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SOCIO- ECONOMIC AND DEMOGRAPHIC DETERMINANTS OF CRIME BY PANEL COUNT DATA ANALYSIS: THE CASE OF EU 28 AND TURKEY

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ABSTRACT

Purpose- Aim of this paper is to examine factors that affect the total number of crimes recorded by the police for EU 28 and Turkey in 2001-2010, which is not used previously in the literature dealing with the developments and changes during a certain period in this study.

Methodology- We used panel count data in analysis of this paper. Count data models are appropriate to determine factors on the number of crimes because of the nature of the dependent variable.

Findings- we used growth rate, GDP per capita, inflation, unemployment rate, urban overpopulation, enrollment rate and the number of the police variables to examine effect on crimes. The results demonstrate that GDP per capita, inflation, unemployment rate and urban overpopulation has a positive on the number of crimes. The increases on the enrollment rate and the number of police decrease the number of crimes.

Conclusion- We observe higher crime rates in highly urbanized areas.

Keywords: Crime, panel count data, fixed effects negative binomial model, EU 28, Turkey.
JEL Codes: C23, C25, K42

1. INTRODUCTION

Crime, defined as a violation of the law, is a problem that afflicts all societies and countries though to varying degrees (Wu and Wu, 2012: 3765). The theory of crime was largely composed of recommendations made by sociologists, psychologists, criminologists, political scientists and law professors that were not based on rigorous empirical investigation, but on beliefs about concepts like depravity, insanity and abnormality (Entorf and Spengler, 1998:1). Criminality is denoted as a historical social phenomenon, which does not rule out from a person's life, but it keeps pace with the social and technological evolution. It has the tension to readjust all the time and as a result, a large variety of criminal activities is shown worldwide during different periods. Lately, types of organized, violent and profiteering crime appear to be the most prevalent, but without ruling out the different kinds of single crimes (Nikolaos and Alexandros, 2009: 51). Crime had traditionally been the domain of labour economists, who studied the educational and career choices of youth, including the choice to pursue crime as a 'career' (Fontenay, 2008: 71).

After some time of relative silence with only a few major contributions in the eighties, the last few years witness a vitalization of the "economics of crime" (Dilulio, 1996; Ehrlich, 1996; Entorf and Spengler, 1998: 2). In the 1980's and 1990's, economists embarked on an investigation into the relationship between crime and the economy, naming it the "economics of crime" which shifted the concern from the pure testing of the deterrence hypothesis to the analysis of socio-economic and demographic crime factors. In other words, research concentrating on the effects of changes in detection probability and the severity of sanctions has shifted to issues concerning some of the considerable factors (Chang and Wu, 2012: 4). The economics of crime are mostly related with these factors such as poverty, social exclusion, income, income inequality, unemployment, inflation, migration, human capital, worker ability or labor market skills, poor employment records, low legitimate earnings, cultural characteristics, age, sex, fertility, demographic transition, education level, family background, its unequal representation with regard to race, the level of urbanization and other economic problems (Nikolaos and Alexandros, 2009: 52; Chang and Wu, 2012: 4; Hamzah and Lau, 2013: 100; Freeman, 1999: 3532). Economic theory predicts that economic recessions generally tend to cause an upturn in criminal activities (Conley and Wang, 2006). Moreover, if, during a recession, government expenditures on crime prevention remain the same, then the rising crime rate results in a fall in the crime detection rate. When the recession is over, criminals may fail to adjust their anticipated probability of crime detection and thus crime rates will remain on a higher level compared to the prerecession period. Recession can have both a short-term and long-term impact on crime rates (Ivaschenko et al., 2012: 23). According to official data tables, during the last decades there is a constant rise of criminal acts in developed countries and countries of the western world (Nikolaos and Alexandros, 2009: 52). Thus, modern studies have been stimulated by the dramatic increase of crime rates in western countries on one hand, and by recent increase in social and economic problems on the other (Entorf and Spengler, 1998: 2).

High rates of crime impose significant costs on society and hinder economic development (Mehlum et al., 2005). At the individual level, the ultimate cost of crime is a loss of life, yet victims can also incur other costs, such as medical expenses, loss of property, or loss of income (Atkinson et al., 2005). At the social level, considerable resources are spent on avoiding being victimized. In response to high rates of crime, government is forced to spend a significant share of its budget on crime prevention, such as financing law enforcement agencies, running detention facilities and prisons, and implementing crime prevention programs. The social loss can be reflected in high spending on crime prevention and lower productivity of victimized individuals (Daniele and Ugo, 2008; Ivaschenko et al., 2012: 22). At the economic level, crime is an act that will show the wind and reap the whirlwind of economics in a country. It is a well-known fact that crime will influence the transmission of economic growth through hindrance of foreign direct investment, constraints for investment in human capital, decline in competitiveness, reducing productive capacity, and increase in expenditure of unprofitable sector (crime fighting) to name a few. Besides these, crime causes the economic loss such as loss of tourism (Hamzah and Lau, 2013: 100).

The aim of this study is to estimate empirically using panel count data models the relationships among the number of crimes, number of police officers, unemployment rate, growth rate, inflation rate, enrollment ratio, GDP per capita and the level of urbanization in EU 28 countries and Turkey during 2001-2010 periods. This paper contributes to the literature economics of crime in Turkey and EU 28 countries by estimating the factors that affect the number of crime through panel count data models in 2001-2010. The research literature on economics of crime is very limited. To our knowledge, no systematic empirical research exists in analyzing the number of crime in Turkey and EU 28 countries using a panel count data model. However, this study presents a comprehensive analysis for economics of crime and provides important findings.

The remainder of this study is organized as follows. Section 2 presents the effects of socio-economic factors on crime. Section 3 presents literature review. Section 4 presents the fixed effects negative binomial model employed in getting the results. Section 5 is devoted to presentation of the data and variables used. In addition, the results obtained from the fixed effects negative binomial model are presented in Section 5. Finally, conclusions are drawn in Section 6.

2. THE EFFECTS OF SOCIO-ECONOMIC AND DEMOGRAPHIC FACTORS ON CRIME

Modern criminology theories can be used to support economic deprivation as a causal factor in explaining many crimes. The variables of interest are depicted over time and between observational units. Analyzing the crime statistics and thus learning about regional differences in the incidence of crime and about the socio-demographic structures of the offenders leads to a better understanding of the factors that may prevent or foster crime (Entorf and Spengler, 1998: 4). Research problems in this area often deals with the multivariate causes of crime, such as: divorce, broken homes, poor schools, poor housing quality, racial and ethnic mix, residential mobility, single-family homes, lack of discipline, or the absence of other social and community controls and population turnover. It would be difficult, if not impossible to separate the variables and assess each one's sole affect on crime (Hall, 2007: 1).

Economic theories concerned with the area of crime try to explain crime rates with the incentives that individuals face in their choice between legal and illegal activity. Becker (1968) marked the beginning of attempts to apply economic models of rational decision making to crime. According to Becker (1968), the theory of the economics of crime considers crime as an activity that takes time and yields economic benefits. The individual compares the expected returns from committing a crime to the returns from legal work (Krüger, 2011: 179; Edmark, 2005: 355). Becker's theory was extended and tested by Ehrlich (1973), who considered a time allocation model and motivated the introduction of unemployment as a measure of how potential criminals fare in the legitimate job market. Since then, a number of significant theoretical and empirical developments have been made (Saridakis and Spengler, 2009: 2). Growing researches have turned their interest to certain economic and sociological aspects such as poverty, wages, income inequality, unemployment, inflation, education, fertility, and population to explain the incidence of crime. Criminology and socio-demographic issues have intersects and interacts with each other directly or indirectly (Hamzah et al., 2013: 101).

In this study, the number of police officers, unemployment rate, growth rate, inflation rate, enrollment rate, GDP per capita and the level of urbanization variables are taken as the determinants of the crime number in EU 28 and Turkey countries. The effects of these variables on the number of the crime are mentioned below. Indicators such as poverty, wages, income inequality and fertility were not included in the analysis due to lack of data in this study.

Crime literature illustrates that the increase in the number of police officers decreases the number of crimes committed (Güvel, 2004; Yıldız et al., 2010: 23). A significant inverse relation found that more police reduces crime (Marvell and Moody, 1996; Levitt 1996). There is some inconsistency in linking economic variables with all crime. This may be due to the difficulty of accounting for multiple variables in research. The existence of a causal link between unemployment and crime has been widely investigated in the past in most studies, leading to different approaches, although the strength of this relationship remains ambiguous both in its nature and in its robustness (Buonanno and Montolio, 2008: 92). The first one indicates a positive relationship known as 'motivation effect', where a rise in unemployment rates leads to economic problems and increases the motivation to engage in criminal acts. The second one indicates a negative correlation known as 'opportunity effect' and indicates that, during economic depression a rise in unemployment rates leads to decrease the consumption expenditures, mostly in households, decrease in median family income, so the potential earnings from illegitimate activities become lower and discourages a person from the decision to commit a crime (Nikolaos and Alexandros, 2009: 53; Freeman, 1999: 3542; Chen, 2009: 115; Chang and Wu, 2012: 4).

In the crime literature crime and growth rate, relationship remains ambiguous. Some of the crime studies have reached to the conclusion that the increase of growth rate affects property crimes negatively (Buonanno and Montolio, 2008: 95). Some of the crime studies found positive relationship between growth and crime rates (Cömertler and Kar, 2007). Some other studies indicate that as economy grows, while total crime and homicide numbers increase, robbery and theft crimes decrease (Güvel, 2004). Some researchers reported that inflation rate played a crucial role in criminal acts. It is found that the inflation rate was positively correlated with crime rate. Assuming the wages are constant, rise of inflation rate will reduce a person's purchasing power and the cost of living will be relatively higher than before. As a result, crime rate may increase because an individual is unable to maintain his/her standard of living as before. In other words an individual is likely to engage in criminal activities to maintain or/and improve his/her purchasing power. However, this phenomenon does not happen immediately because it takes time for inflation to gradually reduce the purchasing power (Tang and Lean, 2007: 313).

As for enrollment rate or education, may affect crime in several ways. Firstly, higher levels of educational attainment are associated with higher returns in the labour market, thus increasing the opportunity cost of criminal behaviour, in this way the negative relationship between education and crime is indicated (Lochner, 1999: 34; Buonanno and Leonida, 2006; Aytaç et al., 2007). Secondly, education may alter personal preferences in a way that affects decisions to engage in crime. In particular, education may have a sort of "civilization" effect (Buonanno and Montolio, 2008: 92). No consensus is also found in the case of income. Several studies show that changes in income can affect crime in three ways: First, an income decrease makes the need for returns from illegal activities. In other words, falls an income of low-wage workers lead to increases in crime (Grogger, 1998; Machin and Meghir, 2004). Second, an income increase sets the opportunities for criminal offences, due to the large amount of stolen goods (Levitt, 1999). Finally, an income increase leads to outdoor activities, thus increasing the likelihood of potential crime victims (Beki et al., 1999). Another factor that may affect crime is the level of urbanization. High levels of urbanization are closely linked to higher crime rates (Ivaschenko et al., 2012: 23: Buonanno and Montolio, 2008: 96).

3. LITERATURE REVIEW

Many studies that refer to criminality for decades were based previously on theoretical and sociological approaches, but only recently economic analysis has been applied. Although Fleisher (1963, 1966) was the first who worked on criminality

from its economic view, Becker's study (1968) became the major breakpoint by designing a model, analyzing a criminal's decision (Nikolaos and Alexandros, 2009: 53). Over the last three decades, a growing amount of research effort, largely inspired by Becker (1968) seminal paper, has been devoted to study the socio-economic determinants of criminal behavior, partly motivated by the remarkable increase in criminal activities in many developed countries (Buonanno and Montolio, 2008: 89). During the 15 years, an increasing number of studies have analyzed the determinants of crime for European countries or for Latin American countries. There are many studies related to the effects of socioeconomic and demographic variables on crime in the literature. Summary of some of these studies, which have different conclusions are given in order of construction date.

Masih and Masih (1996) examine the causal relationship between several categories of crime and various socioeconomic variables in Australia between 1963 and 1990. They find that each of the categories of crime they tested are cointegrated with a host of demographic and socioeconomic variables and that dwelling commencements (a proxy for wealth) and urbanization are the most important determinants of crime. Marvell and Moody (1996) analyze yearly police data and crime rates, at the 49 states and 56 cities in separate regressions, pooled over two decades. They find Granger causation in both directions. The impact of crime on the number of police is slight, but the impact of police on most crime types is substantial and more robust. Scorcu and Cellini (1998) investigate the economic determinants of crime rates in Italy over the period 1951 to 1994 by using cointegration analysis. They show that cointegrating relationships connect the long-run equilibrium levels of crime rates to economic factors in the presence of endogenously determined structural breaks. Entorf and Spengler (2000) study the model in the face of currently discussed factors of crime like demographic changes, youth unemployment, and income inequality. They use a panel of the German states. Results based on static and dynamic panel econometrics/criminometrics. The results confirm the deterrence hypothesis for crime against property. Economic and demographic factors reveal important and significant influences. Being young and unemployed increases the probability of committing crimes. Raphael and Winter-Ebmer (2001) research the relationship between unemployment and crime using a state-level panel covering the period 1971–1997. Using U.S. state data, they estimate the effect of unemployment on the rates of seven felony offenses. Instrumental variable analysis (with instrumental variables for unemployment based on contracts for the defense industry and oil prices), finds support for a causal direction from unemployment to crime. They find significantly positive effects of unemployment on property crime rates that are stable across model specifications.

Gould et al. (2002) deal the degree to which changes in crime rates for the U.S. from 1979 to 1997 can be explained by changes in the labor market opportunities for those most likely to commit crime. They conclude that both wages and unemployment are significantly related to crime. Moreover, they show that state- and county-level property crime rates in the U.S. are lower when unemployment is lower. The magnitude of the unemployment effect is sufficiently large to explain a fair portion of the decline in property crime rates. Deadman and MacDonald (2002) considers the reasons why the general level of recorded crime has been falling in the U.S. and many European countries (Germany, the Netherlands, France, Denmark, Eire, Scotland and Austria) during the 1990s, especially for property crimes. They review the time-series statistical evidence on the determinants of crime. The authors comment that a sustained period of economic growth, low inflation and unemployment in the U.S. has resulted in a fall in the crime rate. However, this is usually for a short period only. Narayan and Smyth (2004) apply Granger causality tests to examine the relationship between seven different categories of property crime and violent crime against person, male youth unemployment and real male average weekly earnings in Australia from 1964 to 2001 within a cointegration and vector error correction framework. Teles (2004) constructed an intertemporal general equilibrium model with micro-fundamentals to explain the relationship between macroeconomic policies and criminal activities. He attracted special attention to the inflation effects on crime. The author found that if the quantity of money held by an economic agent affects the marginal utility of crime, then inflation rate would affect the incidence of crime in economy. Machin and Meghir (2004) explore the role that economic incentives, particularly changes in wages play in determining crime rates. They use data on the police force areas of England and Wales between 1975 and 1996 and find (relative) falls in the wages of low-wage workers lead to increases in crime. The authors execute a number of experiments with different wage measures, including a wage measure that accounts for the effects of changes in the composition of employment. This research reinforces a strong association between the low-wage labor market and crime.

Edmark (2005) uses a panel data of Swedish counties over the years 1988–1999 to study the effects of unemployment on property crime rates. A fixed-effects model is estimated to investigate unemployment and crime relationship. The model includes time- and county- specific effects and a number of economic and socio-demographic variables to control for unobservable and covariates. The results show that unemployment had a positive and significant effect on some property crimes such as burglary, car theft and bike theft. Buonanno and Leonida (2006) examine the impact of education on criminal activity using annual data for the 20 Italian regions over the period 1980 to 1995. A number of hypotheses are tested regarding the effects of education and past incidence of crime on criminal activity. They find evidence supporting education's negative effect on crime in Italy. The results are robust to model specifications and endogeneity. Tang and Lean

(2007) use the modified Wald (MWALD) causality test to re-examine the relationship between crime and its determinants (inflation and unemployment) in the U.S. from 1960 to 2005. Bounds test approach is employed to investigate the existence of a long-run relationship. The empirical evidence illustrates that inflation and crime rates are cointegrated with a positive relationship. Moreover, the causal link is from inflation and unemployment to crime. Wu and Wu (2012) develop a model of crime based on principles from the existing literature. The implications of the model are: Income inequality and unemployment are important explanatory variables for crimes motivated by economic gain. They use panel data of UK regions over the years from 2002 to 2007 to test these predictions. The empirical results strongly support the hypothesis that crime is an economic phenomenon.

4. METHODOLOGY

The Poisson model is the most basic model for count data. The Poisson model has the strong restriction that the variance and mean are equal. However, this assumption is often violated in the real count data sets, that is, the data overdispersed. Overdispersion occurs when the conditional variance exceeds the conditional mean (for more information, see Cameron and Trivedi, 2007). This may be caused by unobserved individual heterogeneity, which is quite common in the real world. To deal with overdispersion, a distribution that permits more flexible modeling of the variance than the Poisson model should be used, the negative binomial distribution is such a distribution (Hu, 2002). The negative binomial model allows each country's Poisson parameter to have its own random distribution.

Since it is used panel data set in this research, panel count data models examine in this research. The fixed and random effects models were developed by Hausman et al (1984) for panel count data models. As a result of the Hausman test is selected in the fixed effects model with panel data, this model will be discussed in this research. Using the panel data, the hidden features can be captured by individual heterogeneity. The simplest fixed effects model for count data is the fixed effects Poisson model. The fixed-effects Poisson regression model for panel data has been described in detail by Cameron and Trivedi (1999). For the Poisson model developed by Hausman et al (1984), the fixed effects model as follows:

$$\lambda_{it} = \exp(\alpha + x_{it}^{'}\beta) \tag{1}$$

where x_{it} is a vector of regressors including the overall intercept.

Fixed effects into the negative binomial model add some additional complexity.

$$f(y_{it}) = \frac{\Gamma(\lambda_{it} + y_{it})}{\Gamma(\lambda_{it})\Gamma(y_{it} + 1)} \left(\frac{1}{1+\theta_i}\right)^{\lambda_{it}} \left(\frac{\theta_i}{1+\theta_i}\right)^{y_{it}}$$

with $E(y_{it} / \theta_i) = \lambda_{it}\theta_i$

and $Var(y_{it} / \theta_i) = \lambda_{it}(\theta_i + \theta_i^2)$

Therefore,

$$f(y_{it},...,y_{iT} / \sum_t y_{it}) = \frac{\Gamma(\sum \lambda_{it})\Gamma(\sum_t y_{it} + 1)}{\Gamma(\sum_t \lambda_{it} + \sum_t y_{it})} \prod_t \frac{\Gamma(\lambda_{it} + y_{it})}{\Gamma(\lambda_{it})\Gamma(y_{it} + 1)}$$

All terms involving ϑ_i are cancelled out (Hu, 2002).

5. EMPIRICAL ANALYSIS

5.1. Data and Variables

Dependent variable used in the negative binomial model with fixed effects is the number of crimes recorded by the police for EU 28 and Turkey in 2001-2010 in this study. The numbers of total crime recorded by the police include homicide, violent crime, robbery, domestic burglary, motor vehicle, theft drug trafficking (see Table 1).

Table 1: The Number of Crimes Recorded by the Police for the EU 28 and Turkey

GEO/TIME	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	522710	591584	643286	643648	605272	589495	594240	572695	591597	535745
Belgium	948268	992264	986899	993265	982215	1004097	1016441	1022682	1046442	1050235
Bulgaria	147022	146929	143921	142093	137800	136410	134685	126673	138105	147025
Croatia	78351	77905	80377	85416	79946	81049	75857	74571	73497	73328
Cyprus	4506	4758	7256	7615	7212	7917	7556	7341	7104	8387
Czech Republic	358577	372341	357740	351629	344060	336446	357391	343799	332829	313387
Denmark	473290	491511	486174	474419	432704	425093	445271	476953	491792	471088
Estonia	58497	53293	53595	53048	52916	51834	50375	50977	48359	48340
Finland	430343	435009	443481	445465	432302	416131	435824	440711	441416	431623
France	4061792	4113882	3974694	3825442	3775838	3725588	3589293	3558329	3521256	-
Germany	6363865	6507394	6572135	6633156	6391715	6304223	6284661	6114128	6054330	5933278
Greece	439629	441138	441839	405627	455952	463750	423422	417391	386893	333988
Hungary	465694	420782	413343	418833	436522	425941	426914	408407	394034	447186
Ireland	86633	106415	103462	99244	102206	103178	-	-	-	-
Italy	2163826	2231550	2456887	2417716	2579124	2771490	2933146	2709888	2629831	2621019
Latvia	51082	49329	51773	62173	51435	62328	55620	57475	56748	51108
Lithuania	79265	72646	79072	84136	82074	75474	67990	71972	76291	70618
Luxembourg	22646	26046	26163	26907	25321	25913	28252	28210	32378	30532
Malta	15929	17023	17739	18384	18580	16527	15005	13803	11953	13296
Netherlands	1379454	1401871	1369271	1319482	1341950	1304325	1292820	1266165	1243285	1192640
Poland	1390089	1404229	1466643	1461217	1379962	1287918	1152993	1082057	1129577	1151157
Portugal	372170	391599	417383	416420	392714	399563	398575	430486	426040	422587
Romania	340414	312204	276841	231637	208239	232659	281457	289331	299889	292682
Slovakia	93053	107373	111893	131244	123563	115152	110802	104758	104905	95252

Slovenia	74794	77218	76643	86568	84379	90354	88197	81917	87465	89489
Spain	2052492	2183457	2144155	2141295	2230906	2267114	2309859	2396890	2339203	2297484
Sweden	1189393	1234784	1255371	1248743	1241843	1224958	1306324	1377854	1405626	1370399
Turkey	400337	438714	472153	507539	667820	975118	970554	1012291	1288085	1521723
United Kingdom	5521825	5974960	6013759	5637511	5555172	5427558	4952276	4702698	4338372	4150097

Source: European Commission, EUROSTAT Statistics Database

Independent variables are growth rate, inflation, GDP per capita, unemployment rate, urban overpopulation, enrollment rate, the number of the police. The data being used are obtained from the World Development Indicator database, EUROSTAT database. Because crime data contained in the EUROSTAT database contains the most recent 2010 data, data range is set at 2001-2010 in this study. Descriptive statistics indicating the variables give Table 2.

Table 2: Descriptive Statistics

Variable	**Mean**	**Std. Dev.**
The numbers of crime	1066587	98304.43
Growth rate	2.517164	0.244561
Inflation	3.859701	3.38E-01
GDP per capita	19789.93	844.5207
Unemployment rate	8.30E+00	2.26E-01
Urban overpopulation	8785203	746044.6
Enrollment rate	8.76E+01	9.16E-01
The number of the police	71713.05	5865.421

5.2. Results of the Fixed Effects Negative Binomial Model

Aim of this paper is to examine factors that affect the total number of the crimes recorded by the police for EU 28 and Turkey in 2001-2010 years by using fixed effects negative binomial model. Since it is used panel data set in this research, panel count data models examine in this research. Basic Poisson and negative binomial models have some limitations. The Poisson model requires the variance-to-mean ratio of the number of crimes data to be about 1. This assumption is often violated in the real count data sets. Both the Poisson and the Negative Binomial models require the number of crimes data to be uncorrelated in time. Due to unobserved heterogeneity and serial correlation in the number of crimes data, both models seem to be inappropriate. To overcome this problem, fixed effect models have been developed. Conditional variance exceeds the conditional mean in this paper. That is, the number of crimes data has overdispersion. Negative Binomial distribution has been adopted in the count data to take care of the over-dispersion problem (see Table 3). Hausman and F test result indicates that, the fixed effects negative binomial model that by treating the data in a time series and cross-section, is more suitable (see Table 3).

Estimated coefficients and marginal effects of the fixed effects negative binomial model are presented in Table 3. F test reported at the bottom of Table 3 of the results provides a formal test for the pooled negative binomial model estimator against the fixed effects negative binomial panel estimator. The result of the F test indicates that the fixed effects panel estimator is important. The Wald test statistics reject the null hypothesis that the parameters in the regression equation are

jointly equal to zero. Count data models are appropriate to determine factors on the number of crimes in EU 28 and Turkey because of the nature of the dependent variable.

Table 3: The Results of Fixed Effects Negative Binomial Model

Variable	Coefficient	Std. Dev.	z value	P>|z|	Marginal effects
Growth rate	0.0013	0.001725	0.76	0.446	0.001315
Inflation	-0.0039	0.002568	-1.51	0.132	-0.00387
GDP per capita	0.00001	3.55E-06	3.08	0.002***	0.000011
Unemployment rate	0.00841	0.003063	2.75	0.006***	0.008413
Urban overpopulation	1.47E-08	5.66E-09	2.6	0.009***	1.47E-08
Enrollment rate	-0.00931	0.002406	-3.87	0.000***	-0.00931
The number of the police	-4.44E-06	9.49E-07	-4.68	0.000***	-4.44E-06
constant	5.35736	0.239912	22.33	0.000***	
Log likelihood	-2789.4769				
Number of observation	290				
Number of groups	29				
Likelihood-ratio (LR) test ($\chi^2(01)$) Negative binomial vs. Poisson model	7.4e+07			0.000	
Wald ($\chi^2(7)$)	98.87			0.000	
Hausman Test $\chi^2(6)$	52.71			0.000	
F test fixed effect negative binomial vs. pooled:	113.82			0.000	

***p<.01, **p<.05, *p<.10.

Marginal effects results of the model in Table 3 demonstrate that, GDP per capita, unemployment rate and urban overpopulation has a positive and important effect on the number of crimes in EU 28 and Turkey. This finding is consistent with the results of Entorf and Spengler (1998). Some studies support the positive relation between unemployment and crime, while the other in general obtains significantly weaker results (Edmark, 2005: 354-355). Field (1990) and Pyle and Deadman (1994) stressed that unemployment might be a less important factor than the rest economic variables in order to investigate the crime rates fluctuation in Great Britain. The results in Tables 3 report that in contrast to the findings of Field (1990) and Pyle and Deadman (1994), unemployment has more important positive direct effect than the rest economic variables on crime in this study. The increases on the enrollment rate and the number of the police seem to have decreased the number of crimes in the direction of expectations. Negative binomial model with fixed effects results estimated using the STATA MP 12 software.

6. CONCLUSION

As stated previously, aim of this paper is to examine factors that affect the total number of the crimes recorded by the police for EU 28 and Turkey in 2001-2010 by using fixed effects negative binomial model. Count data models are appropriate to determine factors on the number of crimes because of the nature of the dependent variable. Marginal effects results of the fixed effects negative binomial model demonstrate that, GDP per capita, unemployment rate and urbanization has a positive and important effect on the number of crimes in EU 28 and Turkey. As usually found, in the literature, we observe higher crime rates in highly urbanized areas. The increases on the enrollment rate and the number of the police seem to have decreased the number of crimes in the direction of expectations. The effect of growth rate and inflation is not clear or insignificant.

Research using a series of victim surveys in 18 countries of the European Union, funded by the European Commission, has reported (Van Dijk et al., 2005) that the level of crime in Europe has fallen back to the levels of 1990, and notes that levels of common crime have shown declining trends in the U.S., Canada, Australia and other industrialized countries as well. The European researchers say a consensus identifies demographic change as the leading cause for this international trend. The European research suggests that "increased use of crime prevention measures may indeed be the common factor behind the near universal decrease in overall levels of crime in the Western world", since decreases have been most pronounced in property crime and less so, if at all, in contact crimes (Van Dijk et al., 2005, 2008; Kesteren et al., 2000). We know from comparisons with other EU members that crime in UK is very high. In 2004 the European Union's Crime and Safety Survey looked at 18 countries and found that the UK was a 'crime hotspot', along with Ireland, the Netherlands and Denmark. In 2007 the EUROSTAT statistics for the 27 EU members found that UK had the third worst crime rate. The report shows that a high-crime society with a particular propensity to violence short of intentional homicide (Civitas Crime, 2012).

REFERENCES

Atkinson, G., Healey, A. and Mourato, S. 2005, “Valuing the Costs of Violent Crime: A Stated Preference Approach”, Oxford Economic Paper, Vol. 57, pp. 559–585.

Aytaç, M., Aytaç, S. and Bayram, N. 2007, “Suç Türlerini Etkileyen Faktörlerin İstatistiksel Analizi”, 8. Türkiye Ekonometri ve İstatistik Kongresi, İnönü University, Malatya, 24-25 May, pp. 1-7.

Becker, G. S. 1968, “Crime and Punishment: An Economic Approach”, Journal of Political Economy, Vol. 78, pp. 526–536.

Beki, C., Zeelenberg, K. and Montfort, K. V. 1999, “An Analysis of the Crime Rate in the Netherlands 1950-93”, British Journal of Criminology, Vol. 39, pp. 401-415.

Buonanno, P. and Leonida, L. 2006, “Education and Crime: Evidence from Italian Regions”, Applied Economics Letters, Vol. 13, pp. 709-713.

Buonanno, P. and Montolio, D. 2008, “Identifying the Socio-economic and Demographic Determinants of Crime Across Spanish Provinces”, International Review of Law and Economics, Vol. 28, pp. 89-97.

Cameron, A. C. and Trivedi, P. K. 2007, “Essentials of Count Data Regression”, in Baltagi B. (ed.), A Companion to Theoretical Econometrics, Blackwell Publishing Ltd., Malden, MA, USA.

Chang, J. and Wu, C. H. 2012, “Crime, Job Searches, and Economic Growth”, Atlantic Economic Journal, Vol. 40, pp. 3-19.

Chen, S. W. 2009, “Investigating Causality Among Unemployment, Income and Crime in Taiwan: Evidence from the Bounds Test Approach”, Journal of Chinese Economic and Business Studies, Vol. 7, pp. 115-125.

Civitas Crime 2012, “Comparisons of Crime in OECD Countries”, Retrieved May 24, 2012. http://www.civitas.org.uk/crime/crime_stats_oecdjan2012.pdf.

Conley, J. P. and Wang, P. 2006, “Crime and Ethics”, Journal of Urban Economics, Vol. 60, pp. 107-123.

Cömertler, N. and Kar, M. 2007, “Türkiye’de Suç Oranının Sosyo-ekonomik Belirleyicileri; Yatay Kesit Analizi”, Ankara Üniversitesi Siyasal Bilgiler Fakültesi Dergisi, no: 62, pp. 37-57.

Daniele, V. and Ugo, M. 2008, “Organized Crime and Foreign Direct Investment: The Italian Case”, CESifo Working Paper, no: 2416, pp. 1-28.

Deadman, D. and MacDonald, Z. 2002, “Why has Crime Fallen? An Economic Perspective”, Institute of Economic Affairs, Blackwell Publisher, pp. 5-14.

Dilulio, J. J. 1996, “Help Wanted: Economists, Crime and Public Policy”, Journal of Economic Perspectives, Vol. 10, pp. 3-24.

Edmark, K. 2005, “Unemployment and Crime: Is There a Connection?”, Scandinavian Journal of Economics, Vol. 107, pp. 353-373.

Ehrlich, I. 1973, "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation", Journal of Political Economy, Vol. 81, pp. 521–565.

Ehrlich, I. 1996, "Crime, Punishment, and the Market for Offenses", Journal of Economic Perspectives, Vol. 10, pp. 43-67.

Entorf, H. and Spengler, H. 1998, "Socio-economic and Demographic Factors of Crime in Germany: Evidence from Panel Data of the German States", Discussion Paper, no. 98-16, pp. 1-43.

Entorf, H. and Spengler, H. 2000, "Socioeconomic and Economic Factors of Crime in Germany: Evidence from Panel Data of the German States", International Review of Law and Economics, Vol. 20, pp. 75–106.

Field, S. 1990, Trends in Crime and Their Interpretation. Home Office Research Study 119. Home Office, London.

Fleisher, B. 1963, "The Effect of Unemployment on Juvenile Delinquency", Journal of Political Economy, Vol. 71, pp. 543-555

Fleisher, B. 1966, "The Effects of Income on Delinquency", American Economic Review, Vol. 56, pp. 118-137

Freeman, R. B. 1999, "The Economics of Crime", in Ashenfelter O. and Card D. (ed.) Handbook of Labor Economics, Chap. 52, Vol. 3, Elsevier, Amsterdam, pp. 3529–3571.

Fontenay, C. D. 2008, "The Economics of Crime: The Case of Argentina", The Melbourne Review, Vol. 4, pp. 70-75.

Gould, E. D., Weinberg, B. A. and Mustard, D. B. 2002, "Crime Rates and Local Labor Opportunities in the United States: 1979–1997", Review of Economics and Statistics, Vol. 84, pp. 45–61.

Grogger, J. 1998, "Market Wages and Youth Crime", Journal of Labor Economics, Vol. 16, pp. 756-791.

Güvel, E. A. 2004, Suç ve Ceza Ekonomisi, Roma Yayınları, Ankara.

Hall, A. 2007, "Socio-economic Theories of Crime", Working Paper, Capella University, pp. 1-18. (www.arichall.com/academic/papers/hs8373-paper.pdf)

Hamzah, S., Zahara, N. and Lau, E. 2013, "The Role of Social Factors in Explaining Crime", Theoretical and Applied Economics, Vol. 20, pp. 99-118.

Hausman, J. A., Hall, B. H., and Griliches, Z. 1984, "Econometric Models for Count Data with an Application to the Patents_R&D Relationship", Econometrica, Vol. 52, pp. 909-938.

Hu, Q. 2002, Analysis of Panel Patent Data Using Poisson, Negative Binomial and GMM Estimation, Simon Fraser University, Master Thesis.

Ivaschenko, O., Nivorozhkin, A. and Nivorozhkin, E. 2012, "The Role of Economic Crisis and Social Spending in Explaining Crime in Russia Regional Panel Data Analysis", Eastern European Economics, Vol. 50, pp. 21–41.

Kesteren, J. N. V., Mayhew, P., Nieuwbeerta, P. 2000, "Criminal victimization in seventeen industrialized countries: key findings from the 2000", International Crime Victim Survey, pp. 98–99. Retrieved April 12, 2013.

Krüger, N. A. 2011, "The Impact of Economic Fluctuations on Crime: A Multiscale Analysis", Applied Economics Letters, Vol. 18, pp. 179-182.

Levitt, S. D. 1996, "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation", Quarterly Journal of Economics, Vol. 111, pp. 319–351.

Levitt, S. 1999, "The Changing Relationship between Income and Crime Victimization", Federal Reserve Bank of New York Policy Review, Vol. 5, pp. 87-98.

Lochner, L. 1999, "Education, Work, and Crime: Theory and Evidence", Working Paper, no: 465, University of Rochester.

Machin, S. and Meghir, C. 2004, "Crime and Economic Incentives", Journal of Human Resources, Vol. 39, pp. 958-979.

Marvell, T. B. and Moody, C. E. 1996, "Specification Problems, Police Levels, and Crime Rates", Criminology, Vol. 34, pp. 609-646.

Masih, A. M. M. and Masih, R. 1996, "Temporal Causality and the Dynamics of Different Categories of Crime and Their Socioeconomic Determinants: Evidence from Australia", Applied Economics, Vol. 28, pp. 1093-1104.

Mehlum, H., Moene, K. and Torvik, R. 2005, "Crime-Induced Poverty Traps", Journal of Development Economics, Vol. 77, pp. 325–340.

Narayan, P. K. and Smyth, R. 2004, "Crime Rates, Male Youth Unemployment and Real Income in Australia: Evidence from Granger Causality Tests", Applied Economics, Vol. 36, pp. 2079-2095.

Nikolaos, D. and Alexandros, G. 2009, "The Effect of Ssocio-economic Determinants on Crime Rates: An Empirical Research in the case of Greece with Cointegration Analysis", International Journal of Economic Science and Applied Research, Vol. 2, pp. 51-64.

Pyle, D. and Deadman, D. 1994, "Forecasting recorded property crime using a time-series econometric model", British Journal of Criminology, Vol. 37, pp. 437-445.

Raphael, S. and Winter-Ebmer, R. 2001, "Identifying the Effect of Unemployment on Crime", Journal of Law and Economics, Vol. 44, pp. 259–283.

Saridakis, G. and Spengler, H. 2009, Crime, Deterrence and Unemployment in Greece: A Panel Data Approach, Discussion Papers, no. 853, pp. 1-9.

Scorcu, A. E. and Cellini, R. 1998, "Economic Activity and Crime in the Long Run: An Empirical Investigation on Aggregate Data from Italy, 1951–1994", International Review of Law and Economics, Vol. 18, pp. 279–292.

Tang, C. F. and Lean, H. H. 2007, "Will Inflation Increase Crime Rate? New Evidence from Bounds and Modified Wald Tests", Gobal Crime, Vol. 8, pp. 311-323.

Teles, V. K. 2004, "The Effects of Macroeconomic Policies on Crime", Economics Bulletin, Vol. 11, pp. 1-9.

Van Dijk, J. J. M., Manchin, R., Van Kesteren, J., Nevala, S. and Hideg, G. 2005, The Burden of Crime in the EU. Research Report: A Comparative Analysis of the European Crime and Safety Survey (EU ICS) 2005. pp. 21–23. Retrieved May 5, 2012.

Van Dijk, J. J. M., Van Kesteren, J. and Smit, P. 2008, Criminal Victimisation in International Perspective, Key findings from the 2004-2005 ICVS and EU ICS. The Hague: Boom Legal Publishers. pp. 99–104. Retrieved June 27, 2013.

Wu, D. and Wu, Z. 2012, "Crime, Inequality and Unemployment in England and Wales", Applied Economics, Vol. 44, pp. 3765-3775.

Yıldız, R., Öcal, O. and Yıldırım, E. 2010, "Suçun Sosyoekonomik Belirleyicileri: Kayseri Üzerine Bir Uygulama", Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, no. 36, pp. 15-31.