

Crime and the (Mediterranean) City: Exploring the Geography of (In) Security in Rome, Italy

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Abstract - The spatial distribution of a selection of crime and demographic indicators in urban and suburban Rome, Italy, was explored in this paper to correlate socioeconomic conditions with urban deviance at local scale. An index of crime concentration was derived at district scale by composing all crime indicators. A principal components analysis was undertaken to correlate crime indicators with the socioeconomic context described through economic and demographic variables, living conditions, and the environmental quality. The geographical distribution of crime in Rome showed a pattern mainly associated to variables including population density, settlement form (compact vs dispersed), income, and unemployment. The spatial distribution of some crime indicators was finally compared with the citizens' perception of security as it was measured by a specific field survey carried out at the same spatial scale. The paper illustrates that the integration between statistical data and qualitative information collected through field observation is an effective tool to inform policies contrasting criminality at local scale.

Keywords - Suburbanization, Socioeconomic structure, Crime severity, Composite indicators, Rome.

1. Introduction

In the contemporary urban society the demand for citizen's security is widespread and only partially associated to the effective level of criminality or proneness to criminality (Barkan, 1997). This is particularly true in cities that have experienced massive immigration processes, as it was recently observed in several northern Mediterranean cities (e.g. Maloutas, 2007). In urban areas cities, violent

crime spreading together with (illegal) immigration may contribute to create a 'landscape of insecurity' especially permeating the marginal suburban areas (Serafino, 2008). Opposite to this pattern, crime distribution usually follows a core-periphery pattern decreasing from the inner city (where the main economic functions are concentrated) to the suburban area (Sampson and Wilson, 1995). The distribution of crime along the urban-rural gradient can be thus monitored in order to explore the possible *mismatch* between the perception of crime severity and the spatial distribution of recorded crimes (Brown, 2007).

To this respect, Rome is a reliable case study as it represents the biggest Italian city in terms of demographic size, population growth, and territorial surface. Moreover, Rome has been the final destination of massive immigration flows in last years determining changes in the social geography of the city (Mudu, 2006a). Notably, while central Italy has been regarded in past as a traditional 'land of emigration', since the early-1990s, it started hosting important flows of migrants, especially from Albania, Romania, and northern Africa, which concentrated in the outskirts of Rome. Precarious conditions of life, unemployment, and conflicts with the local population thrive the quality of life of several migrants compared to indigenous people and could influence the feeling of insecurity in the resident population. This can be observed either in economically-disadvantaged peri-urban settlements and in the affluent urban districts (Cope and Latham, 2009).

Since relatively little is known about the spatial distribution of crime in the Mediterranean city, the present paper contributes to this issue by exploring the possible *mismatch* between the perception (of) and the statistically-measured exposure (to) crime at local scale (Furstenburg, 1971). In details, the present study

analyses the spatial distribution of several crime types in urban and suburban Rome with the aim of (i) classifying the investigated area according to the intensity, severity, and spread of crime, (ii) testing the association among crime variables and several socio-economic indicators and, finally, (iii) correlating the geography of (in)security as assessed by a field survey with the spatial distribution of crime records.

2. Methods

2.1 Data Sources

Criminal records were obtained from the Statistical Office of Rome municipality at each of the city boroughs. Boroughs were chosen in this study as the spatial domain since allows for a relatively detailed geographical analysis of crime concentration at a scale which is easily interpretable by non-technical users. At that date Rome's municipality, which actually covers nearly 1.285 km², was subdivided into nineteen boroughs (the so called 'municipi', Figure 1). The first borough covers the ancient city centre of Rome. The second and third boroughs include the modern city centre. The seventeenth borough covers the inner city surrounding the Vatican State. The remaining boroughs include the compact peripheral areas (i.e. V, VI, VII, IX, XIII boroughs) and the sprawled suburbs (i.e. IV, VIII, X, XI, XII, XV, XVI, XVIII, XIX, XX boroughs) of Rome.

2.2 Crime Indicators

Following a standard crime classification, three main categories of crimes were considered here: (i) violent crime (murder, attempted murder, assault, injury, and sexual assault), (ii) property crime (robbery, theft), and (iii) production and selling of drugs (see the complete list reported in Table 1). The related indicators were calculated as percentages (i.e. by dividing the number of crimes by the total number of resident people in each borough). The gross crime index was then calculated at the same spatial scale by summing all crime records and dividing this value by the resident population. Crime distribution by type and severity was analysed using descriptive statistics and maps. We used crime data referred to 2001 in order to compare them with socio-economic data derived from additional sources and collected at the same date. A diachronic analysis (1999-2001) of crime records showed that no significant variation occurred in crime rate during the three consecutive years in Rome (data not shown).

Twenty-three variables were calculated from the National Census of Households and Buildings (2001) to depict the socioeconomic conditions observed in Rome's boroughs. These variables cover the following themes: demography, immigration, labour market, district value added, education, and the environmental quality (see list in Table 3). Two additional indicators were derived from a field survey carried out in 2000 over a representative sample of households living in Rome. The survey was aimed at studying the perception of crime severity among Rome's citizens (Mignella Calvosa, 2001).

2.3 Statistical Analysis

Pair-wise Spearman rank tests were carried out at borough scale to analyze the spatial distribution of crime indicators. A Principal Components Analysis (PCA) was carried out separately on crime and socioeconomic variables in order to summarize the most important features of Roman boroughs in the two research dimensions. The number of significant axes was chosen according to the PCA explained variance. A pair-wise Spearman rank test was carried out at the borough scale with the aim of checking correlations between the selected crime indicators and boroughs' factor scores on the two most significant axes extracted by the PCA. The probability level in all Spearman rank tests was determined using Bonferroni correction. Finally, Spearman correlations were also used to verify if the crime distribution by type and borough was associated to higher levels of (in)security among citizens as revealed by the field survey described above.

3. Results

3.1 The Geographical Distribution of Crime in Rome

The spatial distribution of crime indicators in Rome was reported in Table 1. The first borough ranked the highest in the gross crime rate. Notably, this index was found high in all boroughs close to the inner city (Figure 2) and in the thirteen borough, a compact urban district located on the sea coast. Crime rate distribution did not follow the urban-rural gradient being influenced by population density, settlement form (compact *vs* dispersed), income, and unemployment.

As far as the crime typology is concerned, the index quantifying the distribution of violent crimes showed a quite different spatial pattern compared to the gross crime index (Figure 3). This kind of crime was found scarce in the city centre while increasing along the north-east industrial districts and in the

coastal area. This spatial pattern may be associated with the disadvantaged socioeconomic conditions of the eastern part of the city, as a result of the processes of social segregation occurring in Rome since 1950s. The robbery rate showed a quite different spatial pattern compared to that observed for violent crimes, and approaches the distribution of the gross crime rate. The highest values of this indicator have been observed in the inner city and in the first-ring boroughs.

The spatial association between crime indicators was studied by Spearman rank correlation tests (Table 2). The gross crime rate was found associated with several crime types but murders, some types of robberies, and prostitution, suggesting that these crimes show a different spatial distribution at the scale analysed in this study. By the contrary, violent crimes and those against property showed a similar distribution since their pair-wise correlation coefficients were found always positive and significant.

A composite crime index was finally derived from results of the PCA carried out on the whole set of crime indicators collected at the borough level. PCA extracted four significant axes, among which the two main axes explained 75% of the total variance (respectively 65% and 10%). The third and fourth axes were found relatively less important (7% and 6%, respectively). Table 3 reports the loadings of crime indicators to the main axes of PCA. The gross crime rate and several other indicators of crime, both violent crimes and those against the property, were found positively correlated to the first axis. Prostitution, robberies in post offices and in jewellery stores were associated to the second axis. The first axis clearly segregated Rome boroughs within the income gradient. The inner boroughs clustered on the positive values of the axis (Figure 4). Low-density boroughs were found associated to negative values of the axis, while compact peripheral districts clustered on the positive side of this axis.

3.2 The Analysis of the Socioeconomic Conditions at Local Scale

Table 4 illustrates the distribution of the twenty-three socioeconomic indicators calculated at each borough and Table 5 reports the main results of the PCA applied to these indicators. The first two components accounted for a relevant part of the total variance (66% in total: 52% and 14%, respectively). The third and fourth components were found relatively less important (11% and 7%, respectively).

The first axis classified Rome boroughs according to their socio-demographic characteristics (e.g. family size, people outside primary education, unemployment rate, number of resident people *per* room). The axis segregated the city boroughs into an east-west gradient. Positive values of the axis indicate the most disadvantaged boroughs, which are generally located in the eastern part of the city. The more affluent boroughs (i.e. I, II, III, IX, and XVII boroughs) were found associated to negative values of the axis.

The second axis depicted a subtle gradient which integrates additional socioeconomic aspects and variables depicting the environmental quality of each district. In synthesis, the axis illustrated an urban-rural gradient which can be associated to the different housing patterns of the resident and foreign people. Apart from the first borough, the positive values of this axis segregated the green and low-density boroughs which are especially located in the northern and southern part of the city. All eastern boroughs and some boroughs from the south-western area of Rome were found associated to the negative values of the axis. All low-income boroughs (i.e. V, VII, X, XII, and XV boroughs) and three boroughs with an intermediate level of *per capita* income were located within the positive values of the axis (Figure 5), while the compact residential boroughs (high population density and low *per capita* green surface area) clustered on the negative side of this axis.

3.3 Crime Indicators and the Socioeconomic Conditions in Rome

The correlation between the factor scores of the two axes extracted by the 'socio-economic' PCA and some selected crime indicators was analysed in Table 6. Significant correlations were detected only between the scores of the first axis and some selected crime indicators. The gross crime rate showed a negative correlation with the first PCA axis. Although the significance of the correlation varied a lot, the same sign of correlation was observed for all considered indicators. As the first axis clearly described the socioeconomic conditions of the city boroughs (e.g. demographic structure, income, immigration, labour market, poverty), it should be clear that this axis may provide important indications in order to model scenarios of crime distribution and concentration.

3.4 Crime Distribution and the Feeling of (In)security in Rome

The results of the field survey carried out on a sample of households residing in Rome indicated that the perception of citizens is different, on average,

when asking about the safety of the district where they live and that of the whole city. Only 32% of households thought that Rome is safe while 62% declared that their district is safe (Table 7). Although a strong correlation was found between the two variables (Figure 6), these percentages showed a marked variation among Rome boroughs. People living in the inner boroughs said that their district is safe more frequently than people living in peripheral or low-income districts.

The correlation observed between crime indicators and the two variables recorded in the field survey suggests that a 'decoupling' process exists in Rome between the feeling of (in)security of citizens and the observed crime rate. As an example, the indicators of violent crime concentration and those against the property were found correlated to a higher 'yes' response rate when asking if the city (and even the district) where the respondent lives is safe (Table 8). The positive relationship between the variables recorded within the field survey and the distribution of the gross crime index (Figure 7) confirms this pattern.

4. Discussion

Crime concentration and severity were found spatially varying in Rome (Mignella Calvosa, 2004). As an example, the gross crime rate showed a marked variability which is linked with the socioeconomic structure of the city. As observed in other Mediterranean cities (Leontidou, 1990; Barata Salgueiro, 2001; Dura-Guimera, 2003; Muñoz, 2003), Rome experienced a process of social segregation influencing the urban geography of the City since the early-1950s (Seronde Babonaux, 1983). At now, however, Rome cannot be treated as a polarised city by searching for traditional gradients such as core-periphery, urban-rural, income (Violante, 2008). Recent analyses have warned on the use of such binary categories in socially complex metropolitan areas (Mudu, 2006b). This complex urban picture confirms the usefulness of an integrated exploratory approach based on geographical and statistical analyses to assess the distribution, concentration, and severity of crime in Rome.

By looking at the district data, the first borough (which covers the ancient city within the 'Aurelian Walls') was top-ranking in crime concentration, confirming literature findings (e.g. O'Sullivan, 2003). This borough traditionally concentrates most of the tourism flows, hotels, restaurants, shops, boutiques, and commercial centres. The area covers

part of the central business district, with the main railway station, the major churches, and several governmental offices. The first borough includes the districts of 'Testaccio', 'Esquilino', and 'Trastevere', which are rapidly changing their social traits due to the recovery of some industrial or abandoned places, and the occupation of old buildings by foreign people. One typical example is the blocks close to 'Piazza Vittorio' holding the ancient central market (Mudu, 2006a). All these features may be factors influencing the higher crime rate found in the first borough compared to that observed in the neighbouring boroughs.

As the multivariate analysis indicates, Rome can be considered as a 'mosaic crime city'. The quality of the dwellings, the infrastructures, the distribution of green areas, as well as the district value added are potential determinants of crime distribution in the urban area of Rome (Eisner and Wikstrom, 1999; Appiahene-Gyamfi, 2003; Ackerman et al., 2004; Hojman, 2004; Rotolo and Tittle, 2006). However, while important differences in crime distribution, concentration, and severity exist in the city, the feeling of insecurity expressed by citizens seems not to follow the same pattern: suburban areas are perceived as prone to the same (or even higher) level of risk than the inner city (Mignella Calvosa, 2001).

The debate on security, fear of crime, and victimisation originated in the early 1990s is currently on going (e.g. Robert, 1990; Lagrange, 1993; Walklate, 1998). This study does not question if official statistics are true and crime perceptions are false because they do not match official statistics. The issues of production of criminal statistics and security discourses are much more complicated (Deflem, 1997) and both are social constructions (Walklate, 1997). We prefer to consider this mismatch as a starting point for future interpretations of the 'urban crime landscape' (Serafino, 2008). As a matter of fact, the connection between crime and the city refers to crime that is 'visible', 'on the street' and against personal property. The other crime – like white collars crime, domestic violence and so on – are only partially quantifiable. This connection may be perceived as an arising association between crime and 'dangerousness', because promotes a concept of 'class apart' when identifying unknown people, especially foreign people (Rostami Tabrizi and Madanipour, 2006). For this reason, uncontrolled immigration can impact on the perception of urban security. The cases of xenophobia and migrant riots in Paris 'banlieux', the racist assaults in Rome 'borgate', and similar phenomena observed in other Mediterranean cities

(Barcelona, Athens, Marseille, Naples) actually suffering important immigration flows are examples of this way of thinking.

On the topic of the relation between criminality and immigration there is an harsh debate in Italy with contradictory results (Barbagli, 1998; Dal Lago, 1999). Some field surveys indicate that Italians' perception of insecurity is fueled by the presence and concentration of illegal migrants, especially those from Africa, the Balkans and the Middle East (Mignella Calvosa, 2004). In November 1998, according to Censis (1999), 35% of Italians were convinced that the area where they were living was more dangerous than in the past and 66% thought that in Italy crimes have increased. A year later, according to Censis (2000), the 75% of Italians was convinced that there was a direct correlation between the presence of immigrants and the growth of criminality. Analysing police data, Bianchi et al. (2008) documented that the size of immigrant population is positively correlated with the incidence of murders, robberies and, to a lesser extent, thefts. By contrast, in a very recent report, Caritas affirms that immigrants have the same criminality rates of the Italians and that in 2008 criminality decreased by 15% in the prefecture of Rome although resident immigrants significantly increased in their number (Caritas, 2010).

Of course, the rapidly expanding immigration became likely one of the most crucial socioeconomic phenomena potentially gripping the Mediterranean cities. While we are not sure that the 'landscape of insecurity' cited earlier is produced (only) by illegal immigrants (Palidda, 2000), the local authorities engaged to manage this relatively novel problem were often found unprepared to solve the related social conflicts. In order to understand the factors which drive the spatial patterns of urban insecurity, the analysis of distribution, type, and severity of urban crime should be integrated with qualitative data collected through interviews, focus groups, and direct observation in significant places of the city (Taylor and Jamieson, 1998). Finally, strategies aimed at mitigating poverty appear as especially effective in preventing urban crime (e.g. Oc and Tiesdell, 1998). The integration of migrants in the urban community and their participation to social and economic activities (e.g. markets, commercial shops, migrants' meeting points, etc.) can also contrast the perceived link between insecurity and immigration. These measures could have also the indirect effect to mitigate social conflicts and racism episodes in the city.

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Figure 1. The nineteen boroughs of Rome (left) and the average distribution of value added in 2003 (Euros *per capita*). CDV indicates the Vatican State.

Figure 1a

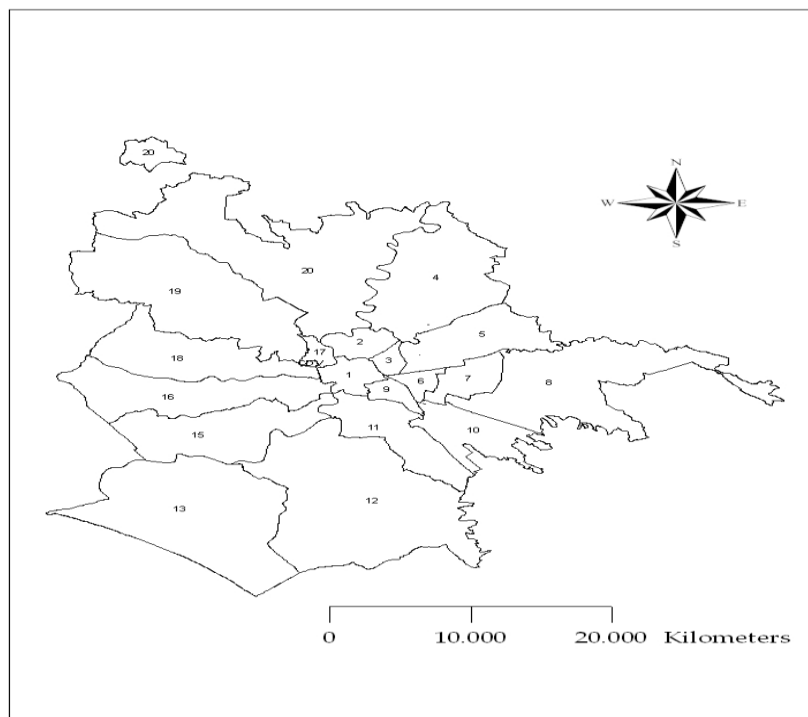


Figure 1b

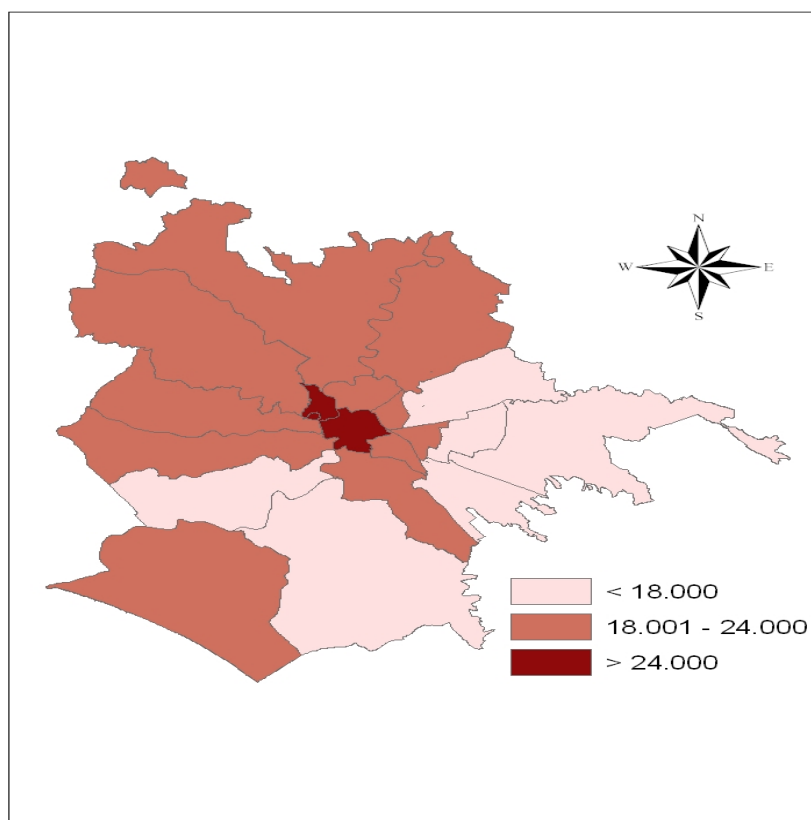


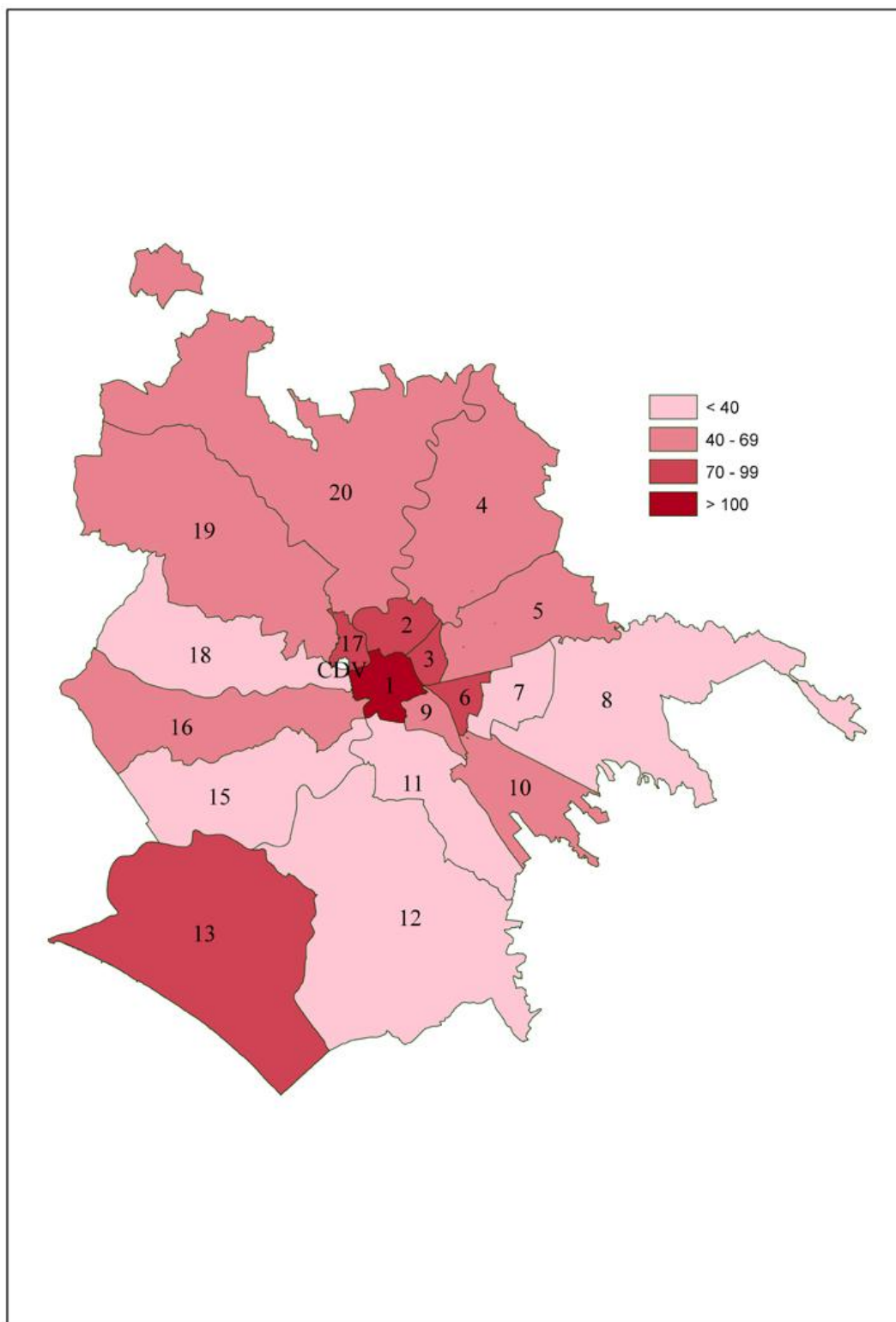
Figure 2. Spatial distribution of the gross crime rate in Rome.

Figure 3. Spatial distribution of some selected crime indicators in the boroughs of Rome

Figure 3a. Violent crimes

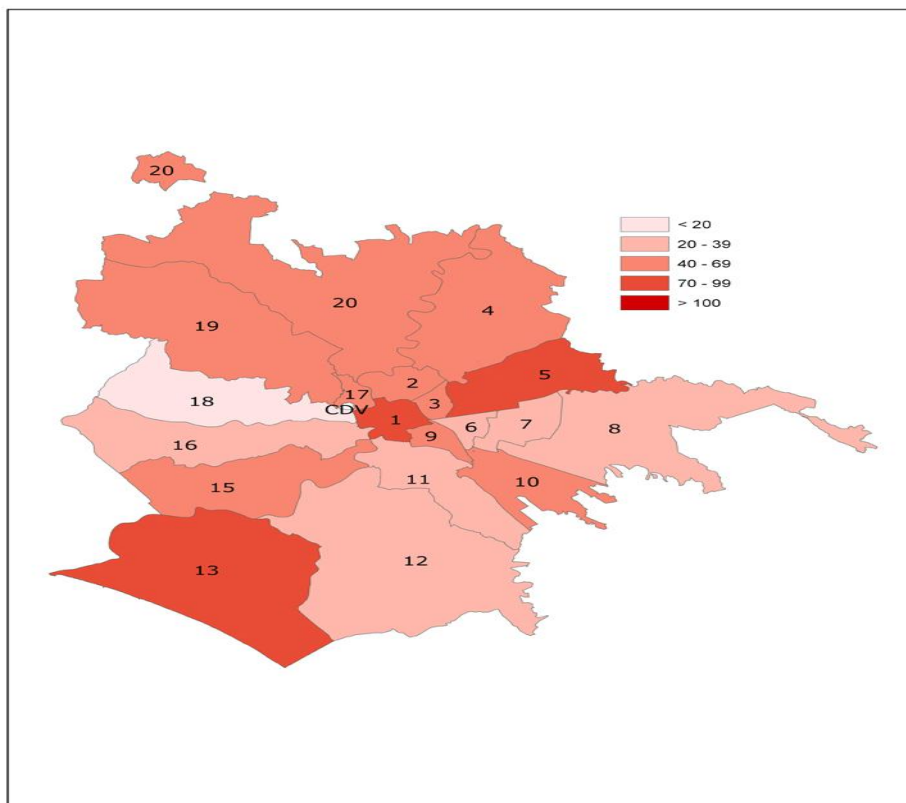


Figure 3b. Thefts

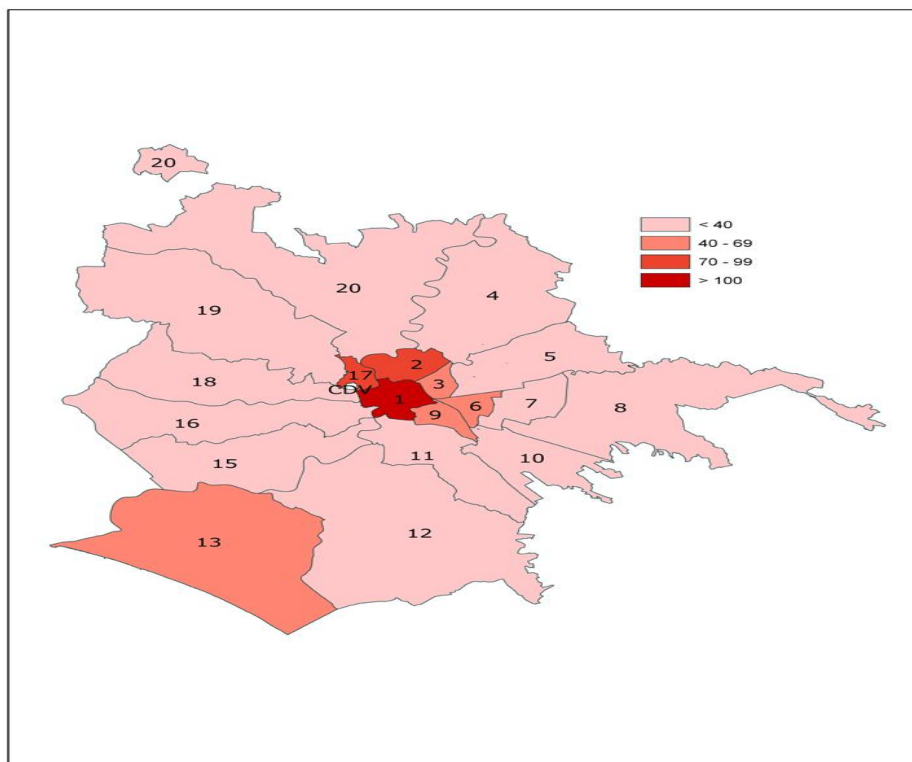


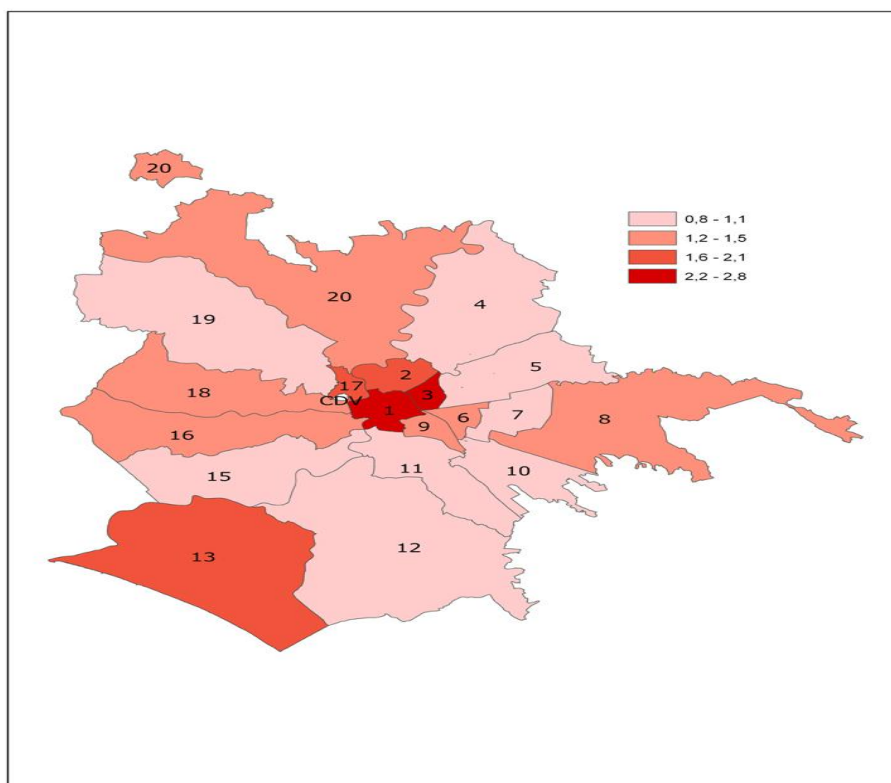
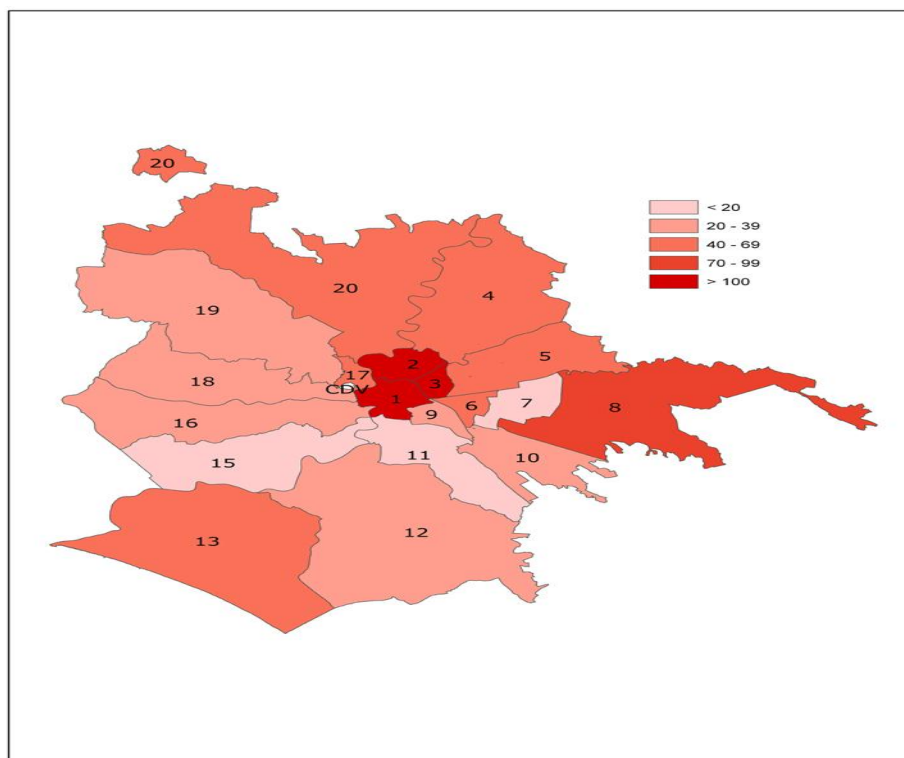
Figure 3c. Robberies**Figure 3d. Production and selling of drugs**

Figure 4. Factor scores indicating the position of Rome boroughs on the factorial plane of the PCA applied to crime indicators

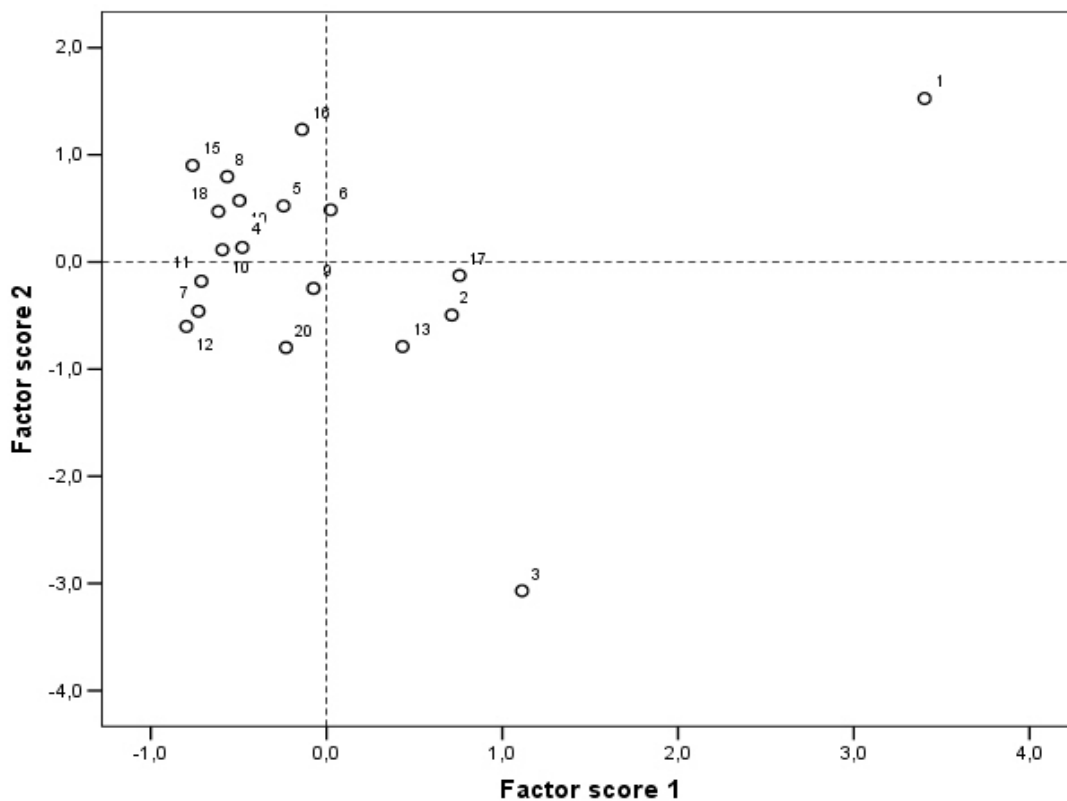


Figure 5. Factor scores indicating the position of Rome boroughs on the factorial plane of the PCA applied to the socio-economic indicators

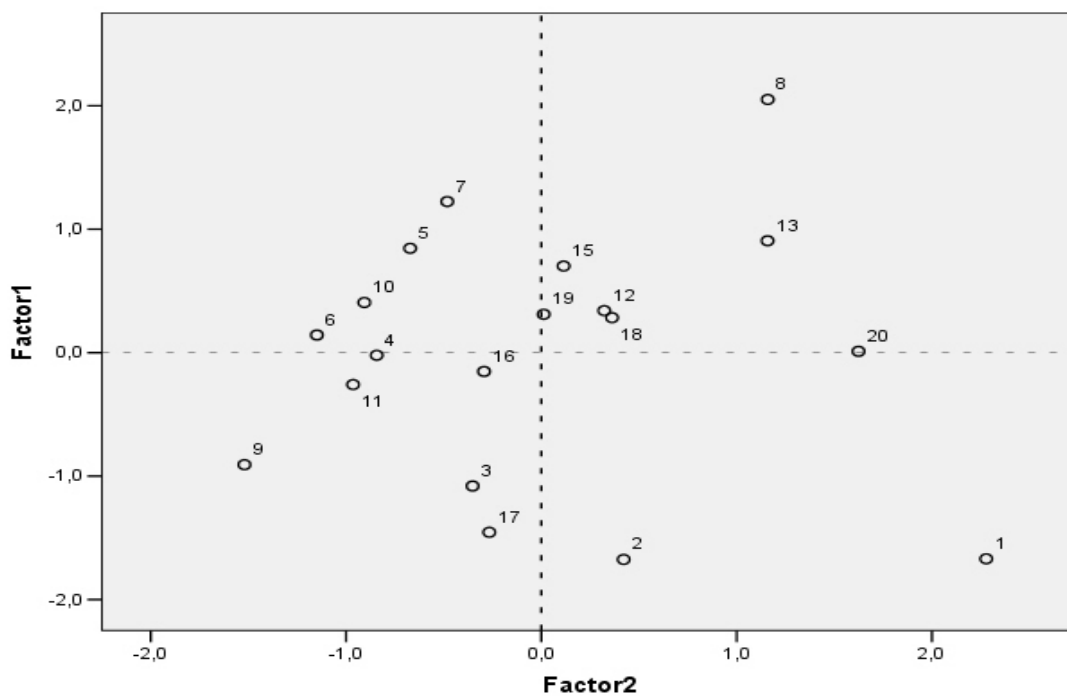


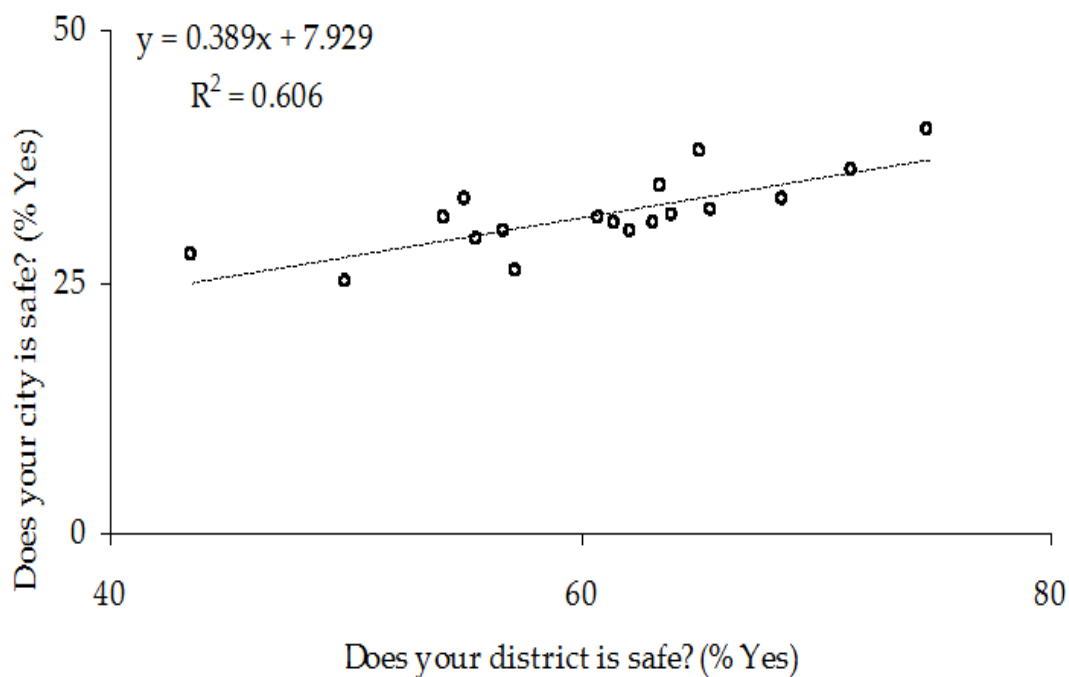
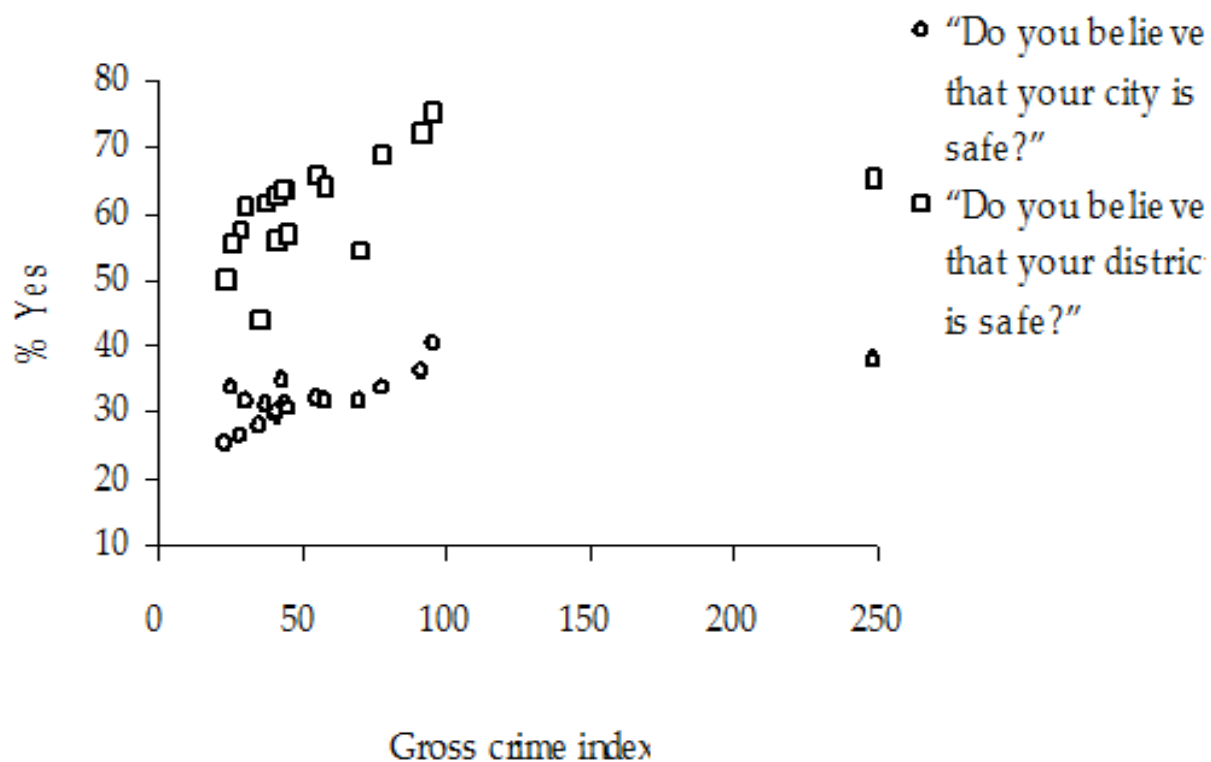
Figure 6. Correlation between the two variables recorded in the field survey by borough (see Table 7)**Figure 7.** Correlation between the gross crime index and the two variables recorded in the field survey by borough (see Table 7)

Table 1. Gross crime index and selected crime rates by type and borough in Rome (2001)

Boroughs	Gross crime rate (per 1.000 individuals)	Violent crime rate (per 100.000 in.)	Murders (per 100.000 in.)	Attempted murders (per 100.000 in.)	Aggravated assaults (100.000 in.)	Sexual assaults (per 100.000 in.)	Thefts (per 1.000in.)	Pick-pocketing (per 1.000 in.)	Snatch (per 10.000 in.)	Thefts in house (per 1.000 in.)	Thefts in shop (per 1.000 in.)	Robberies (per 1.000 in.)	Bank robberies (per 10.000 in.)	Post office robberies (per 10.000 in.)	Robberies in jewellers and precious laboratories (per 10.000 in.)	Robberies to engaged couples or street-walker (per 10.000 in.)	Other robberies (per 10.000 in.)	Production and selling of drugs (per 1.000 in.)	Prostitution crimes (per 100.000 in.)
I	249.5	1.2	6.5	5.7	81.6	28.5	208.0	124.8	21.5	6.6	6.0	2.8	1.4	0.3	0.6	0.7	25.4	1.5	21.2
II	96.5	0.4	1.6	3.2	25.7	8.0	76.6	16.0	14.2	7.4	2.6	1.9	1.4	0.2	0.2	0.2	16.8	1.0	19.3
III	78.9	0.8	1.8	8.8	61.7	8.8	64.3	14.3	9.5	5.2	1.8	2.7	1.2	0.0	0.0	0.4	25.6	1.0	28.2
IV	45.6	0.3	0.5	2.0	23.5	5.9	33.4	4.3	7.6	3.2	1.8	1.0	0.7	0.2	0.0	0.1	9.0	0.6	11.3
V	42.6	0.4	1.1	3.8	30.1	7.0	32.3	4.5	10.0	2.4	1.8	1.1	0.4	0.3	0.0	0.5	10.2	0.6	9.7
VI	70.9	0.3	1.5	3.8	19.8	5.3	47.4	7.0	8.3	3.8	2.8	1.5	0.5	0.3	0.2	0.4	13.5	0.6	12.9
VII	24.6	0.2	2.4	2.4	15.0	3.2	20.2	4.1	2.6	2.0	0.9	1.1	0.2	0.0	0.0	0.3	10.4	0.2	14.2
VIII	36.8	0.2	0.5	3.0	14.6	3.0	31.0	4.1	7.6	3.0	1.1	1.2	0.1	0.4	0.1	0.3	11.0	0.7	9.0
IX	56.3	0.4	1.5	0.0	31.6	5.3	48.2	7.9	7.5	5.7	2.6	1.4	0.5	0.1	0.0	0.4	13.4	0.3	15.0
X	46.0	0.4	1.1	3.9	25.9	4.4	35.6	5.8	5.4	2.4	1.0	0.9	0.3	0.1	0.1	0.2	8.1	0.3	9.9
XI	31.8	0.3	0.7	2.9	18.6	5.0	25.8	3.0	4.1	1.7	0.7	0.8	0.6	0.1	0.0	0.4	7.0	0.2	12.9
XII	29.7	0.1	1.2	0.0	8.6	3.7	24.3	1.8	2.8	2.6	0.6	0.9	0.4	0.0	0.1	0.2	8.3	0.3	20.9
XIII	77.4	0.7	2.1	5.6	55.9	6.7	52.7	4.4	7.2	5.3	2.5	1.7	0.4	0.3	0.1	0.3	16.1	0.6	21.0
XV	26.7	0.3	0.6	3.9	19.4	4.5	21.1	2.5	5.1	1.9	0.9	0.9	0.3	0.5	0.1	0.2	8.4	0.2	10.3
XVI	59.4	0.3	2.7	2.7	16.3	3.4	39.4	6.4	19.1	4.1	1.3	1.2	0.7	0.4	0.3	0.1	10.6	0.3	13.6
XVII	92.1	0.6	1.3	0.0	50.5	9.3	72.3	17.9	14.5	5.2	2.8	2.1	1.1	0.0	0.5	0.3	19.4	0.5	17.3
XVIII	38.0	0.1	2.2	2.2	5.9	3.0	31.4	7.1	8.5	3.1	1.3	1.3	0.2	0.1	0.1	0.2	12.1	0.3	8.1
XIX	41.9	0.3	1.1	0.0	22.9	3.9	32.5	4.3	5.4	5.0	2.0	1.0	0.3	0.2	0.2	0.2	9.0	0.3	11.7
XX	44.6	0.3	2.7	3.4	19.7	6.1	31.3	3.6	3.4	5.3	1.4	1.3	0.5	0.1	0.0	0.2	12.5	0.6	17.0
Rome	58.5	0.4	1.6	2.9	26.8	6.1	44.9	10.9	8.2	3.8	1.8	1.3	0.5	0.2	0.1	0.3	12.0	0.9	14.1

Table 3. Socio-economic indicators in Rome by borough (2001)

Boroughs	Population density	Average family size	Elderly index	<i>Per capita</i> value added	% graduated workers	% population outside primary education	Unemployment index	% highly-qualified workers	% agricultural workers	% employed in the industrial sector	% resident foreign people	% foreign people from Europe	% foreign people from Africa	% foreign people from Asia	% unoccupied dwellings	% rented dwellings	Dwelling size (Rooms <i>per</i> dwelling)	Dwelling composition (Resident people <i>per</i> room)	Dwelling overcrowding index	% not recycled urban waste	% recycled paper on total waste	% change in green area surface	Per capita water consumption	Surface area (hectares)
I	6730	2.1	242	25 067	27.9	0.3	8.3	17.2	1.3	12.2	18.4	36.5	12.8	33.6	21.3	35.5	4.0	2.1	1.4	1.0	1.1	0.9	104.9	1430
II	8099	2.2	226	27 615	33.0	0.2	7.1	19.0	1.4	11.9	9.7	35.4	10.7	36.8	9.7	23.2	4.7	2.2	1.4	1.8	0.4	-8.7	97.2	1367
III	8398	2.2	243	19 193	27.5	0.4	8.1	14.2	1.2	12.2	6.5	33.9	14.5	32.0	10.4	22.6	4.1	2.2	1.6	2.4	0.4	0.5	94.9	591
IV	1955	2.4	182	21 091	15.8	0.4	11.3	9.5	1.1	14.6	5.3	38.0	13.9	30.7	8.0	35.7	3.9	2.5	1.6	3.5	0.1	21.7	76.0	9782
V	3655	2.6	127	15 367	9.7	0.7	13.0	6.1	1.3	17.4	5.6	40.9	18.3	24.7	6.7	36.4	3.7	2.6	1.7	3.1	0.2	20.5	72.2	4915
VI	16336	2.4	207	19 193	8.5	0.6	12.2	5.4	1.6	17.0	9.6	23.9	19.0	43.1	7.9	25.7	3.5	2.4	1.8	3.0	0.4	-16.7	69.2	792
VII	6018	2.5	146	15 798	6.1	0.8	13.7	4.5	1.6	20.4	9.6	41.7	23.8	20.9	7.6	28.6	3.4	2.5	1.8	2.8	0.2	34.8	67.7	1906
VIII	1645	2.8	92	14 064	4.2	1.0	16.9	4.0	1.8	25.0	9.5	55.2	19.7	15.0	9.6	28.9	3.8	2.8	1.9	3.8	0.7	14.4	60.0	11.336
IX	14947	2.2	243	20 817	17.9	0.3	8.9	9.6	1.0	13.3	7.0	32.2	10.5	35.8	9.6	22.7	3.7	2.2	1.5	2.6	0.1	25.4	78.7	807
X	4589	2.5	158	17 991	8.8	0.5	11.4	6.2	1.3	16.4	5.2	40.3	14.1	25.9	6.4	33.6	3.8	2.5	1.7	2.1	0.2	-13.7	71.1	3868
XI	2735	2.3	211	23 263	18.2	0.3	9.1	8.7	1.3	14.2	7.0	40.2	10.3	30.5	7.8	30.8	4.0	2.4	1.8	3.0	0.1	73.9	78.6	4729
XII	813	2.6	110	17 938	18.2	0.4	9.6	8.7	1.3	15.6	6.4	48.6	11.3	22.6	7.9	24.3	4.4	2.7	1.7	4.0	0.4	29.7	81.7	18.317
XIII	1156	2.6	107	19 194	10.2	0.6	12.4	6.6	1.6	17.7	7.2	51.1	18.7	16.5	12.5	25.7	3.9	2.6	1.7	4.9	0.6	0.6	74.1	15.064
XV	1956	2.5	159	16 788	9.8	0.7	11.9	6.2	1.7	17.6	8.5	43.2	14.1	30.2	9.2	31.3	3.6	2.5	1.8	3.8	0.4	-0.4	74.5	7087
XVI	1840	2.4	198	18 031	18.0	0.5	8.9	11.0	1.3	14.3	8.6	40.7	11.8	27.2	9.6	24.7	3.9	2.4	1.7	3.2	0.1	2.9	78.5	7312
XVII	11111	2.2	267	24 895	26.5	0.2	7.4	17.6	1.2	12.2	8.1	38.1	8.4	32.0	9.8	28.3	4.2	2.2	1.5	2.3	0.3	0.0	93.5	561
XVIII	1787	2.5	172	18 369	14.5	0.6	11.4	9.0	1.8	16.1	11.4	41.1	12.3	27.1	7.6	24.4	3.8	2.5	1.6	2.7	0.4	2.7	73.9	6867
XIX	1226	2.5	153	18 369	14.7	0.5	10.9	8.8	1.8	16.3	8.3	34.2	14.3	30.9	10.0	23.4	3.9	2.5	1.7	3.6	0.2	17.6	71.5	13.128
XX	677	2.5	131	19 647	20.8	0.6	9.8	14.7	2.0	17.2	13.9	36.9	13.8	30.9	11.9	24.5	4.3	2.5	1.6	5.9	0.4	15.0	88.1	18.671

Table 4. Results of the PCA applied to the crime indicators: the component matrix

Variable	Component			
	1	2	3	4
Gross crime rate	0.973	0.189	-0.026	-0.062
Violent crime rate	0.926	-0.112	0.188	-0.014
Murders	0.787	0.196	0.022	-0.228
Attempted murders	0.469	-0.345	0.690	0.315
Aggravated assaults	0.888	-0.198	0.154	-0.031
Sexual assaults	0.939	0.169	0.098	-0.197
Thefts	0.967	0.186	-0.022	-0.111
Pickpocketing	0.892	0.305	0.069	-0.243
Snatch	0.755	0.350	-0.218	0.330
Thefts in house	0.714	-0.180	-0.428	0.258
Thefts in shop	0.911	0.229	-0.072	-0.074
Robberies	0.913	-0.299	-0.051	0.105
Bank robberies	0.803	-0.221	-0.297	0.196
Post office robberies	0.053	0.644	0.409	0.585
Robberies in jewelers	0.695	0.464	-0.373	0.021
Robberies to engaged couples or street-walker	0.660	0.046	0.433	-0.424
Other robberies	0.895	-0.337	-0.033	0.091
Production and selling of drugs	0.875	-0.086	0.137	0.184
Prostitution crimes	0.620	-0.663	-0.124	0.019

Table 5. Results of the PCA applied to the socio-economic indicators: the component matrix

Variable	Component			
	1	2	3	4
Population density	-0.50	-0.44	0.58	0.13
Average family size	0.94	0.15	-0.23	0.03
Elderly index	-0.88	-0.29	0.24	-0.05
<i>Per capita</i> value added	-0.88	0.11	-0.08	-0.06
% graduated workers	-0.92	0.23	-0.24	0.06
% people outside primary education	0.91	0.15	0.31	0.10
Unemployment rate	0.93	0.04	0.28	-0.10
% highly-qualified workers	-0.89	0.34	-0.15	0.08
% agricultural workers	0.55	0.54	0.14	0.51
% employed in the industrial sector	0.93	0.16	0.17	0.04
% resident foreign people	-0.26	0.74	0.44	0.09
% foreign people from Europe on total foreigners	0.60	0.41	-0.45	-0.36
% foreign people from Africa on total foreigners	0.72	0.05	0.48	-0.02
% foreign people from Asia on total foreigners	-0.72	-0.30	0.34	0.33
% unoccupied dwellings	-0.44	0.73	0.29	-0.18
% rented dwellings	0.16	-0.01	0.18	-0.81
Dwelling size	-0.59	0.37	-0.61	0.14
Dwelling composition	0.94	0.13	-0.22	0.03
Dwelling overcrowding index	0.84	-0.24	-0.02	0.07
% not recycled urban waste	0.56	0.22	-0.39	0.46
% recycled paper waste type: paper	-0.09	0.83	0.38	-0.18
% change in green area surface	0.18	-0.21	-0.45	-0.24
<i>Per capita</i> water consumption	-0.89	0.36	-0.09	-0.07

Table 6. Spearman rank correlation coefficients between the scores of each borough on the main axes of ‘socio-economic’ PCA and some selected crime indicators

(n = 19 for all comparisons; * indicates significance at $p < 0.05$ after Bonferroni correction)

Crime type	Factor 1	Factor 2
Gross crime rate	-0.674*	0.102
Violent crime rate	-0.480	-0.014
Murders	-0.311	0.345
Attempted murders	0.062	0.207
Aggravated assaults	-0.435	-0.068
Sexual assaults	-0.596	0.074
Thefts	-0.672*	0.054
Pickpocketing	-0.644*	-0.023
Snatch	-0.538	0.115
Thefts in house	-0.607	0.372
Thefts in shop	-0.526	0.065
Robberies	-0.509	0.328
Bank robberies	-0.891*	-0.031
Post office robberies	0.239	0.219
Robberies in jewellers and precious laboratories	-0.267	0.374
Robberies to engaged couples or street-walker	-0.106	-0.174
Other robberies	-0.491	0.333
Production and selling of drugs	-0.324	0.412
Prostitution crimes	-0.514	0.252

Table 7. Results of a survey on the issue of urban security among Roman citizens by borough

(see text for details)

# borough	“Do you believe that your district is safe?” (% Yes)	“Do you believe that your city is safe?” (% Yes)
I	65.1	37.7
II	74.8	40.0
III	68.7	33.1
IV	63.2	30.6
V	55.6	29.1
VI	54.3	31.2
VII	50.1	25.0
VIII	43.5	27.4
IX	65.6	31.9
X	56.8	30.0
XI	60.8	31.2
XII	57.3	26.0
XV	55.2	33.1
XVI	64.0	31.5
XVII	71.6	36.1
XVIII	61.5	30.8
XIX	62.2	29.8
XX	63.5	34.3
Rome	61.5	31.9

Table 8. Correlation between the crime indicators used in this paper and the two variables recorded in the field survey by borough (see text and Table 7 for details)

Variable	Safe borough (Yes%)	Safe city (Yes %)
Gross crime rate	0.43	0.65
Violent crime rate	0.61	0.87
Murders	0.82	0.66
Attempted murders	0.58	0.34
Aggravated assaults	0.58	0.34
Sexual assaults	0.39	0.32
Thefts	0.80	0.97
Pickpocketing	0.97	0.97
Snatch	0.75	0.67
Thefts in house	0.47	0.36
Thefts in shop	0.70	0.71
Robberies	0.74	0.76
Bank robberies	0.65	0.30
Post office robberies	-0.12	-0.14
Robberies in jewellers	0.55	0.19
Robberies to engaged couples or street-walker	0.02	0.30
Other robberies	0.51	0.35
Production and selling of drugs	0.56	0.31
Prostitution crimes	0.55	0.73