacDonald, L. (1976). *The sociology of law and order.* Boulder, CO: Westview.

MacKinnon, J. G. (1991). Critical values for cointegration tests. In R. F. Engle & C. W. J. Granger (Eds.), *Long-run economic relationships: Readings in cointegration* (pp. 267−276). Oxford, UK: Oxford University Press.

Maxfield, M. G., Lewis, D. A., & Szoc, R. (1980). Producing official crimes: Verified crime reports as measures of police output. *Social Science Quarterly*, *62*, 221−236.

McClelland, D. C. (1961). *The achieving society.* Princeton, NJ: Van Nostrand.

Messner, S. F. (1980). Income inequality and murder rates: Some cross-national findings. *Comparative Social Research*, *3*, 185−198.

Messner, S. F. (1982). Societal development, social equality and homicide: A cross-national test of the Durkheimian model. *Social Forces*, *61*, 225−240.

Messner, S. F. (1985). Sex differences in arrest rates for homicide: An application of the general theory of structural strain. *Comparative Social Research*, *8*, 187−201.

Messner, S. F. (2003). Understanding cross-national variation in criminal violence. In W. Heitmeyer & J. Hagan (Eds.), *Handbook of research on violence* (pp. 701−716). Dordrecht, The Netherlands: Kluwer Academic Publishers.

Messner, S. F., Liu, J., & Karstedt, S. (in press). Economic reform and crime in contemporary China: Paradoxes of a planned transition. In

J. Logan (Ed.), *China in transition*. Malden, MA: Blackwell Publishers.

Messner, S. F., & Rosenfeld, R. (2000). Market dominance, crime, and globalization. In S. Karstedt & K. D. Bussmann (Eds.), *Social dynamics of crime and control: New theories for a world in transition* (pp. 13−26). Oxford, UK: Hart.

Neapolitan, J. (1997). *Cross-national crime: A research review and sourcebook.* Westport, CT: Greenwood Press.

Neuman, W. L., & Berger, R. J. (1988). Competing perspectives on cross-national crime: An evaluation of theory and evidence. *Sociological Quarterly*, *29*, 281−313.

O'Brian, R. M. (1985). *Crime and victimization.* Thousand Oaks, CA: Sage.

O'Brian, R. M. (1999). Measuring the convergence/divergence of "serious crime" arrest rates for males and females. *Journal of Quantitative Criminology*, *15*, 97−114.

Ortega, S. T., Corzine, J., Burnett, C., & Poyer, T. (1992). Modernization, age structure and regional context: A cross-national study of crime. *Sociological Spectrum*, *12*, 257−277.

PRC State Statistical Bureau. (1991). *Statistical yearbook of China, 1990.* Beijing: China Statistical Publishing House.

PRC State Statistical Bureau. (2003). *Statistical yearbook of China, 2002.* Beijing: China Statistical Publishing House.

Press of Law Yearbook of China. (1988). *Law yearbook of China, 1987.* Beijing: Author.

Press of Law Yearbook of China. (2003). *Law yearbook of China, 2002.* Beijing: Author.

Shelley, L. (1981). *Modernization, age structure and regional context: A cross-national study of crime.* Carbondale: Southern Illinois University Press.

Wellford, C. F. (1974). Crime and the dimensions of nations. *Journal of Criminology and Penology*, *2*, 1−10.

Xiao, J. (1988). Economic development and crime problem (in Chinese). *Juvenile Delinquency Studies*, *4*, 15.

Yu, L. (1993). *The national study of the crime problem in modern China* (comprehensive vol.) [zhongguo xianjieduan fanzui wenti yanjiou] (zong juan). Beijing: University Press of the Chinese University of People's Public Security.

Yu, O., & Zhang, L. (1999). The under-recording of crime by police in China: A case study. *Policing: An International Journal of Police Strategies and Management*, *22*, 252−263.

Zhu, H., Wang, L., Lu, J., Guo, J., & Zhou, L. (1995). Result of the crime (victim) survey in Beijing, China. In U. Zvekic, L. Wang, & R. Scherpenzeel (Eds.), *Developmental and policy use of criminal justice information: Proceedings of the Beijing seminar, 12–16 September 1994* (pp. 185−217). Rome: United Nations Interregional Crime and Justice Institute.