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<http://dx.doi.org/10.12739/NWSA.2014.9.2.3A0066>

CRIME TRENDS IN TURKEY

ABSTRACT

This study examined the trends and spatial variations of crime types from 1999 to 2008 for turkey, using judicial statistics, geographic information system (GIS) and statistical methods. Changes in crime rates and their statistical significance levels were determined by using trend analysis with linear regression equation. Visualized trends, rates and predictions were interpreted to explain the crime patterns. According to the results while public order crimes (property and violent) were increased, traffic and financial crimes were decreased in turkey at ten years period.

Keywords: Crime Trends, Crime Statistics, GIS, Turkey, Crime Mapping

TÜRKİYE'DEKİ SUÇ TRENDLERİ

ÖZET

Bu çalışmada 1999 ve 2008 yılları arasında toplanan adalet istatistikleri coğrafi bilgi sistemleri ve istatistiksel yöntemler kullanılarak incelendi. Suç oranlarındaki değişimler ve bu değişimlerin istatistiksel anlamlılığı trend analizi kullanılarak belirlendi. Görselleştirilen trendler, oranlar ve tahminler suç yapılarını açıklamak için yorumlandı. Suç yapıları incelendiğinde mülke ve şahsa karşı işlenen suçların oranlarında artış görülürken trafik ve finansal suçların oranlarında azalma olduğu tespit edildi.

Anahtar Kelimeler: Suç Trendleri, Suç İstatistikleri, CBS, Türkiye, Suç Haritalama



1. INTRODUCTION (GİRİŞ)

Improving the quality of life is one of the most important governments' objectives. Increasing in crime or changing in crime pattern, affects our lives. Some decisions such as site selection for home, workplace or school, etc., are subject to change [1, 2 and 3]. It may be too late to take measures and have some knowledge about the spatial and temporal changes in the case of unsustainable life and quality. Any installation of the information system about crime monitoring, data analysis or planning of measures are not very difficult in this digital age. The data storage and analysis system, which is multi-scaled from local to global, provides a lot of benefits in reducing crimes and improving the quality of life. Extracted information in forms such as maps, tables and graphics than GIS which is an information system equipped with geographical data, is one of the most important tools in this field [4].

A lot of researcher and governmental agencies use GIS to discover structure of events, make decisions or perform daily tasks. Law enforcement interest in using GIS to map the incidence of crime occurred in parallel to research activities that identified patterns in crimes and criminal behavior in the emerging field of environmental criminology [5]. Crime location or geographic information associated with a criminal event, can provide clues about the identity of suspects, assist in the design of prevention or apprehension strategies, aid in the evaluation of programs, and help gain a better understanding of environmental factors that may be associated with crime [6].

GIS applications, which consist of the changes spatial and temporal in crimes, have been made by a lot of researches [5, 8-13].

Customized a general GIS software or a special developed software are utilized in crime analysis to extract crime patterns and profiles and determine crime hotspots from data which are either statistics or police records. Generally, values such as crime counts or crimes per thousand people are used in crime analysis of a province or a country. The results of crime analysis cannot be compared easily at between years or countries because of different criminal codes and data contents.

2. RESEARCH SIGNIFICANCE (ÇALIŞMANIN ÖNEMİ)

As distinct from the studies in literature, the time-dependent changes (trends) in the rates of crime types according to the total crimes were examined in this paper. It is possible to obtain the changes in the structure of the distribution of crimes with this distinction point. The method was applied to Turkey's judicial data. The linear regression equation was used for the trend analysis. The statistical results were integrated with the province data on the GIS environment. The analysis results were statistically interpreted not just for Turkey, but also its regions and provinces. The analysis which was multi-scaled from local to global may provide some images to help gain a better understanding of crime patterns in Turkey.

3. METHODOLOGY OF THE STUDY (ÇALIŞMANIN METODOLOJİSİ)

The judicial statistics, which has been accessed crime statistics that are published on provincial basis in Turkey, were obtained between 1999 and 2008 from Turkish Statistical Institute (TURKSTAT) [14]. The "Imprisoned Convict Statistics" covers the provinces and types of crimes committed by the convicts.

The basic spatial data is the vector GIS data and it consisted of 81 province borders. Province borders data stored in ArcGIS "shp" format are geographical coordinates based on Hayford ellipsoid. Data



were examined in below steps by means of SPSS 17.0, Excel and ArcGIS.

- Crimes were categorized under seven crime types: Property (theft, pillaging, fraud), Violent (homicide, bodily harm, deprivation of liberty, insult, maltreatment, firearms and knives, misdemeanours), Alcohol and Drugs (manufacture and trade, using or buying, using, selling and buying), Others (forest crimes, military crimes, other crimes), Traffic, Financial (forgery, embezzlement, bribe, smuggling, bankruptcy and enforcement, corruption), Sexual Crimes (sexual crimes, adultery).
- The rates of each crime types according to year's total were calculated for each province.
- Numbers of convicts per thousand people were calculated as per 2008 population for visualization of rates.
- Trend values rates between years and trends' statistical significances were calculated. The model (1) has been established for the crime type's rate of each province.

$$Y = a + b X \quad (1)$$

where, Y is the dependent variable (rates), X is the independent variable (years), and a is the constant term (the prediction of the mean value of the dependent variable when the value of the independent variable is zero), b is the slope coefficient (the measure in the change of the mean value of the dependent variable when the independent variable changes by one unit). The coefficient b that shows the trend effect has been utilized in the maps.

- The rates of crime types were calculated and predicted by using the coefficients, for 2011 and 2013.
- The values for country and regions were calculated by summarizing provinces results
- Calculated values were related with province spatial data in GIS environment.
- The rates' map was produced through the method of colouring the highest values in the pie charts. Dimensions of the pie chart were sized by using values were mentioned in the 3rd step.
- Trend values and their statistical significances were mapped for each crime types.
- Predicted rates' maps were produced.
- The patterns were interpreted by evaluating the maps, tables and graphs.

The statistics data has some details, and these may be caused by methodological inaccuracies:

- The Turkish Criminal Procedure Code was reformed in 2005. The financial crimes were affected from changes. Therefore, the numbers of the convicts from the financial crimes were increased.
- The statistics for the province of Duzce does not exist in 1999
- Alcohol and drugs values are not exist for the province of Ardahan.
- Some values in the data were empty because of changed or combined criminal codes by judicial system.

4. FINDINGS (BULGULAR)

Turkey: The number of convicts showed minor fluctuations in the period of 1999-2004. The lowest and the highest rates were calculated in 2005 and 2007 respectively (Fig. 1). This change was sourced from the arrangements in the related laws [15].

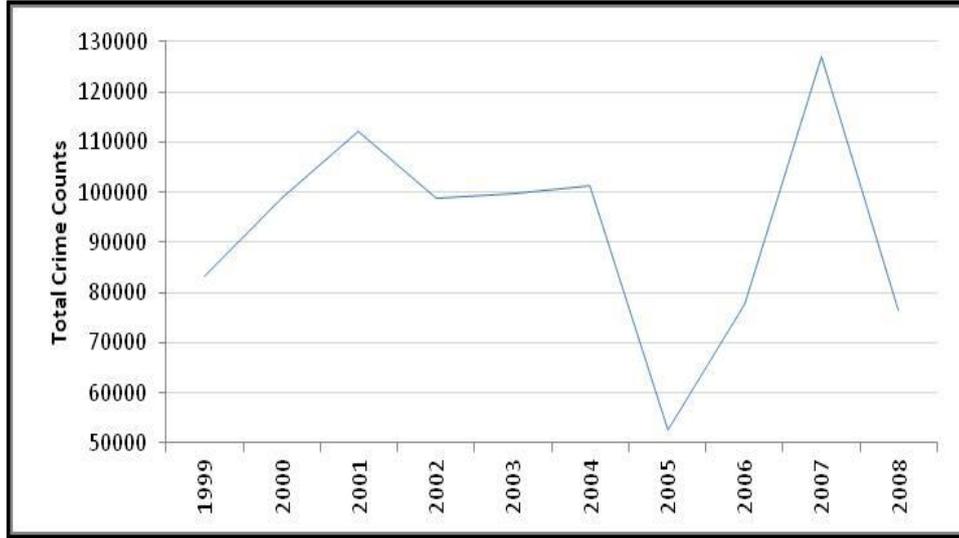


Figure 1. Total crime counts in Turkey
(Şekil 1. Türkiye'deki toplam suç sayılarının yıllara göre değişimi)

The order of total crime rates were financial, property-violent, others, alcohol and drugs, sexual crimes in Turkey (Fig. 2 and 3). There was a stable condition in crimes for sexual, alcohol and drugs and Traffic. But alcohol and drugs crimes were increased in recent years. Public order crimes were increased in 2008 after the peak in 2005. Financial crimes were resulted with an excessive decrease in 2005, an increase in 2007 and again a decrease in 2008.

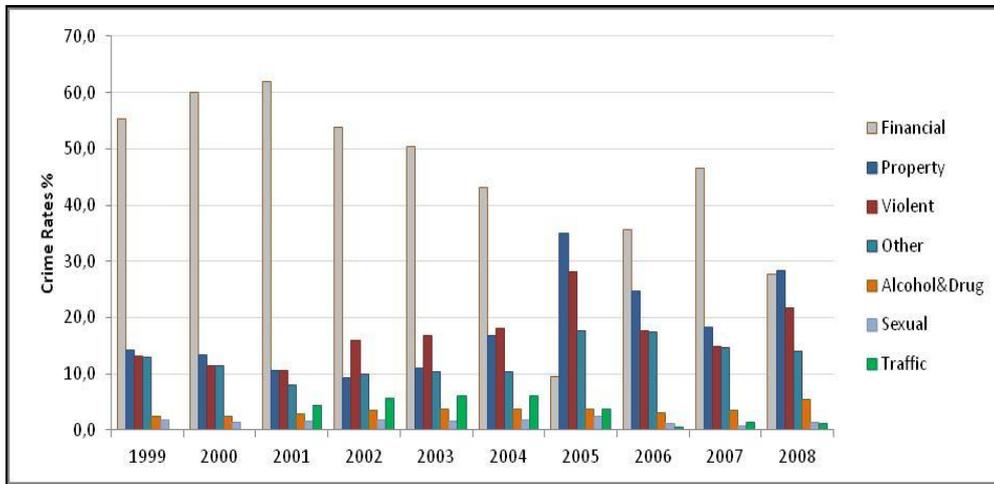


Figure 2. Rates of crime types in Turkey
(Şekil 2. Türkiye'de yıllara göre suç tiplerinin oransal dağılımındaki değişim)

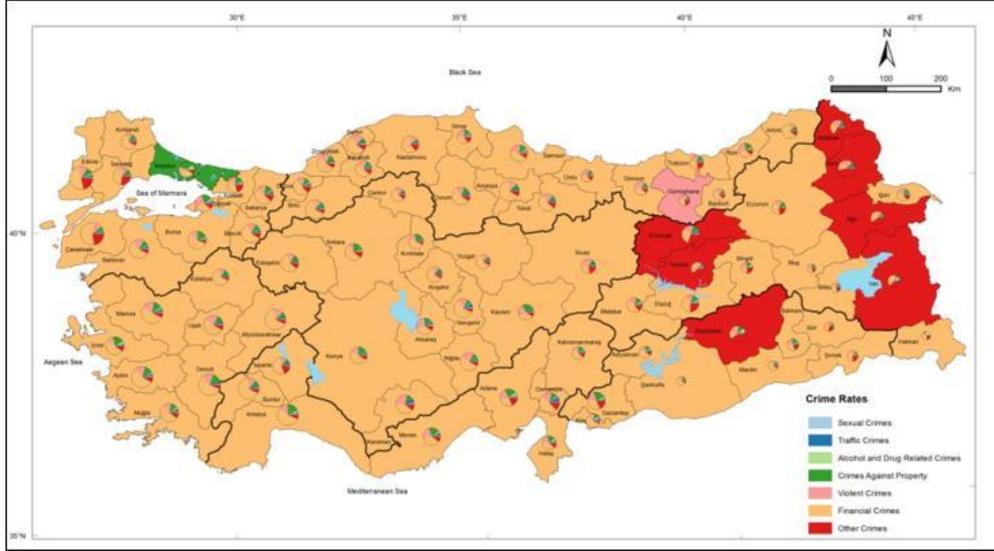


Figure 3. Rates of crime types
Şekil 3. Suç tiplerinin oransal dağılımı

Regions: The increasing in crime rates is ordered as following: Marmara, Aegean, Central Anatolia, Mediterranean, Black Sea, Southeastern and Eastern Anatolia (Fig 4). The pattern of crime rates was really close to regions' population ratios. Significant crime trends of regions (Fig. 5) were calculated from the province data (Table 1). The order of increasing trends is as following:

- Marmara: Property, violent-alcohol and drugs, others
- Aegean: Violent, others, property, alcohol and drugs
- Black Sea: Property, violent, others, alcohol and drugs
- Central Anatolia: Financial, violent, property, alcohol and drugs-others
- Mediterranean: Property, alcohol and drugs, violent-others
- Eastern Anatolia: Violent, property, alcohol and drugs, others, financial
- South Eastern Anatolia: Property, violent, alcohol and drugs-others
- Additionally, the order of decreasing trends is as following:
- Marmara: Traffic, financial, sexual
- Aegean: Traffic, financial
- Black Sea: Traffic, sexual, financial, alcohol and drugs-others
- Central Anatolia: Traffic-sexual
- Mediterranean: Traffic, financial, sexual
- Eastern Anatolia: Financial-traffic, alcohol and drugs, others-sexual
- South Eastern Anatolia: Alcohol and drugs-traffic-financial, sexual, others.

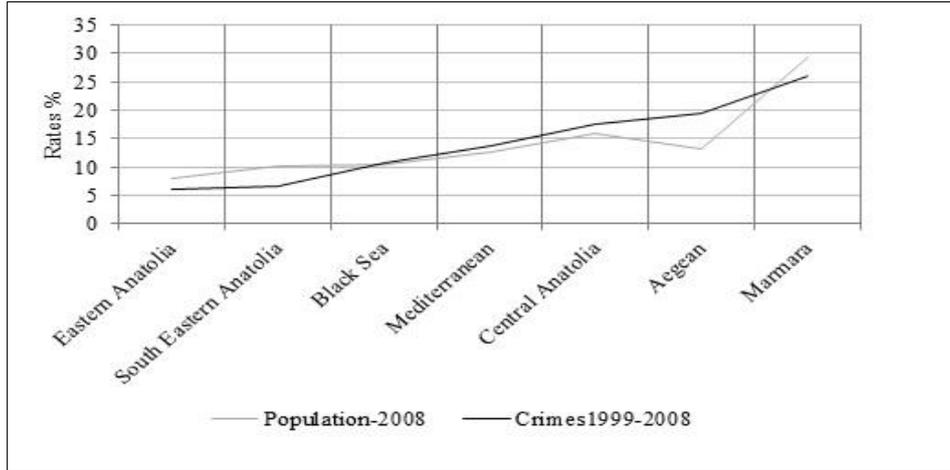


Figure 4. Crime rates and population ratios of regions.
(Şekil 4. Bölgelere göre suç ve nüfus oranlarının karşılaştırılması)

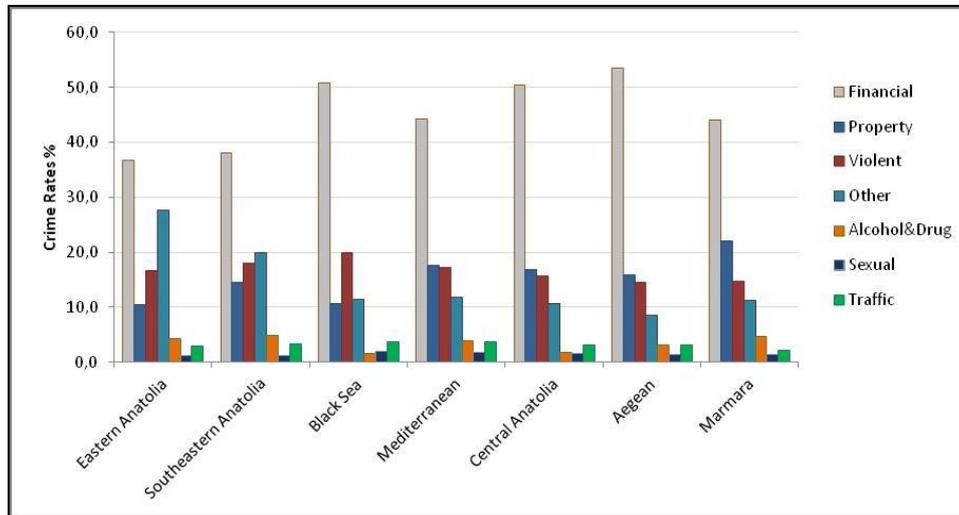


Figure 5. Distribution of crime rates in regions
(Şekil 5. Bölgeler içinde suç oranlarının dağılımı)

Provinces: After calculating the rates of crime types, they were resulted with generally homogenous distribution, except 9 provinces (Figure 3, 6). Some comments about provinces as following:

Financial crimes have the highest value with 89% of provinces

- Other crimes have the second value with 8% of provinces which are in the east of the country.
- The public order crimes have shared values with 2% of provinces. The rates of crimes against property are higher than others in İstanbul. Violent crimes are higher than others in Gumushane province, located east of the Black Sea Region.

Crime trends which were presented in Figure 7 and Table 1, were evaluated and the crime pattern of Turkey for ten years were extracted. Patterns of trends are as following:

- Percentage of cities which have significant trend coefficients: (Crime Type - Percentage of cities)
- Increasing: Property crimes -56%, violent crimes -46%, alcohol and drugs crimes-31%, other crimes-26%, financial crimes-1%
- Decreasing: Traffic crimes-65%, financial crimes-57%, sexual crimes-26%, alcohol and drugs crimes-9%, other crimes-5%

- Total values of trends (Crime Type - Percentage of cities)
 - Increasing: Property crimes -99%, violent crimes -94%, alcohol and drugs crimes -75%, other crimes-73%, sexual crimes-30%, financial crimes-9%, traffic crimes-2%
 - Decreasing: Traffic crimes-98%, financial crimes-91%, sexual crimes-70%, alcohol and drugs crimes- 25%, other crimes-22%, violent crimes-6%, property crimes-1%
 - Pattern of trends are similar for total and significant values, except sexual and traffic crimes in increasing trends, public order crimes in decreasing trends.
 - The results shows that public order crimes were increased, traffic and financial crimes were decreased in Turkey in ten years period.

Crime trends of metropolis are as following:

- Property crimes: while Istanbul (SG) and Ankara (SG) shares the highest values, İzmir's value (NSG) is low in increasing trends.
- Violent crimes: Ankara (SG) and İzmir (SG) have higher values than Istanbul (NSG) in increasing trends.
- Alcohol and drugs crimes: While Ankara (SG) and Istanbul (NSG) have increasing trends; İzmir (NSG) has decreasing trends.
- Other crimes: Ankara (SG) is ordered as sixth among provinces, İzmir (NSG) and İstanbul (NSG) have low values in increasing trends.
- Traffic crimes: İstanbul (SG) and İzmir (NSG) have decreasing values; Ankara's value (NSG) is close to zero in increasing trends.
- Financial crimes: While Ankara (SG) has the lowest value, İzmir (NSG) and İstanbul (SG) are in decreasing values.
- Sexual crimes: İstanbul (SG) and İzmir (NSG) are in decreasing values, Ankara (NSG) is in increasing values.

Prediction of Rates for 2011 and 2013: The probable distributions of crimes which have the highest percentage in each province were estimated for 2011 and 2013 by relying on the trend coefficient values calculated for each types of crime (Fig. 8). According to the results crimes show that distribution in Turkey, violent crimes-39% of provinces, financial crimes-26% of provinces, property crimes-20% of provinces and other crimes-15% of provinces in 2011, violent crimes-42% of provinces, property crimes-25% of provinces, financial crimes-20% of provinces and other crimes-13% of provinces in 2013.

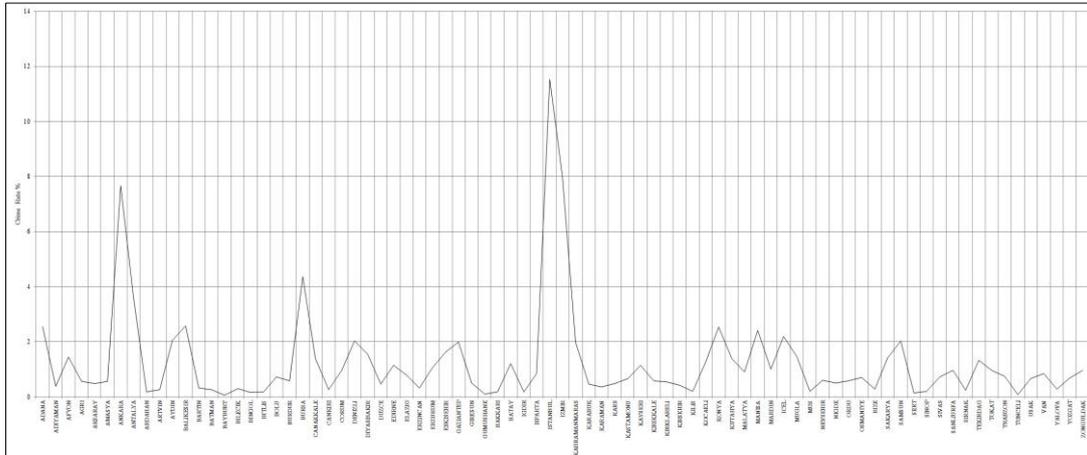


Figure 6. Crime rates of provinces
(Şekil 6. İllerin suç oranları)

Table 1. Crime trends of provinces
(Tablo 1. İllerdeki suç trendleri)

Crime Types	Increasing Trends		Decreasing Trends	
	Total and Percent	Provinces	Total and Percent	Provinces
Property	SG:45-55.56% NSG: 35-43.21% Total: 99%	<u>İstanbul</u> , <u>Ankara</u> , <u>Kayseri</u> , <u>Batman</u> , <u>Kocaeli</u> , ... , <u>İzmir</u> , ...	NSG: 1,1.23% Total: 1%	<u>Bayburt</u> , <u>Bartın</u> , <u>Van</u> , <u>Aksaray</u> , <u>Giresun</u>
Violent	SG: 37-45.68% NSG: 39-48.15% Total: 94%	<u>Niğde</u> , <u>Iğdır</u> , <u>Bingöl</u> , <u>Gümüşhane</u> , <u>Kırşehir</u> ,..., <u>Ankara</u> , ... , <u>İzmir</u> ,... <u>İstanbul</u> , ...	NSG: 5, 6.17% Total: 6%	<u>Bayburt</u> , <u>Hakkari</u> , <u>Rize</u> , <u>Van</u> , <u>Şırnak</u>
Alcohol and Drugs	SG: 25, 30.86% NSG: 36, 44.44% Total: 75%	<u>Bitlis</u> , <u>Bingöl</u> , <u>Kilis</u> , <u>Muğla</u> , <u>Tunceli</u> , ... , <u>Ankara</u> , <u>İstanbul</u> , ...	SG: 7, 8.64% NSG: 13, 16.05% Total: 25%	<u>Hakkari</u> , <u>Van</u> , <u>Kocaeli</u> , <u>Batman</u> , <u>Diyarbakır</u> , ... <u>İzmir</u> , ...
Others	SG: 21, 25.93% NSG: 38, 46.91% Total: 73%	<u>Kars</u> , <u>Edirne</u> , <u>Kocaeli</u> , <u>İsparta</u> , <u>Çanakkale</u> , <u>Ankara</u> ,..., <u>İzmir</u> , ... , <u>İstanbul</u> , ...	SG: 4, 4.94% NSG: 18, 22.22% Total: 27%	<u>Tunceli</u> , <u>Kastamonu</u> , <u>Siirt</u> , <u>Batman</u> , <u>Şırnak</u> , ...
Traffic	NSG: 2, 2.47% Total: 2%	<u>Ankara</u> , <u>Giresun</u>	SG: 53,65.43% NSG: 26,32.10% Total: %98	<u>Osmaniye</u> , <u>Kars</u> , <u>Çankırı</u> , <u>Çorum</u> , <u>Adıyaman</u> ,..., <u>İzmir</u> , <u>İstanbul</u> ,...
Financial	SG: 1,1.23% NSG: 6,7.41% Total:%9	<u>Kastamonu</u> , <u>Hakkari</u> , <u>Bayburt</u> , <u>Van</u> , <u>Siirt</u>	SG: 46,56.79% NSG: 28,34.57% Total: 91%	<u>Ankara</u> , <u>Niğde</u> , <u>Edirne</u> , <u>Hatay</u> , <u>Kırşehir</u> , ... , <u>İstanbul</u> , ... , <u>İzmir</u> , ...
Sexual	NSG: 24,29.63% Total:%30	<u>Uşak</u> , <u>Tunceli</u> , <u>Kırklareli</u> , <u>Niğde</u> , <u>Şırnak</u> , ... , <u>Ankara</u> , ...	SG: 21,25.93% NSG: 36,44.44% Total: 70%	<u>Gümüşhane</u> , <u>Bayburt</u> , <u>Aksaray</u> , <u>Çankırı</u> , <u>Düzce</u> ,..., <u>İstanbul</u> ,... <u>İzmir</u> ,...
Alcohol and Drugs	SG: 25, 30.86% NSG: 36, 44.44% Total: 75%	<u>Bitlis</u> , <u>Bingöl</u> , <u>Kilis</u> , <u>Muğla</u> , <u>Tunceli</u> , ... , <u>Ankara</u> , <u>İstanbul</u> , ...	SG: 7, 8.64% NSG: 13, 16.05% Total: 25%	<u>Hakkari</u> , <u>Van</u> , <u>Kocaeli</u> , <u>Batman</u> , <u>Diyarbakır</u> , ... <u>İzmir</u> , ...
Others	SG: 21, 25.93% NSG: 38, 46.91% Total: 73%	<u>Kars</u> , <u>Edirne</u> , <u>Kocaeli</u> , <u>İsparta</u> , <u>Çanakkale</u> , <u>Ankara</u> ,..., <u>İzmir</u> , ... , <u>İstanbul</u> , ...	SG: 4, 4.94% NSG: 18, 22.22% Total: 27%	<u>Tunceli</u> , <u>Kastamonu</u> , <u>Siirt</u> , <u>Batman</u> , <u>Şırnak</u> , ...
Traffic	NSG: 2, 2.47% Total: 2%	<u>Ankara</u> , <u>Giresun</u>	SG: 53,65.43% NSG: 26,32.10% Total: %98	<u>Osmaniye</u> , <u>Kars</u> , <u>Çankırı</u> , <u>Çorum</u> , <u>Adıyaman</u> ,..., <u>İzmir</u> , <u>İstanbul</u> ,...
Financial	SG: 1,1.23% NSG: 6,7.41% Total:%9	<u>Kastamonu</u> , <u>Hakkari</u> , <u>Bayburt</u> , <u>Van</u> , <u>Siirt</u>	SG: 46,56.79% NSG: 28,34.57% Total: 91%	<u>Ankara</u> , <u>Niğde</u> , <u>Edirne</u> , <u>Hatay</u> , <u>Kırşehir</u> , ... , <u>İstanbul</u> , ... , <u>İzmir</u> , ...
Sexual	NSG: 24,29.63% Total:%30	<u>Uşak</u> , <u>Tunceli</u> , <u>Kırklareli</u> , <u>Niğde</u> , <u>Şırnak</u> , ... , <u>Ankara</u> , ...	SG: 21,25.93% NSG: 36,44.44% Total: 70%	<u>Gümüşhane</u> , <u>Bayburt</u> , <u>Aksaray</u> , <u>Çankırı</u> , <u>Düzce</u> ,..., <u>İstanbul</u> ,... <u>İzmir</u> ,...

SG: Statistically significant (0.1 and less) valued provinces number and its ration to 81 provinces
NSG: Statistically non-significant valued provinces which were typed as underlined, number and its ration to 81 provinces
Total: Percent value of trend, SG+NSG/81
Increasing trends were typed since the highest value, decreasing trends were typed since lowest value.

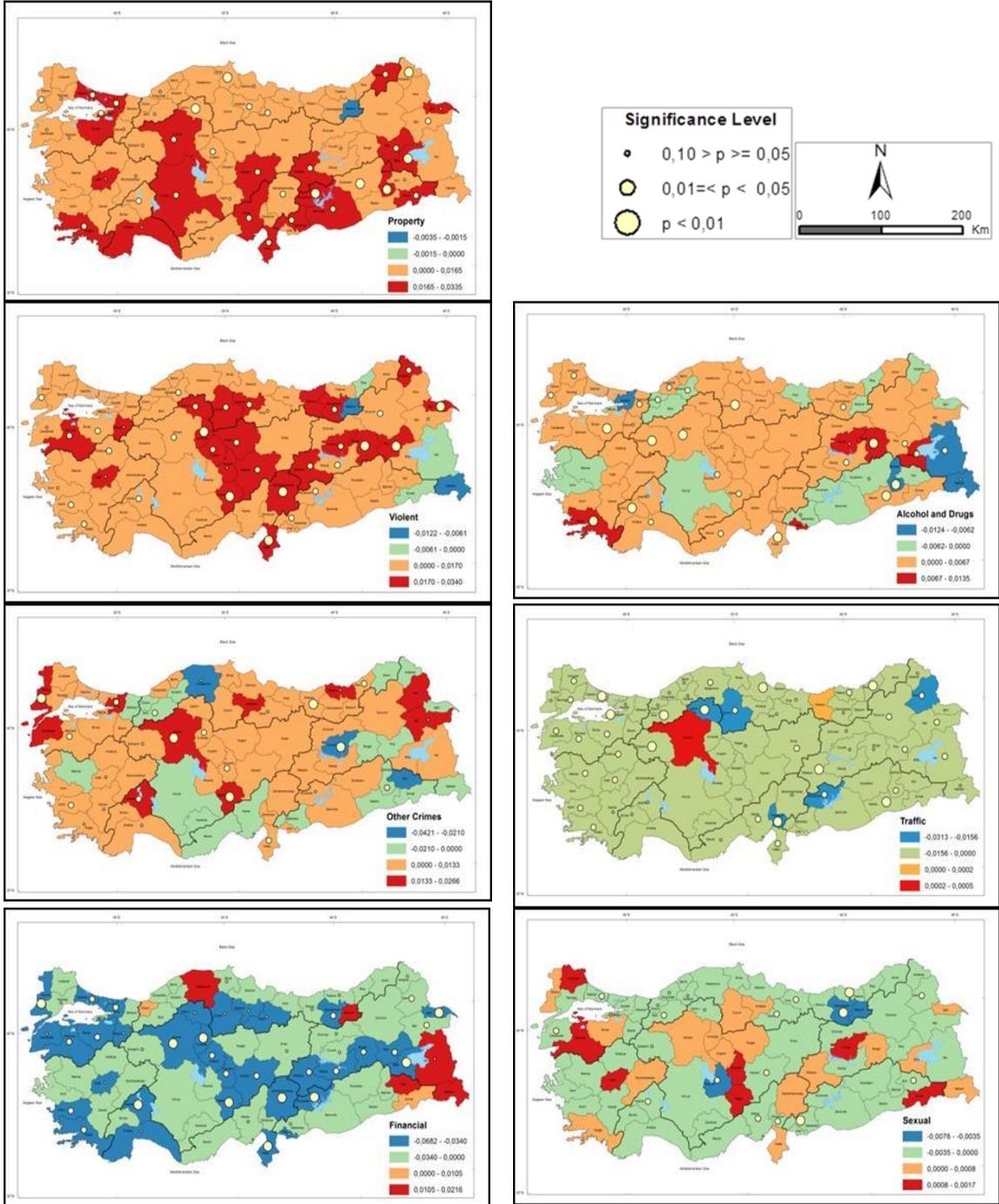


Figure 7. Trends of crime types of provinces
(Şekil 7. İl bazında suç türlerinin eğilimleri)

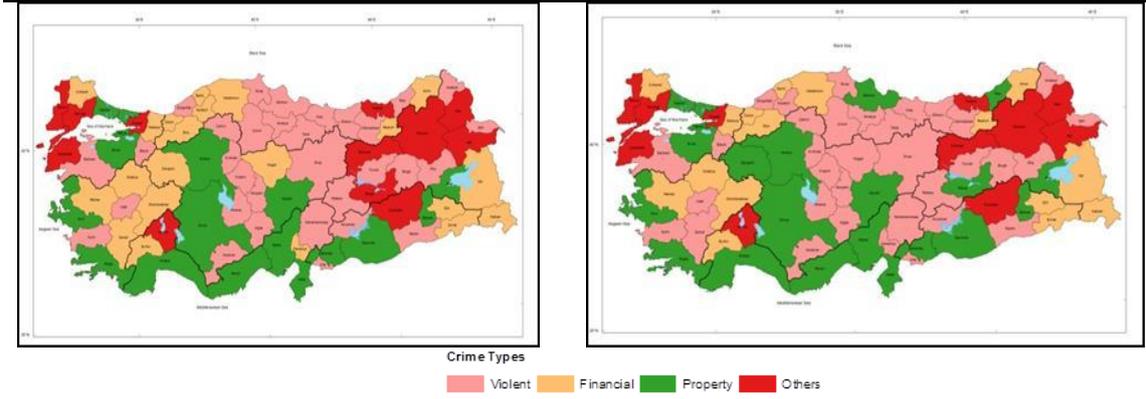


Figure 8. 2011 and 2013 predictions for the crimes
(Şekil 8. 2011 ve 2013 yılları için suç türlerinin tahminleri)

5. CONCLUSION AND RECOMMENDATIONS (SONUÇ VE ÖNERİLER)

In this paper, crime type patterns, which were produced from local to global for Turkey, were presented. Only one crime dataset and a GIS file were used to extract patterns. Processes were preceded in a GIS and statistics software. The literature review and this study show us that the data collection and storage standards are more important than software, if we want to compare results. Using the linear regression equation for trends has applied at a lot of projects. But the equation has not examined to extract the crime types pattern. This study created a lot of images about Turkey's crime patterns. Researchers who have studied on crimes could examine our method and results also Turkish Government Police Department could use our results to reduce crimes. The produced maps will give clues for making new research studies to the sociologists.

NOTE (NOT)

This paper is based on the doctoral dissertation study of the first author and also this research was supported by the Y.T.Ü. under Grant No. 29-03-02-ODAP01. It was presented in 1st International Symposium on Digital Forensics and Security (ISDFS'13) on 20-21 May 2013 at Elazığ, Turkey.

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