

ASPECTS OF CRIMINALITY IN CITIES OF PAULISTA

ASPECTOS DA CRIMINALIDADE DAS CIDADES PAULISTAS

ASPECTOS DE LA CRIMINALIDAD EN LAS CIUDADES PAULISTA

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ABSTRACT

The present work has that goal to verify empirically the economic and social determinants of crime in the cities of São Paulo State. Due to wide range of crime-related components, this work to estimate an econometric model able to show what impact economic and social variables have on the types of crimes (murders, thefts and robberies) that are present in the cities of São Paulo. Using cross-sectional data for all cities in São Paulo during the year of 2010, the study presents has as the crime rates react with the explication variable in the degree of urbanization, participation of young male population, Gini index, income per capita, illiteracy rate, spent on public safety and growth rate of crimes in the previous year to 2010. The results show an important inertial component in the crime rate. To the rate of thefts only spent on public safety is connected with the theft of the cities. For the murder rate model, variables such as per capita income and unemployment were those that had a negative relationship with their dependent.

Keywords: Crime Rate. Public Safety. Thefts. Robberies and Homicides. Economic Variables.

RESUMO

O presente trabalho tem como objetivo verificar empiricamente os determinantes econômicos e sociais da criminalidade nas cidades do estado de São Paulo. Devido a ampla gama de componentes ligados à criminalidade, este trabalho buscou em estimar um modelo econométrico capaz de apresentar qual o impacto que variáveis econômicas e sociais têm sobre os tipos de crimes (homicídios, furtos e roubos) que estão presentes nas cidades paulistas. Com a utilização de dados em corte transversal para todas as cidades paulistas durante o ano de 2010, o estudo apresenta como os índices de criminalidade reagem com a variação no grau de urbanização, participação da população jovem masculina, índice de Gini, renda per capita, taxa de analfabetismo, gasto com segurança pública e taxa de crescimento dos índices de crimes no ano anterior a 2010. Os resultados obtidos apontam para um importante componente inercial na taxa de criminalidade, que para a taxa de furtos apenas o gasto com segurança pública tem relação negativa com os furtos das cidades. Para o modelo de taxa de homicídio, variáveis como renda per capita e taxa de desemprego foram as que tiveram relação negativa com sua dependente.

Palavras-chave: Taxa de Criminalidade. Segurança Pública. Furtos. Roubos e Homicídios. Variáveis Econômicas.

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RESUMEN

El presente trabajo tiene como objetivo verificar empíricamente los determinantes económicos y sociales del crimen en ciudades del estado de São Paulo. Debido a la amplia gama de componentes vinculados al crimen, este trabajo buscó estimar un modelo econométrico capaz de presentar el impacto que las variables económicas y sociales tienen sobre los tipos de delitos (homicidios, hurtos y robos) presentes en las ciudades de São Paulo. Utilizando datos transversales de todas las ciudades de São Paulo durante el año 2010, el estudio presenta cómo las tasas de criminalidad reaccionan con la variación en el grado de urbanización, la participación de la población masculina joven, el índice de Gini, el ingreso per cápita, la tasa de analfabetismo, el gasto en seguridad pública y la tasa de crecimiento de las tasas de criminalidad en el año anterior a 2010. Los resultados obtenidos apuntan a un importante componente inercial en la tasa de criminalidad, que para la tasa de hurto sólo el gasto en seguridad pública tiene una relación negativa con el hurto en ciudades. Para el modelo de tasa de homicidios, variables como el ingreso per cápita y la tasa de desempleo fueron las que tuvieron una relación negativa con el dependiente.

Palabras clave: Tasa de Criminalidad. Seguridad Pública. Robos. Robos y Homicidios. Variables Económicas.

1 INTRODUCTION

The criminal economy has been gaining more and more prominence in the concern of Brazilian citizens and in the news of the mainstream media. However, Brazil has managed to achieve important economic results in the last decade in relation to extreme poverty, an increase in real wages simultaneously with an improvement in the labor market since 2003, which has resulted in a slight decrease in income inequalities, benefiting workers and families, as well as other social advances (DIEESE, 2014). Nevertheless, other economic and social factors still remain crucial problems that affect the lives of the population, such as crime rates (against life and property).

Although these improvements mentioned above are not yet in the standards of developed economies, there have been advances. However, these were not able to reverse the negative numbers that most Brazilian cities present on crime (thefts, robberies and homicides). An example of this negative situation are the IPEADATA figures, in which the evolution of the number of homicides in Brazil in five years from 2005 to 2009, showed an increase from 47578 in 2005, to 50318 for the year 2009.

This concern about crime has been gaining more and more space among researchers, whether in the social, economic or political areas, seeking to understand how economic and social variables can explain this phenomenon of crime. Balassiano et al. (2012), for example, applied an econometric model including economic variables such as unemployment, income distribution index and wage levels, with the objective of explaining crime in the state of Rio Grande do Sul. In this model, they also considered the different types of crime, with the intention of verifying whether each crime had different explanatory variables. This division of type of crime was classified as homicide, number of robberies and number of assaults on vehicles or other goods.

As with the work done for Rio Grande do Sul, the objective of this study is to try to understand the main variables that affect the crime rate of the municipalities of the state of São Paulo in the year 2010, applying an econometric model similar to the one done in Balassiano, et al. (2012).

We will use the crime rate considering two types of crimes: (i) homicides and (ii) thefts and robberies. The explanatory variables used will be: degree of urbanization, participation of the young male population aged between 15 and 24 years, Gini index, *per capita* income, illiteracy rate, public security expenditure and growth rate of crime rates in the year prior to 2010 (this variable seeks to capture the inertial component in the crime rate). With this, we

seek to understand how these chosen variables contribute to the increase or decrease of crime rates in the municipalities of São Paulo. And, in return, offer pertinent information to the authorities involved with public policies to combat crime, identifying its main economic and social aspects. It should be noted, however, that this work is a static and not a dynamic portrait for the year 2010.

1.1 PROBLEM AND ITS IMPORTANCE

In 2012, Brazil had around 50 thousand homicides according to Stuenkel (2014). Even with the drops in the homicide rate in some states, São Paulo still has alarming numbers. In 2005, the state had 8727 cases, decreasing this number to 6310 in 2009 (IPEADATA). Although there is a drop in the number of cases with intentional homicide, it is still considered relatively high when it comes to the number of lives that are lost every year, whether for economic or social reasons.

Analyzing the data from the work of Stuenkel (2014), it is noted that the number of homicides is not a problem exclusive to the state of São Paulo, which, by the way, has a rate much lower than the national average of 26.2 in 2010, according to the Map of Violence 2012. It is worth noting that São Paulo showed a significant drop in the numbers for the homicide rate from 42.2 in 2000 to 13.9 in 2010 for every 100 thousand inhabitants.

Being the richest state in the federation (ROTARY-SP), its economic importance is extremely relevant for Brazil, however, it must be taken into account, if really, better economic indices denote better indices in relation to the crime present in the cities of the richest Brazilian state. However, the other states of the country are always seeking to raise the levels of their economic activity in order to generate better living conditions for their population.

The objective of this study is to analyze the determinants of crime in the municipalities of the state of São Paulo in 2010, separating the variables (i) homicides and (ii) thefts and robberies. This division seeks to understand the specificities of each type of crime and how economic variables affect them differently.

In relation to economic aspects, crime generates insecurity, unhappiness and loss of manpower. In view of the data presented, most homicides occur among young people aged between 15 and 24 years, as revealed by the 2010 Map of Violence, as well as in Mello and Schneider (2004), who obtained in their results an elasticity of 4.5 for the variable participation of the male population between 15 and 24 years old, representing that the increase of 1% of the young population represents an increase of 4.5% in the homicide rate in the state in the

years 1990 to 2000, for women they also present significant parameters, representing a very large loss of young people in cases of intentional homicides.

From 2000 onwards, both federal and municipal authorities began to act with greater intensity in public security issues, managing to reduce the numbers related to crime, contributing to the increase in improvements in socioeconomic conditions. The relative decrease of young people in the population due to the drop in the birth rate in recent years has also contributed to the drop in crime rates in the State of São Paulo, since there is a greater propensity of young people to participate in criminal activities. Just as the more incisive presence in the areas of criminal justice has helped to reduce this rate:

During this period, there was also an increase in the growth rate of incarceration and sentences to alternative sentences. Finally, to complete the favorable scenario, it was possible to proceed with a relative control in the diffusion of firearms. The major problem observed in this last period refers to the growth of the illicit psychoactive drugs market. Still, after 11 consecutive years of increase in the homicide rate, it has begun to recede. (CERQUEIRA, 2010)

Considering other types of crimes, statistics such as robberies and thefts have a high level considering world standards. According to the São Paulo Public Security Secretariat, the capital city had a 41.8% increase in the number of robberies in the interregnum of 2013 and 2014. A survey by the security secretariat shows a comparison of robberies in the capital with robberies throughout the state. The result shows that in the capital alone, the number of robberies went from 8380 in 2011 to 13416 in 2014. The numbers found for the entire state were 18076 in 2011, increasing to 26987 in 2014, emphasizing that these numbers do not include vehicle thefts, but cargo theft, banks and homes.

In view of this fact, the feeling of insecurity that the population of large cities feels when they are circulating on the streets of their municipality is perceived. It is increasingly dangerous to travel at times with less flow of people on the streets, the fear of being robbed on the way home to work is increasing. With such a situation, even commerce feels the reflections of this fear that the population has due to the numbers of thefts and robberies in a certain region, whether in the smaller number of people who pass in front of the establishment, or in the risk of it being robbed.

In the work presented by Carvalho et al. (2014), they show the diffusion of crime that is occurring from the capital to the cities of the interior, breaking the taboo that the cities of the interior have total tranquility to live in. The study describes that criminals, when they

realize that small cities have possible victims to practice their robberies, take advantage of the more precarious security system of these municipalities, which end up making an environment conducive to robberies of securities institutions such as banks and jewelry stores, as well as people.

Some studies that relate the economy to aspects of crime associate economic performance and development with an increase or decrease in criminal activity (SANTOS et al., 2008; ANDRADE et al. 2007; ARAÚJO, 2002; BEATO FILHO, 2002). Even in a stable economy, economic factors such as income inequality, wage levels and unemployment are not able to mitigate the negative social effects generated by better numbers of these variables.

Thus, as described in macroeconomics textbooks, a low unemployment rate remains heated, and in parallel, with the result of better wages, the opportunity costs of perpetrators of crimes against property increase. It is worth noting that, in an environment with discrepant inequality, the offender is often faced with others who have assets and income relatively higher than his, which can induce acts of theft and robbery, promoting, even if inconsequentially, a distribution of income, in which the one who has less, takes possession of part of the assets, of the one who has more (BECKER, 1968).

However, it is hoped that this work will contribute to the understanding of the relevant causes of crime that the country has been facing for years, and which, unfortunately, consumes millions of lives, which has even reached the mark of more than one million people in three decades of recorded data, (CERQUEIRA, 2010). Another factor associated with crime is the loss of well-being that occurs with the increase in the number of crimes against property and against life, producing negative economic impacts.

1.2 GENERAL OBJECTIVES

This paper seeks to explain the most relevant causes of homicides, robberies and thefts in the municipalities of São Paulo in 2010, conditioning the components such as unemployment rate, *per capita* income, gini index, participation of the young male population, illiteracy rate, degree of urbanization, crime rate of the previous year and spending on public security. Using an econometric model of multiple regression, it is possible to estimate parameters that represent the impact of each variable on the components of crime, theft, robbery and homicide.

1.3 SPECIFIC OBJECTIVES

The specific objectives are to verify which are the most relevant economic variables to explain (i) homicides and (ii) thefts and robberies. With this, we will seek to understand the specificities of each type of crime, as well as the influence of each of the explanatory variables considered. Although it is a static and not dynamic work, we will seek to understand the aspects of each type of crime committed against life and property, in an attempt to contribute to the reduction of crime rates in the municipalities of São Paulo, being a possible orientation for policies that have this purpose.

2 THEORETICAL FRAMEWORK

Becker (1968) is the main reference when it comes to Economics of Crime. He proposed a model in which the behavior of criminality is conditioned by an individual process in the context of the rational choice model. In this way, the agent, when making his decision to commit or not commit a crime, compares possible costs and benefits of this activity. Thus, economic and social variables that describe the situation of a particular region or municipality could impact the choice of whether or not to enter into criminal activity.

In addition, as pointed out in Ehrlich (1973), income inequality can impact the choice of criminal activity. Thus, an increase in inequality would lead to an increase in criminal activity. A more recent model than the one presented in 1973, which relates crime to income inequality, was proposed by Mendonça (2003). In his work, he describes that the innovation of introducing the reference income variable into the classic structure of rational choice, mentioning the consumption expectations of individuals. With the impossibility of earning this income through the normal means of the labor market, such a situation drives the agents to resort to crimes in search of additional income and, thus, to obtain the reference income that had been imposed on them by their living environment. It is noted that a district with greater income inequality increases this difference, increasing the frustration of those who are on the verge of committing a criminal offense. In this context, new works add an explicit variable such as the Gini index to capture this theoretical dynamic.

Work such as the one offered by Sah (1991) is inferred in a model that shows that the citizen who has been convicted once for criminal activity has a certain tendency to be a repeat offender in the criminal act, since, when trying to re-enter the labor market, he finds it more difficult to reinsert, causing his opportunity cost against the patrimony to be reduced, inducing the field of violence again. Given this greater uncertainty in the labor market for people who

have already been incarcerated, crime can have an inertial character with these verified characteristics.

Regarding the empirical literature, we can cite the work of Hartwig (2010). It presents an estimate for crime in the State of Rio Grande do Sul using variables such as the participation of young people in the population, drug addiction, which refers to the number of occurrences or arrests of cases involving drug trafficking, income level, degree of urbanization and dummy for coastal cities in the South region. In this study, Hartwig used panel data for the years 2002 to 2006, the estimation method was the clustered MQO (Minimum of Ordinary Squares), finding a positive correlation for per capita income, degree of urbanization, dummy for coastal cities and drug addiction, however the correlation of crime in the population between 15 and 24 was negative, in contradiction to what was expected.

In this context, researchers from different areas of knowledge who work in research, dedicate more time of their time to be able to solve these problems and contribute more effectively, generating better results to this issue faced by Brazil and the world, which consume many lives every year. As the study of this work is referenced in the state of São Paulo, it is worth mentioning with greater emphasis some studies of Brazilian cases and in this specific area.

Andrade and Lisboa (2000) applied their models in an attempt to explain the evolution of homicide rates in the states of Minas Gerais, Rio de Janeiro and São Paulo, between 1981 and 1997. With this research, they identified that the homicide rate was related to the age group of men aged between 15 and 40, and that economic factors such as real wages, unemployment and inequality coefficient could explain the characteristics of homicides, showing that for other places with these same characteristics they could present similar results. From the collection of annual data in time series, the study observes that young people between 15 and 19 years of age, when there was an increase in their real salary, there was a drop in the homicide rate. However, the same process did not occur in older age groups. In this sense, it allows the acceptance that the effect of real wages in this age group of 15 to 19 years corroborates in a more forceful and lasting way in the fight against violence.

Another work that addresses this subject can be referenced by Hartung and Pessoa (2007), who apply similar models working with temporal factors to explain the inductions of homicide crimes. This time the approach becomes more specific, making the scope of application of the study the city of São Paulo, based on the demography of the region in the period between 1980 and 2000. Based on this analysis, he projected that the rates of theft

and robbery combined with a positive relationship with the level of income and inequality during these periods of economic instability, showing that it is not enough to make only one model for this type of explanation of crime, without taking into account the economic situation in which the agents are inserted.

3 METHODOLOGY AND RESULTS

3.1 EMPIRICAL MODEL AND ECONOMETRIC TESTS

For the estimation of the econometric model, it is intended to work with the following regression:

$$C_{s,i} = \beta_0 + \alpha C_{s,t-1} + \sum_{j=1}^k \beta_j X_{j,i} + u_i \quad (1)$$

Where:

$C_{s,i}$ = crime rate s at instant t (per 100 thousand inhabitants)

β_0 = Equation Intercept

α = parameter of the dependent variable lagged at $t-1$

$X_{j,i}$ = represents the k th explanatory variables

β_j = represents the parameters that will be estimated for the explanatory variables

u_i = is the term of the random error

Regarding the stage of verification of the adequacy of the model, the Jarque-Bera test was used to test whether the regression residuals follow a normal distribution. The data distribution curve should show kurtosis equal to three and asymmetry equal to zero. To confirm the normality of the residuals, a hypothesis test is applied, which the null hypothesis of the test implies a normal distribution of errors, following this characterization we have:

H_0 : $S=0$; $K=3$ (distribution is normal)

H_1 : $S \neq 0$; $K \neq 3$ (distribution is not normal)

Where:

S stands for Asymmetry and K stands for Kurtosis.

The decision rule used was p-value higher than the chosen level of significance indicates acceptance of the hypothesis, lower p-value is rejected in favor of where the distribution is not normal. $H_0 H_0 H_1$

The White Test was performed to verify whether there is heteroscedasticity, that is, to verify whether or not the residuals (U_i) have constant variance. This problem is verified when there are very discrepant databases (*outliers*), for example. As the model used works with several cities, which have different numbers of crime rates, especially in relation to large urban cities and small rural areas, the errors may present heteroscedasticity, due to the value of the variance of the samples. The hypotheses tested to verify the presence of heteroscedasticity of the model have the decision rule:

$$H_0: N^* > (\text{heteroscedasticity}) R^2 X_m^2$$

$$H_1: N^* < (\text{does not have heteroscedasticity}) R^2 X_m^2$$

3.2 DESCRIPTIVE ANALYSIS OF THE DATA

To carry out this work, it was decided to use secondary data, offered by the database of the STATE SYSTEM OF DATA ANALYSIS FOUNDATION (Seade), with estimation of the model in cross-sectional data with all cities in the state of São Paulo for the year 2010, totaling a sample of 646 cities. Based on the empirical literature, the following variables were included in the model:

- FUR = Theft rate of each city in the state of São Paulo, with the number of thefts occurring per hundred thousand inhabitants. The data were extracted from the database of the SEADE foundation.
- C_FUR = Growth rate of the number of thefts by city in the year 2009 to 2010, with the ratio between the two numbers. Data from the SEADE foundation.
- C_HOM = Growth rate of the number of homicides per city in the year 2009 to 2010, with the ratio between the two numbers.
- A_15_24 = Numbers of young people aged between 15 and 24 years of age for each city in the year 2010 in absolute numbers, SEADE foundation.
- DESEMP = Unemployment rate verified by city in the state, calculated by DATASUS.
- G_URB = Degree of urbanization obtained by the ratio of the urban population of the city to the total population of each city in 2010. SEADE.
- GINI = Gini index as a variable to measure the level of income concentration in the

cities of São Paulo, which the index that presents a number close to zero is consistent with the city with the lowest concentration of income and, values close to one with a higher concentration. DATASUS.

- ANALF = Illiteracy index of the cities, this data is calculated through the percentage of illiterates in relation to the total population of the city. SEADE.
- RENDA_PC = Per capita income, a variable found by dividing the city's GDP by its population in current reais. SEADE.
- G_PUB = Public expenditure on public security in each city in the year 2010 in current reais. SEADE.

In this part of the descriptive analysis, we seek to present the behavior of the explanatory variables and the dependent variable, relating them to each type of city, verifying the numbers in relation to metropolitan regions with a concentration of large industries, cities more focused on rural activity and others that have tourist attractions as attractions, present more clearly in coastal cities.

Starting with the description of the homicide rate that each city in São Paulo presents, it is noted that the city of Suzanápolis has the highest number of homicides for every hundred thousand inhabitants. To explain the behavior of this variable in a more forceful way, TABLE 1 shows which are the cities in São Paulo with the highest homicide rates in 2010.

Table 1

The 10 cities with the highest homicide rates in the state of São Paulo in 2010. (Homicides for every hundred thousand inhabitants)

Locality	Tx of homicide
Suzanápolis	1124,93
Santa Salete	968,19
Monteiro Lobato	267,25
Mira Estrela	248,40
Rinópolis	181,12
Fernando Prestes	144,59
Santana da Ponte Pensa	121,73
Flora Rica	113,96
Barra do Turvo	64,67

Embu

63,78

Source: Prepared by the authors with data from SEADE.

Suzanápolis is the city with the highest homicide rate, located in the mesoregion² of Araçatuba and microregion of Andradina. The city is 641 kilometers from the capital, in 2010 it had a population of 3378, according to data from the SEADE FOUNDATION. Its economic activity is more focused on beef cattle ranching in an extensive way with large land tenants. As TABLE 1 shows, Suzanápolis had 1124.93 cases of intentional homicide per hundred thousand inhabitants in 2010, a result well above the average of the same year for all cities in São Paulo, which was 13.02 per hundred thousand inhabitants.

Santa Salete, which is the second city with the highest homicide rate in the state, has characteristics similar to those of Suzanápolis, with a population of 1,447 inhabitants (IBGE/2010) and an area of 79.4 km². Santa Salete belongs to the Microregion of Jales. As well as the city with the highest homicide rate, Santa Salete's main economic activity is livestock and agriculture. Of the 1447 citizens living in the city, 819 are in the urban area and 628 are in the rural area, its demographics have 50% of people living in the rural area and a high homicide rate for every hundred thousand inhabitants with 968.19, very high in relation to the state average as well.

Another municipality with a high homicide rate, ranking third in the *ranking*, is Monteiro Lobato, located in the micro-region of Campos do Jordão, 132 kilometers from São Paulo, with an estimated population in 2010 of 4116 inhabitants (SEADE), 1516 in the urban area and 2100 in the rural area. The main economic activity is agriculture, with emphasis on the cultivation of beans, rice and corn, beef and dairy cattle raising, as well as pigs and horses. Embu, which from 2011 onwards was renamed Embu das Artes after a plebiscite held in the city, among the 10 cities is the one that is inserted in the Metropolitan Region of São Paulo, 30 kilometers from the capital, according to the SEADE FOUNDATION, had in 2010 about 63.78 homicides for every hundred thousand inhabitants.

In the entire State of São Paulo, in 2010, two hundred and sixty-two cities did not have homicides within their municipality, a very expressive number considering the total number of

² **Mesoregion** is a subdivision of Brazilian states that brings together several municipalities in a geographic area with economic and social similarities, which in turn are subdivided into microregions. It was created by the IBGE and is used for statistical purposes and therefore does not constitute a political or administrative entity.

the state, which has six hundred and forty-five cities, including Santana de Parnaíba, Monte Mor, São José do Rio Pardo, Dracena and Brotas.

Even with the positive changes in aspects such as the decrease in the Gini index that serves to analyze the level of income concentration, with an interval from 0 to 1, the lower the index, the better the income distribution in the country, region, state or city. According to the PNAD time series, the index had a significant reduction in the period from 2001 to 2011, presenting results from 0.594 to 0.527, respectively. In view of this information, it is sought to present how the crime rates behave in the face of these variations in the Gini, unemployment and average income of workers. An increase in the real wage of workers also seeks to explain this context of crime that occurs in São Paulo cities. Since 2003, the value of the minimum wage has had a real growth (already discounted for inflation) of 72.31%, according to data from the Inter-Union Department of Statistics and Socioeconomic Studies (Dieese), benefiting 48 million people and contributing to the increase in the average income of wages in recent years.

Another important component for the explanation of the dependent variable is unemployment, since crime can be conditioned by the number of people who cannot find work, but need income to survive, such a link between these two components can come from this need for consumption and the low opportunity cost of the individual who enters the criminal activity, in the search for social insertion, also highlighting that the existence of laws that allow the offender to easily avoid being punished may be another factor that induces an increase in crime. However, according to the data on unemployment, there is also a significant drop in the period 2000-2013, from a rate of around 20% to approximately 5% in 2013 (SUMMA, 2014).

As the 10 cities with the highest homicide rate, there is no city with industrial agglomerations and high demographic density, TABLE 2 brings the numbers of the 20 largest cities in the state and shows their crime rates, unemployment rate, gini index and population.

Table 2

Homicide Rate, Population, Unemployment and Gini Index of the 20 largest cities in the State of São Paulo

Locality	Population	Gini	Unemployment	Tx of homicide
São Paulo	11.245.983	0,6453	7,2	10,63
Guarulhos	1.220.653	0,5345	9,57	13,44
Campinas	1.079.140	0,5782	6,26	14,55

S. Bernardo do Campo	764.922	0,5525	7,94	8,89
Santo André	676.177	0,5428	7,94	11,54
Osasco	666.621	0,5459	7,93	9,15
São José dos Campos	629.106	0,5633	7,14	8,74
Ribeirão Preto	603.774	0,5458	4,91	7,12
Sorocaba	585.780	0,529	8,4	10,07
Saints	419.388	0,5624	7,59	8,58
Mauá	416.585	0,458	11,68	7,92
São José do Rio Preto	407.816	0,5081	4,1	6,87
Mogi das Cruzes	387.260	0,5487	9,38	8,52
Diadem	385.838	0,4592	9,44	20,99
Jundiaí	369.710	0,5435	5,28	5,14
Carapicuíba	369.368	0,4965	8,98	11,64
Piracicaba	364.261	0,5398	6,41	10,71
Bauru	343.695	0,5596	5,87	13,09
Saint Vincent	332.193	0,4892	9,43	13,25
Itaquaquecetuba	321.329	0,4556	12,05	20,23

Source: Prepared by the authors with data from SEADE and DATASUS (2010).

In TABLE 2, it is observed that the capital, which is the largest city in the state, has a homicide rate per hundred thousand inhabitants of 10.63, slightly below the state average. With 11,245,983 inhabitants, the city of São Paulo has the worst index of gini, in which the higher the index, the greater the concentration of income in the city. The average unemployment rate of the ten largest cities in the state is 7.87%, so the capital is below average with 7.2%, in this regard São José do Rio Preto is the city that has the lowest unemployment rate, 4.1%, Itaquaquecetuba has the highest, 12.05%, among the ten largest cities in the state. São Paulo occupies the eighth position, behind Ribeirão Preto, Jundiaí, Bauru, Campinas, Piracicaba and São José dos Campos. The lowest gini index found among these cities is found in Itaquaquecetuba with 0.4556, followed by Mauá and Diadema, which have 0.458 and 0.4592 respectively, both belonging to the Metropolitan Region of São Paulo.

Among this selection of cities, Jundiaí is the one with the lowest homicide rate, about 5.28 deaths for every hundred thousand. On the other hand, those with the highest homicide rates are those with the best indicators of income concentration, Diadema and Itaquaquecetuba, bringing with them 20.99 and 20.23 respectively.

As shown in TABLE 2, Guarulhos has a population of 1,220,653 inhabitants, 13.44 homicide rate, 9.57 unemployment rate and 0.5345 for the gini index. In the ranking of the homicide rate, Guarulhos occupies the fourth position, above the state average. Its

unemployment rate is also above the average of 6.72%. In relation to the concentration of income, its index is almost a tenth-higher than the average.

Campinas, the third largest city in the state, shows that it has the second highest index of gini, behind only São Paulo, which has the most concentrated income of this group, its index in 2010 was 0.5782. The city's unemployment rate was below the state average, standing at 6.26%, on the other hand, its homicide rate is in third position considering the group of the ten largest cities, standing at 14.55 deaths for every hundred thousand. Its estimated population for the same year was 1,079,140.

Now analyzing the characteristics of the last three cities among the twenty selected, starting with Bauru, it had an estimated population of 343,695 in 2010, a gini index of 0.5596, slightly above the average in relation to this group of cities. Its homicide rate was 13.09, very close to the state average of 13.02 for the same year. The unemployment rate is among the lowest in the group, with 5.87.

Following the analysis São Vicente, a coastal city with 332,193 inhabitants, presented a homicide rate of 13.25 for the year of selection, considering the ranking among the twenty cities, São Vicente would be in the fifth position in the aspect of value above the state average more than three percentage points that was observed at 6.27%. In relation to its gini index, it is in the fourth position of least concentrated income with 0.4892.

As the work also focuses on the theft rate of the cities of São Paulo and not only on the homicide rate, table three brings some of the data regarding the numbers of thefts in the municipalities in 2010, which were the highest and lowest rates for the year of study.

Table 3

The ten highest and lowest theft rates per hundred thousand inhabitants

THEFT RATE			
	10 More		10 Less
Ilha Comprida	7097,63	207,47	Santa Salete
Aparecida	3507,97	199,76	Colonel Macedo
Mongaguá	3096,18	197,91	Piquerobi
Itanhaém	2919,96	196,54	Santa Rita d'Oeste
Guaíra	2814,34	189,47	Guzolândia
Ilhabela	2552,89	159,07	Mesópolis
Praia Grande	2351,27	158,51	Gavião Peixoto
Barretos	2348,48	98,45	Monte Castelo
Peruíbe	2316,66	59,54	Stream
Ilha Solteira	2259,03	27,25	Balbinos

Source: Prepared by the authors with data from SEADE

Following the data in TABLE 3, which presents which are the cities with the highest and lowest theft rate per 100 thousand inhabitants, selecting the ten most and the ten least dangerous in relation to the number of thefts. As shown in the table, the city of Ilha Comprida is the municipality that has the highest theft rate in the state of São Paulo in 2010, with 7097.63 thefts for every hundred thousand inhabitants. Campina do Monte Alegre according to SEADE, (2010) had a population of 9003 inhabitants, the municipality is located 209 kilometers from the capital on the south coast of São Paulo.

In second place in the ranking is Aparecida with 3507.97 thefts per 100 thousand, population in 2010 of 35006 (SEADE), belonging to the region of Vale do Paraíba Paulista, is 168 kilometers from the capital. The city is very famous for its Basilica of Our Lady of Aparecida, it is considered one of the largest religious pilgrimage centers in Latin America, receiving millions of visitors annually, making the municipality one of the main tourist attractions in Brazil. Although the city has a large part of its economy linked to services and commerce that comes from municipal tourism, it brings with it a high number of thefts to the city, due to the large flow of people in the city at a certain time of the year.

Concluding the three cities with the highest theft rates in the state comes Mongaguá, another coastal city in São Paulo. In 2010 its population was estimated at 46186, it is located 93 kilometers from its capital, in the same year the city had a theft rate of 3096.18. Note that of the 10 cities selected, six of them are with beaches, Guaíra and Barretos, which are in the northeast of the state bordering Minas Gerais and Ilha Solteira, which is to the northwest of the state on the bank of the Paraná River, and Aparecida, which has already been mentioned, are the municipalities that do not border the sea. Although these cities are not coastal, they have similar characteristics, which is the attraction of tourists at a certain time of the year, Barretos and Guaíra have the pedestrian party, Ilha Solteira has its Carnival and university games and Aparecida its Basilica of Our Lady.

Looking at the opposite side of the table, in which we have the municipalities with the lowest numbers referring to theft rates in the cities of São Paulo, in the best position is the city of Balbinos with a little more than 3900 inhabitants in 2010 (IBGE), 405 kilometers from São Paulo in the mesoregion of Bauru and has a theft rate of 27.25 per hundred thousand inhabitants. Its economy has as its main activity agriculture in the cultivation of sugar cane, an interesting detail of the city is that in 2005 there was the construction of two prisons in the city, which according to the residents, enabled a better performance in commerce, because of the increase in the number of people who visit the imprisoned family members and even the increase in its population, or in the number of prisoners, who are counted as residents of the city, and even the relatives of the prisoners who end up moving to another city to be closer to the jail and be able to visit them every week.

The second city with the fewest thefts per hundred thousand inhabitants is Ribeira, located 354 kilometers from the capital, on the border with Paraná, population in 2010 of 3358, with a theft rate of 59.54 for the same year. Agriculture is the economic base of the municipality, with the production of bananas, exported to the capital, and also the cultivation of oranges, rice, sugarcane, beans, cassava, corn and cattle, pork and poultry farming. The raising and export of cattle are of great importance to the local economy.

Monte Castelo is the third best city in relation to the number of thefts per hundred thousand inhabitants in the state, with 98.45 in theft rate. With 4063 inhabitants in 2010, it is located in the micro-region of Dracena, 679 kilometers from São Paulo. Per capita income in 2010 was R\$17,039.15. Its economy is focused on agriculture with a strong participation of sugarcane and cattle raising.

Among all the municipalities of São Paulo, the average number of thefts per hundred thousand inhabitants in 2010 was 1005.82. São Paulo, which is the largest city, has 1904.85, almost double the state average, Campinas, another large city in the state, has 2036.52. It is noted that the lowest numbers of the theft rate are found in municipalities further away from the capital and with agricultural activity.

4 RESULTS AND DISCUSSIONS

After estimation of the regression considering several combinations of chosen variables. The best estimated model was the theft rate of the cities of São Paulo for the year 2010, using the following explanatory variables: number of young males aged 15 to 24 years, illiteracy rate in relation to the city's population, per capita income, public spending on public security, growth rate of thefts from 2009 to 2010 and Gini index, without the use of intercept. The unemployment rate was discarded because it did not present a significant parameter, perhaps this is due to the fact that the population with the highest participation in the number of thefts, especially people between 15 and 24 years old, were not looking for a job in the last 6 months before the data collection period, since a positive relationship with the crime rate was expected.

All variables were used in natural logarithm, except for public spending on public security, which for some cities assumes a value equal to zero and thus makes the application of logarithms unfeasible. Table 3 shows the result found for the estimation of the variable theft rate and homicide rate.

Table 4

Analysis of the estimated parameters

Variable	Theft	Homicide
C	-	3,400831 (0,0005)
A_15_24	0,149518 (0,0000)	-0,120648 (0,0125)
Gini	0,427797 (0,0549)	-
Renda_pc	0,240192 (0,0000)	-0,131927 (0,0532)
Urb	0,751130 (0,0000)	-

C_fur	0,940166 (0,0000)	-
Analf	0,222617 (0,0032)	0,273510 (0,0543)
Tx desperation	-	0,387309 (0,0003)
C_hom	-	0,474815 (0,0000)
G_pub	-2.92E-09 (0,0441)	4.19E-09 (0,0134)

Source: Prepared by the authors with E-views 6.0 software

With this estimation, the impact of each explanatory variable on the dependent variable is obtained, remembering that, as previously mentioned, the model has no intercept, which would be the result of the LOG of the theft rate in 2010 if no explanatory variable had undergone any change. Starting with the variable a_15_24, it is observed that the coefficient 0.1495, being a positive number, it says that an increase in the population of young males aged between 15 and 24 years, produces an increase in the theft rate as well. With the use of natural logarithms in the variables, their coefficients already give us the percentage generated in the variable that is being explained, that is, it presents the elasticities of each component of the regression. The interpretation shows that for the variation of one unit in the population aged 15 to 24 years, it corresponds to an increase of approximately 0.15% in the theft rate. In TABLE 4, the values in parentheses represent the respective p-values of each estimated coefficient, showing that all parameters are significant with α of 5%.

For the interpretation of the relationship of the gini index, it is observed that the addition of one unit of this index reflects 0.42% positively in the dependent variable, highlighting that this index varies from 0 to 1, so one unit represents one hundredth considering two places after the decimal point for the index. As has already been proposed in other works that deal with crime, the greater the concentration of income in a country, region or municipality, the greater the propensity of citizens with little or almost no income to commit crime against property, this can even occur as a measure of deconcentration of income in a forced and illegal way, within the laws that guarantee the right to property, evidenced in Mendonça (2003).

In relation to per capita income, the coefficient was also shown to have a positive participation, denoting that the increase of one real in the per capita income of a city increases

the theft rate by 0.24%, with a higher per capita income individuals are more likely to obtain it illicitly, since this higher income does not have a uniform distribution, it makes some have access to consumer goods that others do not have. All variables have a positive relationship with the dependent variable, except for public spending on public security. Following the interpretation, the degree of urbanization increases by 0.75% to dependent, thus, the increase of 1% in the urban population of the city generates an increase in the number of thefts, such a situation may be associated with the fact that in more urbanized cities people are more sensitive to social exclusion, and also, there is the issue of formation of favelas in neighborhoods further away from the central region of the city, In which public policies are less present, especially in education and health, in the absence of public power, criminals take control of these areas.

Trying to capture an inertial component (and also control for possible omitted variables) of the phenomenon explained by the insertion of the growth rate of thefts from one year to the next, it shows that the increase of 1% in the theft rate in one year produces an effect of 0.94% in the following year, showing that this phenomenon tends to keep increasing if this positive variation is not controlled. For the illiteracy rate, the variation of 1% in the rate reflects on thefts in 0.22%, in this case, there may be a scenario that the individual with low qualification, with little or no level of education, tends to participate in criminal activity to equate this educational difference, which submits him to the work of manual labor with lower remuneration.

Therefore, the only variable that showed an inverse relationship to what was expected was spending on public security. However, as this was used at a level (i.e., without the application of the natural logarithm). Although the estimated coefficient is statistically significant, its value is very small, being practically inexpressive to explain the crime rate. However, the exclusion of this variable causes a worsening in the performance of the model (measured by the information criteria), which is why it was decided to include it in the model.

The insertion of these variables mentioned in the model was able to explain the phenomenon studied in 88.78%, verified by the R^2 extracted from the *software* used to estimate the model. With this, it can be said that the components chosen for the model can describe a large part of the theft rate of cities in the state of São Paulo. All parameters were significant at the significance level of 10%.

Perhaps, variables such as corruption rates, measured by the number of complaints with the management of the public machine of a city, number of occurrences of drug seizures

in the city and the lack of daycare centers for children, which can increase the probability of this individual who without receiving dignified conditions at the beginning of his life, generates negative results in the social formation of this citizen. However, these data were not included in the model because some of these variables do not have them for the year 2010 or many cities do not have these values.

To create the estimated linear regression model for the homicide rate variable, a smaller number of observations was used than that used to estimate the theft rate, this difference occurs because the observations for the homicide rate there are many cities that have a number of homicides equal to zero, so this fact makes it impossible to use a logarithm in this variable. With this model, an R^2 of 0.4026 was obtained, i.e., it can describe a little more than 40% of the estimated variable and almost 60% is included in the random error variable.

In the application of the econometric tests mentioned in item 5 of this study, it was observed that for the homicide estimation model there is no autocorrelation in the errors, they have a normal distribution and there is no heteroscedasticity in the errors, all the hypothesis tests performed for each test presented a value greater than 0.10, accepting the null hypothesis of absence of heteroscedasticity, autocorrelation and normal distribution of waste. For the theft rate estimation model, heteroscedasticity was present, which was corrected through White's robust covariance variance matrix. The other of these showed results of normality and absence of autocorrelation.

Table 5

Model diagnosis

	Thefts	Homicides
Jarque Bera	13.85	1.73
White's Test (0.000)*	(0.8382)	
Godfrey-LM (0.5252)	(0.6445)	
R^2	0.8878	0.4026

Source: Prepared by the authors with software eviews 6.0.

* Values in parentheses are the p-values.

From the results of the tests, it is possible to find that the White test in the theft rate model rejected the H_0 hypothesis, however its correction was made with White's robust covariance variance matrix. For the other tests, the null hypothesis was not rejected.

The second model for the homicide rate was generated from a database with 292 observations, so it is understood that 352 observations were excluded, which are the number of cities that had zero deaths by intentional homicide in 2010.

Analyzing the results found, it is clear that the model that best fits to explain the homicide rate using the database of this work was with a regression with intercept whose estimated value was 3.400831, which represents how much the homicide rate of a given city would be if there was no variation of any explanatory variable for the period analyzed. The absolute number referring to the participation of the young population in the city had a negative impact on the homicide rate, inferring that given its estimated coefficient of -0.1206, the increase of 1% in the participation of the young population decreases the homicide rate by 0.1206%, a result different from what was expected, since young people in this age group are more likely to commit acts of crime, as well as in Andrade and Lisbon (2000) who applied an econometric model to the cities of the state of São Paulo, Rio de Janeiro and Minas Gerais between 1981 and 1997.

The illiteracy rate showed a positive correlation, indicating that for an increase of 1% in the participation of illiterate people in the population of a city, the dependent variable moves in the same direction in the proportion of 0.2735%. One hypothesis for this positive correlation may be the case that an illiterate individual is less inserted in society, whether in legal matters or issues of future perspective, which ends up reducing his opportunity cost when committing such a crime, as verified by Becker (1968). Smaller cities in the interior usually have higher illiteracy rates, it may be due to the old customs that these cities still preserve, which generates a relationship of homicide focused on the situation as a crime of passion, hurting the honor of an individual or even the tradition of a family and also the lack of investigation more consists of investigations in cases of homicides in these cities.

Regarding the growth rate of municipal homicides, the behavior of this variable is inferred as an inertial component of the crime rate, that is, if in the previous year the municipality had a high homicide rate, this result will also cause a high rate in the following year. In the estimated regression, its reflection on the dependent denotes that its growth from one year to the next in the variation of one unit generates a positive impact of 0.4748% on the estimated variable. A fact associated with this result must be that in regions high growth of crime makes the citizen who does not participate in criminal activity move from this area to one with fewer acts of crime, making the place that has increasing cases of homicides increasingly under the command of criminal people.

The unemployment rate, which was not significant and had its exclusion for the estimation of the theft rate, was significant for the homicide rate, its relationship with the dependent occurred positively, showing that the increase in the unemployment rate in one unit produces an effect in the same direction for homicides in 0.3873%, such a result was what was expected, Unemployed people are more likely to commit crimes against life, either because of the low opportunity cost "*I have nothing to lose*", or to acquire income in the search for social insertion, considering the cases of robberies that occur in the municipalities of São Paulo.

Per capita *income* was another variable that presented a negative relationship, an acceptable result since a *high per capita income* is assumed that such a region has a labor market with greater opportunities, better public services and even better levels associated with the education of the population. The impact of *per capita income* on the homicide rate infers that for the increase of one real in income generates a drop of 0.1319% in the homicide rate. In the study by Hartwig (2010), the result was also negative for its estimation in Rio Grande do Sul, with panel data from 2002 to 2006.

It is worth mentioning that the gini index was removed from the model because it was not significant at 10% significance, as well as the degree of urbanization of the municipalities. The last variable to be analyzed is public spending on public security, which, because it did not have values greater than zero for all observations, the logarithmic base was not applied to it. However, it showed a positive relationship, demonstrating that increased spending on public security produces an increase in homicide rates. This result, although statistically significant, is not economically relevant (given the low numerical value of the estimated coefficient). In addition, there may be a problem of simultaneity between these variables, a treatment that is beyond the scope of the present work.

5 CONCLUSION

The objective of this study was to empirically analyze the determinants of crime in the municipalities of São Paulo during the year 2010. To this end, a linear regression model was estimated using the following explanatory variables: participation of the male population between 15 and 24 years old, Gini index, per capita income, degree of urbanization, illiteracy rate, spending on public security and growth rate of thefts from 2009 to 2010, estimation for the variable theft and, for the variable homicide rate, the unemployment rate and growth rate of homicides were inserted, excluding degree of urbanism and Gini index.

The results obtained showed that for the homicide rate, spending on public security showed a somewhat controversial result, given that crime is expected to decrease with increased spending on public security, and not the other way around as the model shows. However, as explained, this result, although statistically significant, is not economically relevant (given the numerical value of the estimated coefficient). In addition, there may be a problem of simultaneity between these variables, a treatment that is beyond the scope of the present work.

The explanatory variable that had the most impact on the dependent was the growth in the theft rate in the previous year. This result indicates that the inertial component of criminality is quite important. We can conjecture, perhaps, that the non-punishment of the individual who commits the crime is the main factor in the behavior of this variable, since the offender, having no punishment, continues to commit his crimes, producing this inertial effect.

For the model estimated for the homicide rate, the variable with the greatest explanatory power was also the growth rate of the previous year, the second that most explains the homicide rate was the unemployment rate, with a positive correlation inferring that a 1% increase in the unemployment rate increases the homicide rate by 0.3873%. For *per capita income*, the correlation of the variables was negative, implying that the increase in *per capita income* decreases the homicide rate, as extracted from the model, an increase of one real in income decreases the homicide rate by 0.1319%. The illiteracy rate shows that a 1% increase in this rate increases homicides by 0.2735%.

With the results found for these variables, it is possible to reduce the number of homicides by making more persistent investments in job creation, which in itself produces an increase in *per capita income*, improvements in the education system, which also, in the long run, has an income-generating effect and a better degree of culture of the people who are part of society. producing a more harmonious social environment.

As possible extensions of this work, a dynamic analysis of crime with data for the cities of São Paulo is suggested. In addition, the inclusion of variables such as the corruption index, the index referring to drug trafficking, alcoholic beverages, the number of firearms in circulation in the cities, and even binary variables for black people, in an attempt to verify the social characteristics of the victims of homicides in the municipalities of São Paulo.

DEDICATION

I dedicate this work, first, to my family members, especially my mother and my brothers, who managed to pass on life values to me that enabled me to face any difficulty during my graduation.

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