İstanbul Ticaret Üniversitesi Fen Bilimleri Dergisi Yıl: 11 Sayı: 22 Güz 2012 s. 37-53

THE INFLUENCE OF SOCIAL, ECONOMICAL AND PHYSICAL ENVIRONMENTAL FACTORS ON CRIME RATES: A CASE STUDY OF THE BOSPHORUS CONSERVATION AREA, ISTANBUL, TURKEY*

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Received: 15.03.2012 Accepted: 14.11.2012

ABSTRACT

This study aims to analyze the relation between personal and property crime and social, economical and physical environmental factors. Crime data was collected at neighborhood level in the coastal strip and fore front view area of the Bosphorus, Istanbul, Turkey. For the social and economical factors, data on population density, average land value, percentage of unemployment, percentage of population with primary school and under education, and percentage of large households were collected. For the physical environmental factors, data on building density, land use (percentage of residential, commercial, and public facilities buildings), physical detoriation (percentage of good quality buildings), percentage of buildings with water, sewage and natural gas were collected. In general, the findings provided evidence that (1) personal and property crimes are positively correlated, (2) the affect of physical environmental factors are more pronounced for property crimes than personal crimes, and (3) lower crime rates are observed in socially and economically disadvantageous neighborhoods. The possible explanations for each finding and how each finding could inform future research in this area are discussed.

Key Words: personal crime, property crime, physical environment, empirical study

SOSYAL EKONOMIK VE FİZİKSEL ÇEVRE FAKTÖRLERİNİN SUÇ ORANLARI ÜZERİNDEKİ ETKİLERİ: ISTANBUL BOGAZİÇİ ÖNGÖRÜNÜM ALANINDA DENEYSEL BIR ÇALIŞMA

ÖZET

Bu çalışma sosyal, ekonomik ve fiziksel çevre faktörlerinin suç oranları üzerindeki etkisini İstanbul Boğaziçi Öngörünüm alanında deneysel olarak test etmeyi amaçlamıştır. Sosyal ve ekonomik durum göstergeleri olarak nüfus yoğunluğu, ortalama arazi değeri, işsizlik oranı, eğitim ve hane halkı büyüklüğüne ilişkin veriler kullanılmıştır. Fiziksel çevrenin özelliklerine yönelik göstergeler ise yapı yoğunluğu, arazi kullanış durumu, fiziksel bozulma, ve altyapı olanaklarına ait verileri içermiştir. Sonuç olarak (1) cana ve mala karşı işlenmiş suç oranları arasında pozitif bir korelasyon olduğu, (2) mala karşı işlenen suçlarda fiziksel çevre özelliklerinin sosyal çevre özelliklerinden daha etkili olduğu (3) sosyal ve ekonomik açıdan dezavantajlı bölgelerde suç oranlarının daha düşük olduğu bulunmuştur. Bundan sonra konu hakkında yapılacak araştırmalara yön verebilmek amacıyla, elde edilen bulgular çalışmanın yöntemi ve kapsadığı alan kapsamında tartışılmıştır.

Anahtar Kelimeler: Cana Karşı İşlenen Suçlar, Mala Karşı İşlenen Suçlar, Fiziksel Çevre, Deneysel Araştırma

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** A different version of this study was presented in `1st National Symposium on Quantitative Methods in Planning - 1. Uluslararası Planlamada Sayısal Modeller Sempozyumu` and a different version in Turkish was published as "Akman Cinar E. & Cubukcu, E. (2010) Fiziksel ve Sosyal Faktörlerin Suçun Mekansal Dağılımına Etkisi: İstanbul Boğaziçi Öngörünüm Alanı Örneği, 1. Uluslararası Planlamada Sayısal Modeller Sempozyumu, 24-26 Kasım 2010, İstanbul, 645-659".*

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1. INTRODUCTION

In his seminal paper, titled as 'A Theory of Human Motivation' Maslow (1943) argued that 'safety' is a basic human need that must be fulfilled before the activation of other basic human needs, such as 'love and belonging', 'self esteem', and 'self actualization'. As safety overshadows the other basic human needs, researchers has long been investigating the means to prevent (or diminish) criminal activity. Such means ranged from law to governmental policies to environmental design.

The common knowledge suggests that criminal activity is as old as human society and the scientific data shows that it is still a major concern in modern society. According to the International Crime Victim Survey (ICVS), which has collected data on 30 countries and 28 main cities in various world regions, almost 16% of the population has been a victim of any crime in 2004 and most of the high crime countries are relatively highly urbanized (Van Dijk, van Kesteren, & Smit, 2008). In other words, crime is a serious problem in metropolitan cities and Istanbul, Turkey is not an exception. Based on the data obtained from the archives of the Turkish Statistical Institute, Istanbul's contribution to the total crime committed in all cities in Turkey varied from 11% to 16% between the years 1990 and 2008 (Figure 1). Thus, this study focuses on crime in Istanbul, Turkey.

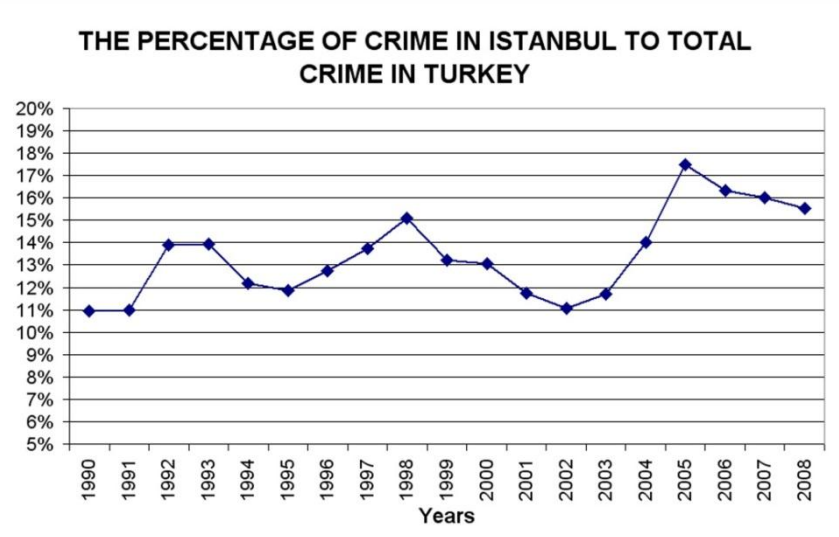


Figure 1. Istanbul's share of crime in Turkey from 1990 to 2008.

The topic of crime has long attracted researchers from different fields, such as psychology, criminology, economy, architecture and planning. Analyzing crime in urban areas and developing strategies for crime prevention in urban areas is essentially important for planners who aim to design, establish, preserve and

develop safe environments. Researchers specialized in planning analyzed crime at two levels: macro and micro levels (Ackerman & Murray, 2004). At the macro level, the total number of crime (in proportion to population) is analyzed at the census tract level, in order to identify problem neighborhoods (or districts). On the other hand, at the micro level the precise location, where the crime is committed, is specified and clusters of crime is analyzed to identify the problem areas within neighborhoods. A macro level approach is employed in this study.

At the macro level, spatial pattern of crime is analyzed to understand the relation between crime and social, economical and physical environmental factors (Ackerman & Murray, 2004). For the social and economical factors, researchers focused on landvalue (Ayhan & Cubukcu, 2010; Lockwood, 2007; Yirmibesoglu & Ergun, 2007a;), unemployment (Kohlfeld & Sprague, 1988; Yirmibesoglu & Ergun, 2007a), education (Ackerman & Murray, 2004; Ergun & Yirmibesoglu, 2005, 2007; Yirmibesoglu & Ergun, 2007a, 2007b), income (Ackerman & Murray, 2004), density (Ergun & Yirmibesoglu, 2007; Ergun, Giritlioglu & Yirmibesoglu, 2003; Yirmibesoglu & Ergun, 2007a), and family structure (Ergun, et al., 2003; Ergun & Yirmibesoglu, 2007). They argued that higher land values, unemployment, low level of education, low income, overcrowding and changes in the family size contributes to crime statistics. For the physical environmental factors, researchers discussed the impact of land use (Ergun, et al. 2003; Ergun & Yirmibesoglu, 2005; Browning et al., 2010; Lockwood, 2007; Yirmibesoglu & Ergun, 2007a, 2007b) on crime and argued that physical detoriation (Ackerman, 1976; Ergun & Yirmibesoglu, 2007; Kohlfeld & Sprague, 1988) and inadequacy of infrastructure (Ergun, et al., 2003) produced higher crime rates. Although the social, economical and physical environmental factors that facilitate crime have long been studied, little is known about the root causes of crime as they are diverse and complex (Levitt & Dubner, 2006). In brief, the literature suggests a wide range of causes (or correlates) of crime (see literature review by Ayhan & Cubukcu, 2007). However, the influence of social, economical and physical environmental factors on crime could vary with the site studied. For example, the factors that are claimed to affect crime in metropolitan cities may not affect crime in small size cities. Similarly, the studies conducted in developed countries may not have an applied value in developing countries. Although, crime in Istanbul has been investigated at specific neighborhoods at micro level (Unlu et al. 2003; Unlu et al., 2004), and at the district level (macro level studies) (Ergun et al., 2003; Ergun & Yirmibesoglu, 2005, 2007; Yirmibesoglu & Ergun, 2007a, 2007b), no study analyzed the spatial distribution of crime rates in Istanbul at neighborhood level and investigate the influence of social, economical and physical environmental factors on property and personal crime rates with a comprehensive approach. This is the focus of our work.

In brief, majority of previous studies on crime in urban areas were conducted in cities of various sizes in “developed” countries. This study is conducted in a “metropolitan” city in a “developing” country. Previous studies focused either on personal crime or property crime. This study focuses on both to investigate the

relation between two types of crime. Previous studies focused on either social and economical factors or physical environmental factors. This study aims to analyze the simultaneous effect of social, economical and physical environmental factors on crime rates.

2. SITE

The coastal strip and fore front view area of the Bosphorus, Istanbul, Turkey was selected to analyze the spatial distribution of crime in Istanbul for two reasons. First, the neighborhoods within this area shows a heterogeneous character with respect to social, economical and physical factors. Second, it is difficult to access data on crime in developing countries (Ergun & Yirmibesoglu, 2007) and data collected by Istanbul Metropolitan Area was available only for this area.

The border of fore front view area of the Bosphorus was determined by the Bosphorus Law in 1983 (Figure 2) and it is within the Istanbul Metropolitan Area. The area is about 4632 hectare and involves 49 neighborhoods within the districts of Besiktas, Sariyer, Beykoz and Uskudar. Note, the border of fore front view area of the Bosphorus does not overlap with the neighborhood borders. Among the 49 neighbourhoods, 7 neighbourhoods (Camlibahce, Cigdem, Icadiye, Kiralitepe, Kucuksu, Ortacesme, PTT evleri) has less than 10 hectares within the border of fore front view area of the Bosphorus. Such neighborhoods that were represented with less than 10 hectares within the border of fore front view area of the Bosphorus were eliminated from the data set. The selected area extends from Ortakoy to Rumelikavagi at the European side and from Hacihesna Hatun to Anadolukavagi at the Anatolian side.

2.1. Distribution of Personal and Property Crime in the coastal strip and fore front view area of the Bosphorus, Istanbul.

Crime data, classified according to type, date, and the location where the crime had been committed, was obtained from the Istanbul Police Department. The data involves more than 60 types of crimes committed in 2007. The crime types were reclassified into two types; personal and property crimes. Murder, injury and / or harm were reclassified as ‘personal crimes’. Robbery from cars, businesses and homes, armed robbery, pick pocketing, snatch thievery were reclassified as ‘property crime’.

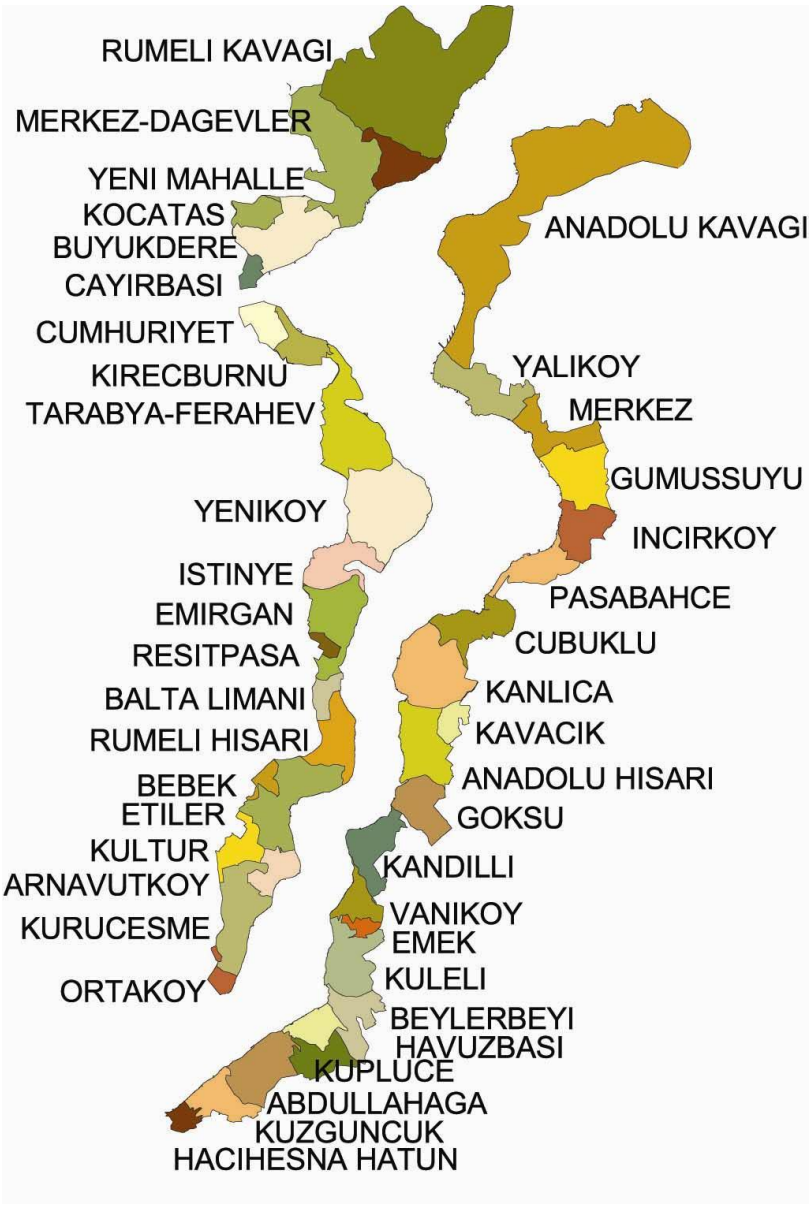


Figure 2. The neighborhoods in the fore front view area of the Bosphorous.

Table 1. Descriptive statistics on the distribution of crime rates per 1000 people in 42 neighborhoods in the fore front view area of the Bosphorous. The calculations are based on crimes committed either in the whole neighborhood or in the selected part of the neighborhood (within the fore front view area of the Bosphorous).

		Rate of Crime per 1000 people			
Crime rates per 1000 people calculation based on:	**Crime Type**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**
Crimes committed in the whole neighborhood	Personal crime	0.00	21.95	3.74	4.06
	Property Crime	0.34	18.60	5.75	5.33
Crimes committed in part of the neighborhood which is within the fore front view area of the Bosphorous	Personal crime	0.00	13.00	2.52	2.87
	Property Crime	0.00	38.69	7.04	8.02

According to the precise location of crime commitment, the total number of personal and property crimes in each neighborhood was calculated. As the neighborhoods vary in size[1], it was necessary to calculate the crime rates (total number of crime in proportion to neighborhood population). Recall, the border of fore front view area of the Bosphorus does not overlap with the neighborhood borders. Thus, four measures of crime were calculated; (1) rate of personal crime per 1000 people in the whole neighborhood[2], (2) rate of property crime per 1000 people in the whole neighborhood[3], (3) rate of personal crime per 1000 people in part of the neighborhood which overlaps with the fore front view area of the Bosphorous[4], and (4) rate of property crime per 1000 people in part of neighborhood which overlaps with the fore front view area of the Bosphorous[5]. Table 1 shows the minimum,

[1] *For the 42 neighbourhoods, the populations vary from 599 to 30703.*

[2] *Rate of personal crime per 1000 people in the whole neighborhood = (Total number of personal crimes committed in the whole neighbourhood * 1000) / Neighbourhood population*

[3] *Rate of property crime per 1000 people in the whole neighborhood = (Total number of property crimes committed in the whole neighbourhood *1000) / Neighbourhood population*

[4] *Rate of personal crime per 1000 people in the neighborhood within the fore front view area of the Bosphorous = (Total number of personal crimes committed in the selected part of a neighbourhood * 1000) / (Population within the neighbourhood * (Neighbourhood area within the fore front view area of the Bosphorous / Total neighbourhood area)*

[5] *Rate of property crime per 1000 people in the neighborhood within the fore front view area of the Bosphorous = (Total number of property crimes commited in the selected part of a neighbourhood **

maximum, mean and standard deviation of crime rates. Results indicate that more property crimes were committed than personal crimes.

The data reveals a significant and positive correlation between personal and property crime rates (Whole neighborhood: $r = 0.704$, $p = 0.000$; Part of the neighborhood overlapping the fore front view area of the Bosphorous: $r = 0.415$, $p = 0.006$).

Next, the crime rates in each neighborhood was classified as (1) below average[6], (2) about average[7] and (3) above average[8] to visually analyze the spatial patterns of crime. Results showed that spatial distribution of personal and property crimes were related (Figure 3). For the data which calculates the crime rates in the whole neighborhood, 9 of the 11 neighborhoods which were rated as 'below average' for personal crimes were also rated as 'below average' for property crimes. Similarly, 7 of the 11 neighborhoods which were rated as 'above average' for personal crimes were also rated as 'above average' for property crimes and 14 of the 20 neighborhoods which were rated as 'about average' for personal crimes were also rated as 'about average' for property crimes. Results were similar for the data which calculates the crime rates in part of the neighborhood which overlaps with the fore front view area of Bosphorous. 7 of the 11 neighborhoods which were rated as 'below average' for personal crimes were also rated as 'below average' for property crimes, 7 of the 11 neighborhoods which were rated as 'above average' for personal crimes were also rated as 'above average' for property crimes and 12 of the 20 neighborhoods which were rated as 'about average' for personal crimes were also rated as 'about average' for property crimes.

2.2. The relation between Crime Rates and Social, Economical and Physical Environmental Factors

For the social and economical factors, this study collected data on population density, average land value, percentage of unemployment, percentage of population with primary school and under education, and percentage of families with more than 4 people. For the physical environmental factors, data on building density, land use (percentage of residential buildings, commercial buildings, public facilities buildings to total number of buildings), physical detoriation (percentage of good quality buildings), percentage of buildings with water, sewage and natural gas were collected.

*1000) / (Population within the neighbourhood * (Neighbourhood area within the fore front view area of the Bosphorous / Total neighbourhood area)*

[6] *Crime rates below first quadrant*

[7] *Crime rated between first and third quadrants*

[8] *Crime rates above third quadrant*

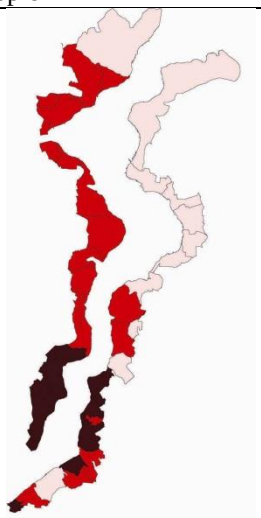
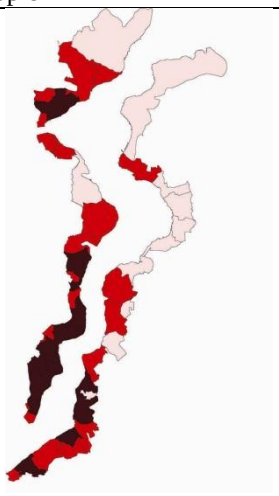
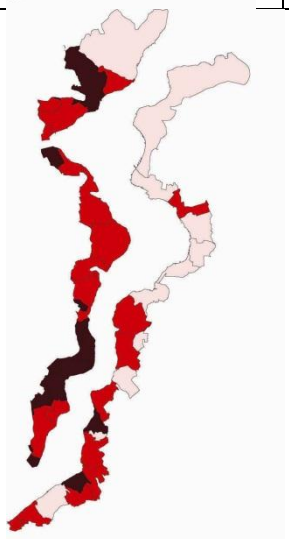
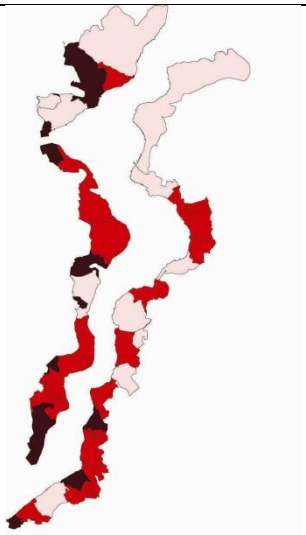
	Property Crime per 1000 people	Personal Crime per 1000 people
Crime rates calculated in the whole neighborhood		
Crime rates calculated in part of the neighborhood which is within the forefront view area of Bosphrous		
Low (below first quartile)		
Moderate (between first and third quartile)		
High (above third quartile)		

Figure 3. Spatial distribution of crime rates in the fore front view area of the Bosphorous.

Table 2 shows the descriptive statistics (minimum, maximum, mean and standard deviation) for each social, economical and physical environmental factor. As the distribution of percentage of commercial buildings does not show much variation (0 % to 3 %) in the selected area, this factor is eliminated from the remaining analyses. Similarly, the factors related to the percentage of buildings with water (mean = 97 %) and the percentage of buildings with sewage (mean = 93 %) were eliminated from the remaining analyses as the variation among 42 neighborhoods is quite limited. Almost in all neighborhoods the percentage of buildings with water and sewage is above 90 %.

Table 2. Descriptive statistics on the distribution of social, economical and physical environmental factors in 42 neighborhoods in the fore front view area of the Bosphorous.

	Factors	Min	Max	Mean	SD
Social and Economical	Population Density (total population / total neighborhood Area)	19.76	89.15	61.52	16.85
	Average Land Value	9.82	775.41	159.37	193.02
	Unemployment Rate (% of unemployed population within the population of 15-64 years)	33	68	58	6
	Low Education Rate (% of primary school and under educated people)	32	83	64	13
	Percentage of Large Families (% of households with more than 4 people)	8	41	22	8
Physical Environmental	Building Density (building area / part of the neighborhood area within the fore front view area of the Bosphorous)	0	75	18	13
	Percentage of Residential Buildings	0	29	11	7
	Percentage of Commercial Buildings	0	3	1	1
	Percentage of Public Facility Buildings	0	28	5	8
	Percentage of Good Quality Buildings	19.76	89.15	61.51	16.85
	Percentage of Buildings with Water	69	100	97	5
	Percentage of Buildings with Sewage	51	100	93	9
	Percentage of Buildings with Natural Gas	0	95	26	29

Note, the data on the social economical factors were retrieved from the Turkish Statistical Institute for the whole neighborhood[9]. On the other hand, the data on physical environmental factors were retrieved from Istanbul Metropolitan

[9] *The data was not available for the part of the neighbourhood within the boundary of the fore front view area of the Bosphorous.*

Municipality, Department of Bogazici Devleopment[10] for a part of the neighborhood which overlaps with the boundary of fore front view area of the Bosphorous. Thus, data on crimes committed within the whole neighborhood was employed to investigate the relation between crime and social and economical factors and data on crimes committed in part of the neighborhood (which overlaps with the fore front view area of Bosphorous) was employed to investigate the relation between crime and physical environmental factors.

First, each neighborhood was assigned to 'low (below median)' or 'high (above median)' classes for each social, economical and physical environmental factor in order to compare the crime rates in socially, economically, and physically advantageous and disadvantageous neighborhoods. Figure 4 shows the spatial distribution of socially, economically and physically advantageous and disadvantageous neighborhoods.

Consider the relation between 'personal crime rates' and 'social economical factors', t-test analyses showed a significant effect of land value ($t = -4.176$, $df = 40$, $p = 0.00$), education ($t = 3.121$, $df = 40$, $p = 0.00$), and household size ($t = 2.39$, $df = 40$, $p = 0.02$) on personal crimes committed within the whole neighborhood. Personal crime rates were higher in neighborhoods with high land values (mean = 5.96), low percentages of people with poor education (primary school and under) (mean = 5.52), and low percentage of large households (with more than 4 people) (mean = 5.17), compared to those with low land values (mean = 1.53), high percentages of people with poor education (mean = 1.97), and high percentages of large households (mean = 2.32) (Table 3). When the relation between 'personal crime rates' and 'physical environmental factors' was analyzed, t-test analyses showed a marginally significant effect of building density ($t = -1.940$, $df = 40$, $p = 0.06$) and a significant effect of percentage of public facility buildings ($t = 3.288$, $df = 40$, $p = 0.00$), and percentage of buildings with natural gas ($t = -4.176$, $df = 40$, $p = 0.00$) on personal crimes committed in part of the neighborhood which overlaps with the fore front view area of the Bosphorous. Personal crime rates were higher in neighborhoods with high building density (mean = 3.35), high percentages of public facility buildings (mean = 3.82), and high percentages of buildings with natural gas (mean = 5.96) compared to those with low building density (mean = 1.68), low percentages of public facility buildings (mean = 1.21), low percentages of buildings with natural gas (mean = 1.53) (Table 3).

[10] *The data was not available for the whole neighbourhood but fort he part of the neighbourhood which is within the boundary of the fore front view area of the Bosphorous.*

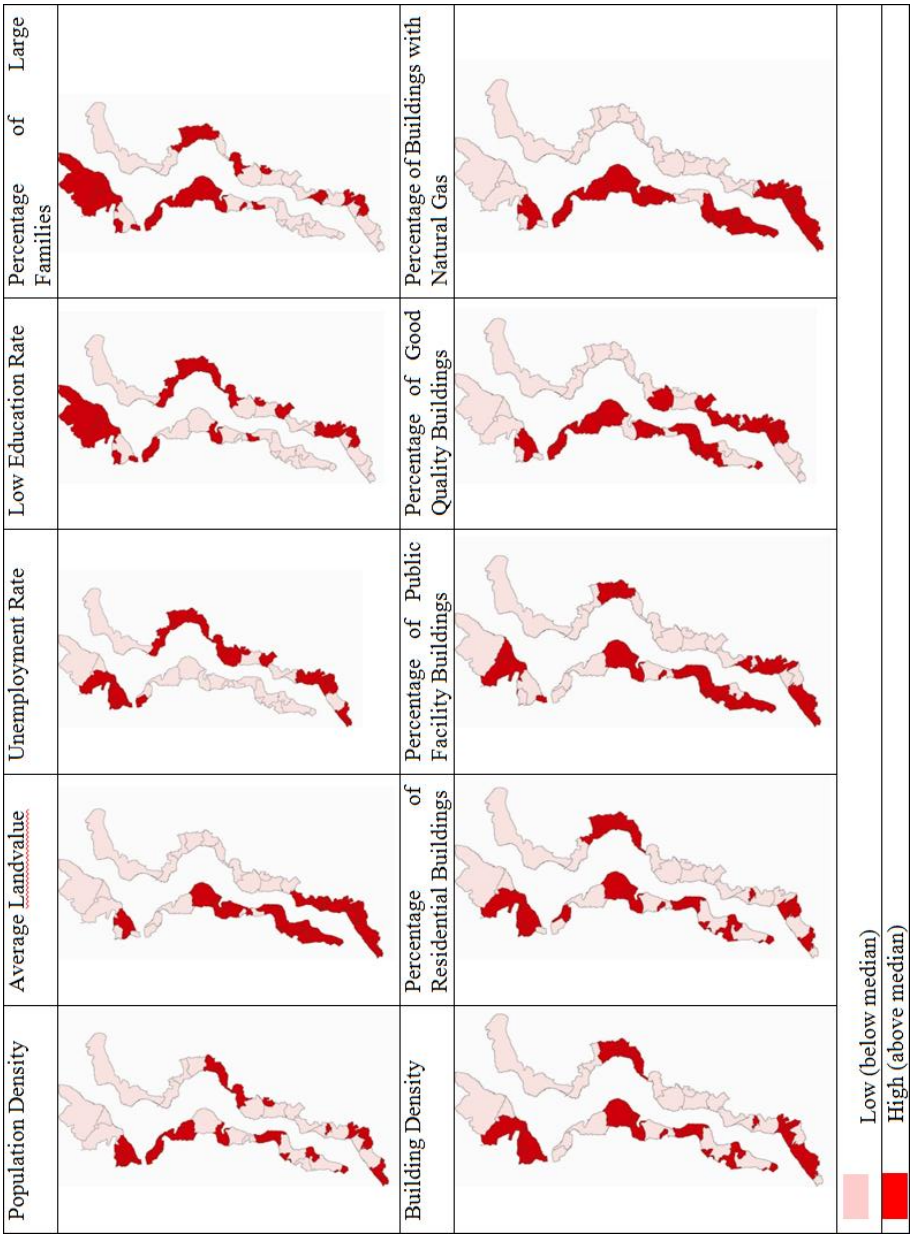


Figure 4. Spatial distribution of social, economical and physical environmental factors in the fore front view area of the Bosphorous.

Now, consider the relation between 'property crime rates' and 'social economical factors', t-test analyses showed a significant effect of land value ($t = 5.482$, $df = 40$, $p = 0.00$), unemployment ($t = 2.577$, $df = 40$, $p = 0.01$), education ($t = 4.349$, $df = 40$, $p = 0.00$), and household size ($t = 3.629$, $df = 40$, $p = 0.00$) on property crimes committed within the whole neighborhood. Property crime rates were higher in neighborhoods with high land values (mean = 9.20), low unemployment rates (mean = 7.74), low percentages of people with poor education (primary school and under) (mean = 5.92), and low percentage of large households (with more than 4 people) (mean = 8.38), compared to those with low land values (mean = 2.30), high unemployment rates (mean = 3.76), high percentages of people with poor education (primary school and under) (mean = 2.76), and high percentage of large households (with more than 4 people) (mean = 3.13) (Table 3). When the relation between 'property crime rates' and 'physical environmental factors' was analyzed, t-test analyses showed a significant effect of building density ($t = 2.288$, $df = 40$, $p = 0.03$), percentage of residential buildings ($t = 2.339$, $df = 40$, $p = 0.02$), percentage of public facility buildings ($t = -2.868$, $df = 40$, $p = 0.01$), percentage of good quality buildings ($t = -3.007$, $df = 40$, $p = 0.00$), and percentage of buildings with natural gas ($t = -5.482$, $df = 40$, $p = 0.00$), on property crimes committed in part of the neighborhood which overlaps with the fore front view area of the Bosphorous. Property crime rates were higher in neighborhoods with high building density (mean = 9.74), high percentages of residential buildings (mean = 9.79), public facility buildings (mean = 10.31), and good quality buildings (mean = 10.61), and high percentages of buildings with natural gas (mean = 5.55) compared to those with low building density (mean = 4.34), low percentages of residential buildings (mean = 4.29), public facility buildings (mean = 3.76), good quality buildings (mean = 3.79) and low percentages of buildings with natural gas (mean = 1.57)

Table 3. Personal and property crime rates in various neighborhood types

	Neighbourhood Type		**Personal Crime Rates***	**Property Crime Rates***
Social and economical factors	Unemployment Rate	High	No significant difference	3.76 (3.58)
		Low		7.74 (6.09)
	Landvalue	High	5.96 (4.70)	9.20 (5.55)
		Low	1.53 (1.24)	2.30 (1.57)
	Percentage of people with poor education	High	1.97 (1.59)	2.76 (2.12)
		Low	5.52 (4.97)	5.92 (1.29)
	Percentage of large Households	High	2.32 (2.25)	3.13 (2.08)
		Low	5.17 (4.96)	8.38 (6.28)
Physical Environmental Factors	Building density	High	3.35 (3.66)	9.74 (10.22)
		Low	1.68 (1.42)	4.34 (3.50)
	Percentage of good quality buildings	High	No significant difference	10.61 (9.97)
		Low		3.79 (3.56)
	Percentage of residential buildings	High	No significant difference	9.79 (10.21)
		Low		4.29 (3.45)
	Percentage of public facility buildings	High	3.82 (3.49)	10.31 (9.91)
		Low	1.21 (1.07)	3.76 (3.35)
	Percentage of buildings with natural gas	High	5.96 (4.70)	5.55 (1.21)
		Low	1.53 (1.24)	1.57 (0.34)
* Mean values (standard deviation)				

3. DISCUSSION

This study aimed to analyze the influence of social, economical and physical environmental factors on property and personal crimes in a developing country. In general, the findings provided evidence that (1) personal and property crimes were positively correlated, (2) the affect of physical environmental factors were more pronounced for property crimes than personal crimes, and (3) lower crime rates were observed in socially and economically disadvantageous neighborhoods (poorly educated, high concentration of large households, higher unemployment rates) and higher crime rates were observed in physically advantageous neighborhoods (better infrastructure, high percentages of good quality buildings). As in other empirical studies, this study has some methodological limitations that should be addressed to properly draw conclusions from these results that could inform future research in this area.

First, this study showed that the neighborhoods with higher personal crime rates were also the ones with higher property crime rates and vice a versa. This is an expected result when property and personal crimes are initiated by similar reasons. Note, in this study various crime types were combined to calculate an aggregate personal and an aggregate property crime rate; however, the initiatives behind each crime type were similar. All crime types used in this study were related to economical initiatives. One may argue that, including violent crimes (homicides) in calculating the aggregate personal crime rate may reverse the findings of this study. Thus, a useful extension of this study could analyze the relationship between violent crimes, property crimes and personal crimes.

Second, considering the relation between crime rates and the physical environmental factors, the findings of this study suggested that the affect of physical environmental factors were more pronounced for property crimes than personal crimes. Among the physical environmental factors, building density and the percentage of public facility buildings and the buildings with natural gas showed a significant effect on personal crime. On the other hand, almost all physical environmental factors (building density, percentage of residential, public facility and good quality buildings and percentage of buildings with natural gas) showed a significant effect on property crime. Note, in this study the calculation of property crimes involved crimes committed on street (robbery from cars, armed robbery, pick pocketing, snatch thievery) and crimes committed in buildings (robbery from businesses and homes). The influence of physical environmental factors on property crime committed on street may differ than that committed in buildings. Subsequent studies may compare the influence of physical environmental factors on different types of property crimes (eg. crimes committed on street and in buildings) in addition to that on aggregate property and personal crime rates.

Finally, for the influence of 'social and economical factors' on crime rates, this study showed that neighborhoods with high land values, lower percentages of poorly educated people, and lower percentages of large households had higher personal and property crime rates. Also, neighborhoods with higher unemployment rates had lower property crime rates. For the influence of 'physical environmental factors' on crime rates, higher personal and property crime rates were observed in neighborhoods with high building density, high percentages of public facility buildings, and high percentages of buildings with natural gas. Also, higher property crime rates were observed in neighborhoods with high percentages of residential buildings and high percentages of good quality buildings. Put it differently, in this study lower crime rates were observed in socially and economically disadvantageous neighborhoods (poorly educated, high concentration of large households, higher unemployment rates). There may be two explanations for this unexpected finding. First, the influence of social, economical and physical environmental factors on crime rates may differ (or reverse) in developed and developing countries. The literature suggests that crime rates increases with poverty in disadvantageous neighborhoods in developed countries. However, perhaps in developing countries,

like Turkey, poverty brings people together and such personal connections might lead to social surveillance (or natural surveillance), which in turn could diminish crime as Newman (1972) suggested. When investigating the crime rates in Istanbul , Turkey at district level, Ergun and Yirmibesoglu (2007) and Ergun, Giritlioglu, and Yirmibesoglu (2003) found similar findings to this study and argued that despite low living standards in some neighborhoods (particularly squatter housing areas) tight family ties function as an informal control. Future studies may compare the level of natural surveillance in socially, economically and physically advantageous and disadvantageous neighborhoods and investigate the influence of natural surveillance (in addition to other factors of interest) on crime rates at the neighborhood level. Also, investigating the crime at micro scale (eg. the street level) and comparing the level of natural surveillance in low and high crime areas and in socially, economically and physically advantageous and disadvantageous areas is necessary before providing general conclusions about the status natural surveillance in socially, economically and physically advantageous and disadvantageous neighborhoods. Second, the data on physical environmental variables were aggregated to neighborhood level[11]. Perhaps such an aggregation had biased the results. If the exact location where the crime was committed and the exact location of good quality buildings were plotted on the map, a cluster analysis may yield a different finding. In brief, in order to better understand the relation between crime rates and physical environmental factors, finer scale analyses are on call.

As a concluding remark, this study shows the crime distribution in the coastal strip and fore front view area of the Bosphorus, Istanbul, Turkey at the neighbourhood level for a year section (2007). Before generalization of the results it is necessary to analyze the changes in the spatial distributions of crime rates annually. Also, whether the results of the present study will apply to other neighborhoods in Istanbul, other cities in Turkey and in other developing countries remains to be seen.

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[11] For example for the percentage of good quality buildings within a neighbourhood, each building was classified as good, average or bad.

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