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THE EFFECTS OF ECONOMIC CONDITIONS ON CRIMES*

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Using quarterly data for the period January 1982 to April 2004, this paper examines the causal effects of economic conditions on crimes in Korea, employing the standard set of time-series techniques recently developed. Empirical evidence suggests that income inequality and unemployment positively Granger-cause theft, while income level does not. Income level has a negative effect and unemployment has a positive effect on assault, while income inequality does not have a significant effect. This evidence may imply different effects of relative and absolute deprivation on different types of crimes, and support the institutional role of steady employment in controlling criminal behavior often emphasized in sociology and criminology.

Key Words: *Relative and absolute deprivation, Unemployment, Crime rates, Cointegration test, Granger-causality test, Impulse-response analysis*

INTRODUCTION

Economists and sociologists have argued that the poor are more likely to commit crimes in order to supplement their legitimate incomes. Becker (1968) presents a model of criminal behavior in which crime is considered as a rational choice of a potential criminal who compares costs and benefits of the crime. He argues that "*some individuals become criminals because of the financial and other rewards from crime compared to legal work*." Merton presents a theory of criminal behavior, called strain theory, extending Durkheim's concept of anomie. Merton (1968) argues that *"the moral mandate to achieve success exerts pressure to succeed by fair means, if possible, and by foul means, if necessary."* The idea of linking poverty to crime can go back further to Adam Smith and Karl Marx. In The Wealth of Nations, Adam Smith argues that *"the affluence of the rich excites the indignation of the poor, who are often both driven by want, and prompted by envy, to invade his possessions."* Karl Marx also once said that *"ahouse can be large or small; as long as the surrounding houses are equally small it satisfies all social demands. But if a palace rises beside the little house, the little house shrinks into a hut."* While rational choice theory and strain theory focus on economic deprivation that bring about criminal

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behavior, social control theory puts more emphasis on social contexts of employment, family, and neighborhood that can control and prevent it. The routines of steady employment, for example, are expected to reduce the opportunities for criminal behavior.

Empirical studies investigating the link between economic conditions and crime have been carried out by using cross-sectional data and time-series data. Evidence from the cross-sectional data such as surveydata, official criminal justice data, or cross-country data tend to strongly support the proposed hypotheses on the link. Levitt (1999) finds that property crime victimization has become increasingly concentrated on the poor from the National Crime Victimization Survey. Braithwaite (1979) finds that crime rates and inequality are positively correlated within countries and between countries, and this correlation reflects causation from inequality to crime rates, even after controlling for other crime determinants. Using the National Longitudinal Survey of Youth, Crutchfield and Pitchford (1997) find that young adults employed in secondary sector jobs are more likely to engage in crime than those in more stable jobs. Uggen (2000) finds that older criminals provided with employment opportunities are less likely to report crime and arrest. On the other hand, evidence from empirical studies of time-series data do not tend to support the proposed link between economic conditions and crime. Allen (1996) and Doyle et al. (1999) find no significant effect of income inequality on crime rates. According to Chiricos (1987), most empirical studies find a positive relationship between unemployment and crime, but this effect is not always significant, and some even find a negative association.

Time-series data of economic conditions and crime rates are non-stationary in most cases, as will be discussed in the next section, and therefore special attention is required in statistical inferences. Traditional analysis of the time-series data without accounting for the non-stationarity would produce spurious results. Since non-stationarity is not properly accounted for in older studies, conclusions drawn from these studies should be revisited. However the techniques that can properly and efficiently analyze non-stationary time-series variables have been developed only recently and therefore empirical studies of the link between economic conditions and crime fully employing the newly developed techniques are limited. This may partly explain why little evidence hasbeen found to support the link between economic conditions and crime from empirical studies investigating time-series data.

This paper provides an empirical analysis of the causal effects of economic conditions on crime rates in Korea, employing the standard set of

time-series techniques recently developed. The paper consists of 4 sections. The next section discusses variables and provides the results of unit root tests. Section 3 explains the methods, and provides the empirical results including the Johansen cointegration tests, the Granger-causality tests and impulse response analysis. Concluding remarks follow in the final section.

DATA

Variables

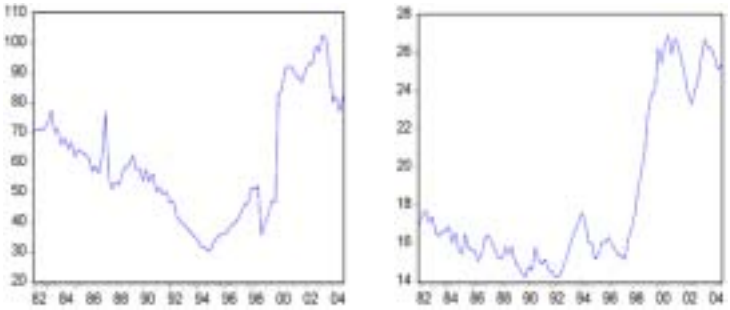
Income level, income inequality, and unemployment are variables that summarize economic conditions in different dimensions. Income level is defined by the mean monthly income of wage earners' households in cities, which is again adjusted by the consumer price index. Income inequality is measured by the Gini index. Unemployment is measured by the unemployment rate. All necessary data can be downloaded from the Korean Statistical Information System (KSIS). Income data are based on the Household Income and Expenditure Survey (HIES) data by the Korea National Statistical Office. The HIES data are monthly, however only quarterly data are available from the KSIS. All economicvariables are seasonally adjusted by the U.S. Census Bureau's X12 procedure.

Figure 1 shows the changes in income level, income inequality, and unemployment from January 1982 to April 2004 in Korea.

Income level measures the average level of income, while income inequality reflects the dispersion of income distribution. In other words, income level is related to absolute poverty while income inequality is related to relative deprivation. The unemployment rate represents instability of income because it depends on the employment opportunity given by an economy. Figure 1 clearly shows that economic conditions were severely aggravated in all dimensions by the Asian financial crisis in

(a) income level (b) income inequality (c) unemployment

FIGURE 1. CHANGES IN ECONOMIC CONDITIONS



(a) theft (b) assault

FIGURE 2. CHANGES IN CRIMES

1997-1998. Except the years of the suffering period, economic conditions have been improved in all dimensions. Income level has increased and both income inequality and the unemployment rate have decreased over time.

Theft and assault are investigated in this paper because they are the most important and frequent crimes among property crime and felony, respectively. Other important crimes such as murder and rape have only small quarterly observations; therefore they are not included in this study. Crime variables are defined as the number of crimes per 100,000 population. The crime numbers are available from the various issues of *Crime Analysis* published by the Supreme Prosecutors' Office. They are monthly data, except for the year 1993 when only yearly statistics are available. In order to match economic variables, crime variables are converted to quarterly data, from January 1982 to April 2004. Having some missing quarterly observations, crime variables are seasonally adjusted by the Tramo and Seats procedure which can handle time-series data with missing observations as well.

Figure 2 shows the changes in crime rates of theft and assault.

The sharply increased crime rates of theft and assault in 1998-2000 might have to do with the aggravated economic conditions brought about by the Asian financial crisis.

Unit-Root Tests

Table 1 shows the results of the unit root tests. All variables are expressed in their logarithmic transformation.

The results of the augmented Dickey-Fuller (ADF) tests and the Phillips-Perron (PP) tests are reported. The lag numbers ofthe ADF tests

TABLE 1. UNIT ROOT TESTS

Variables	Levels		First differences	
	ADF	PP	ADF	PP
income level	-0.512(0)	-0.674(5)	-9.343**(0)	-9.439**(5)
income inequality	-1.902(1)	-2.655(0)	-13.200**(0)	-14.571**(6)
unemployment	-3.077(1)	-2.134(4)	-5.218**(1)	-4.548**(6)
theft	-1.437(0)	-1.379(1)	-10.490**(0)	-10.483**(1)
assault	-1.914(8)	-1.721(5)	-5.206**(3)	-8.672**(5)

Notes: The numbers in parentheses are either lag numbers of the ADF tests selected by the SIC or the bandwidth parameters of the PP tests selected by the Newey and West (1994) method using the Bartlett kernel. ** and * respectively indicate statistical significance at 1% level and 5% level. All tests include an intercept and trend.

are selected by the Schwarz information criterion (SIC) and the bandwidth parameters of the PP tests are selected by the Newey and West (1994) method using the Bartlett kernel. The results show that all variables are $I(1)$.

EMPIRICAL RESULTS

Methods

Suppose that a 4-dimensional vector y_t (income level$_t$, income inequality$_t$, crime rate$_t$) is $I(1)$ and follows a vector autoregression (VAR) of order p given by,

$$y_t = \sum_{i=1}^{p} \Phi_i y_{t-i} + Dx_t + \varepsilon_t \tag{1}$$

where x_t is a vector of exogenous variables such as constants, and ε_t is a vector of shocks. And suppose that there are $r < 4$ linearly independent cointegrating vectors $\{a_j\}_{j=1}^{r}$ such that $A'y_t$ is $I(0)$, where $A=[a_1 \ \Lambda \ a_r]$ and $\{a_j\}_{j=1}^{r}$ form a basis for the space of cointegrating vectors of y_t. Engel and Granger (1987) show that the equation (1) can be expressed as a vector error correction (VEC) form given by,

$$\Delta y_t = BA' y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + Dx_t + \varepsilon_t \tag{2}$$

for some matrix B of rank r, where

$$BA' = -\left(I - \sum_{i=1}^{p} \Phi_i \right), \Gamma_i = -\sum_{j=i+1}^{p} \Phi_j . \quad (3)$$

The cointegration implies a long run relationship among variables. Engel and Granger (1987) show that if series are individually $I(1)$ and cointegrated, a causal relationship will exist in at least one direction. Toda and Yamamoto (1995) proposean augmented Granger causality test which provides an asymptotically Chi-squared test even in the presence of non-stationary variables. Assuming p is the lag number and r is the maximum order of integration, the Toda and Yamamoto (1995) procedure estimates the VAR given by,

$$y_t = \sum_{i=1}^{p+r} \Phi_i y_{t-i} + Dx_t + \varepsilon_t \quad (4)$$

and tests only the first p coefficients for Granger-causality.

Cointegration Tests

Table 2 shows the results of the Johansen (1988) cointegration tests.

For each crime variable, a different VEC model is assumed. The lag numbers for the cointegration test are selected by the Akaike's final prediction error (FPE) criterion on the level VAR. Both the trace tests and the maximum eigenvalue tests find just one cointegrating relationship in

TABLE 2. JOHANSEN COINTEGRATION TESTS

Crime variable	Bull hypothesis	Trace statistics	Max. Eigenvalue statistic
theft(5)	$r = 0$	102.456**	59.680**
	$r \leq 1$	42.776	20.935
	$r \leq 2$	21.841	14.432
	$r \leq 3$	7.409	7.409
assault(4)	$r = 0$	71.080*	34.055*
	$r \leq 1$	37.025	24.835
	$r \leq 2$	12.190	7.693
	$r \leq 3$	4.497	4.497

Notes: ** and * respectively indicate statistical significance at 1% level and 5% level. All tests include a trend for both the cointegrating equation and the vector error correction equation. The lag numbers for the cointegration tests are shown in parentheses which are selected by the Akaike's final prediction error (FPE) criterion on the level VAR.

TABLE 3. TODA AND YAMAMOTO (1995) GRANGER-CAUSALITY TESTS

Direction of causality			
income level	⇒	theft	8.474
income inequality	⇒	theft	24.671**
unemployment	⇒	theft	14.959**
income level	⇒	assault	18.191**
income inequality	⇒	assault	3.664
unemployment	⇒	assault	20.029**

Notes: ** and * respectively indicate statistical significance at 1% level and 5% level.

each system of VEC models.

Granger-Causality Tests

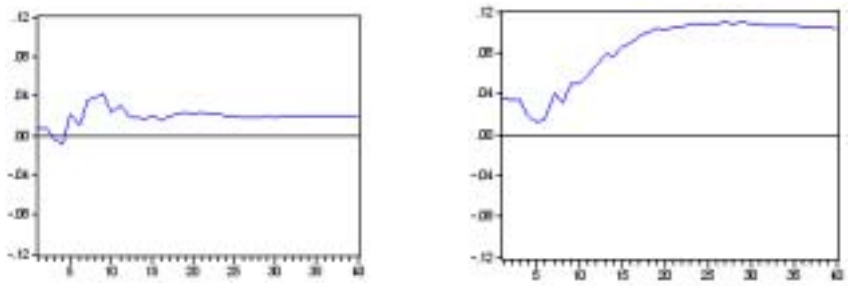
Table 3 shows the results of the Toda and Yamamoto (1995) Granger-causality tests.

Both income inequality and unemployment Granger-cause theft, while income level does not. On the other hand, both income level and unemployment Granger-cause assault, while income inequality does not.

Impulse-Response Analysis

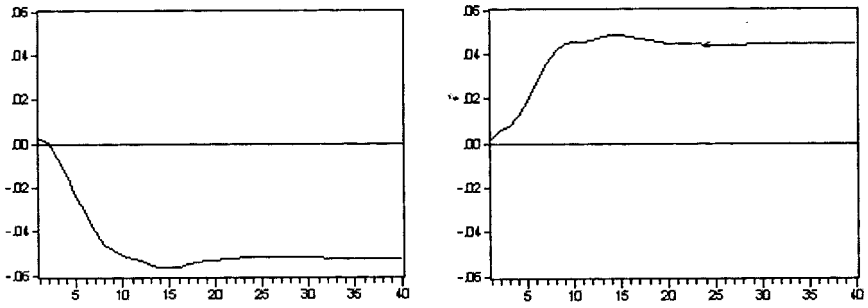
Figure 3 shows the results of the IR analysis which will show the signs of the Granger-causality effects on theft.

The IRs are generated from the VEC model of (2). In order to avoid the effects from an arbitrary ordering of the variables in the IR analysis, the generalized IRs by Pesaran and Shin (1998) are used. IRs up to 40 quarters are shown in the figure in order to see the convergence of the effects. Both



(a) income inequality (b) unemployment

FIGURE 3. IRS OF THEFT TO A GENERALIZED 1 S. D. SHOCK



(a) income inequality (b) unemployment

FIGURE 4. IRS OF ASSAULT TO A GENERALIZED 1 S. D. SHOCK

income inequality and unemployment positively Granger-cause theft.

Figure 4 shows the results of the IR analysis which will show the signs of the Granger-causality effects on assault.

Income level negatively Granger-causes assault, while unemployment positively Granger-causes assault.

CONCLUDING REMARKS

Time-series data of economic conditions and crime rates are non-stationary in most cases and traditional analysis without accounting for the non-stationarity would produce spurious results. The techniques that can properly and efficiently analyze non-stationary time-series variables have been developed only recently and therefore empirical studies of the link between economic conditions and crime fully employing the newly developed techniques are limited. This may partly explain why little evidence has been found to support the link between economic conditions and crime proposed in economics and sociology from the previous empirical studies investigating time-series data. Using quarterly data for the period January 1982 to April 2004, this paper examines the causal effects of economic conditions on crimes in Korea, employing the standard set of time-series techniques recently developed. Empirical evidence suggests that income inequality and unemployment positively Granger-cause theft, while income level does not. Income level has a negative effect and unemployment has a positive effect on assault, while income inequality does not have a significant effect.

Income inequality and income level correspond to relative and absolute deprivation respectively. The reason why relative deprivation is important while absolute deprivation is not in a property crime like theft may well be explained by Messner's and Rosenfeld's institutional anomie theory. Messner and Rosenfeld (1994) argue that culturally produced pressures to secure monetary rewards promote high rates of criminal activity. The culturally produced pressure to secure monetary rewards is arguably more relevant to relative deprivation than to absolute deprivation. In a felony like assault, evidence suggests that absolute deprivation is important wile relative deprivation is not. Messner et al. (2001) investigate youth homicide arrest rates for 1967-1998, and find that absolute deprivation measured by child poverty rates is positively related to homicide arrest rates however the effects of relative deprivation are highly sensitive to thechoice of income inequality measures. The evidence found in this paper is consistent with this finding. The effects of unemployment can be interpreted in many different ways. However the evidence that it is related toboth a property crime and a felony may be interpreted as supporting the institutional role of steady employment in controlling criminal behavior which is often emphasized in criminology and sociology.

This paper established several interesting stylized facts on the causal relationship between economic conditions and crimes. Although a sketchy explanation is given, a formal and theoretical explanation of the facts is beyond the scope of this study. Moretheoretical exploration as well as empirical studies should follow in order to interpret the newly found evidence.

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