

ANALYSIS OF THE TREND OF THE CRIME RATES OVER ITALY FROM 2006 TO 2021

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INTRODUCTION

Crime is an ever-present topic: every day, in all kinds of media, we are constantly bombarded with news and reports related to all kinds of crimes and criminals. The issue of crime has been a longstanding concern in Italy, impacting various aspects of society and posing significant challenges to law enforcement agencies and the overall well-being of its citizens. Like many countries, Italy experiences a range of criminal activities, including organized crime, corruption, drug trafficking, and property crimes. According to the report regarding the perception of safety published by ISTAT¹ in 2018: "[...] In 2015-2016, it is estimated that 27.6% of citizens consider themselves little or not at all safe going out alone at night, for 38.2% the fear of crime influences their habits a lot or enough. [...] Women's sense of insecurity is significantly higher than men's: 36.6% do not go out at night out of fear (compared to 8.5% of men), 35.3% when going out alone at night do not feel safe (19.3% of men)." Continuing to study the report, one notices a general improvement in feelings of worry over the years. Nevertheless: "[...] 33.9 per cent of citizens believe they live in an area at risk of crime (very or fairly). [...] there is a widespread opinion that the police should be on the streets more often (55.5%), be more numerous (44.2%) or more present in the area (26.6%), and particularly in areas at risk (20.5%) and at night (20.3%). [...] The territorial picture is as varied as ever, with regions in which fear and concern present themselves as very marked problems. Among the divisions, the one that stands out is Central Italy, which owes its critical situation to Lazio. Among the other regions, Lombardy emerges, followed by Campania and Apulia. [...]".

The aim of this project is to thoroughly investigate the trend of crime indices in Italy from 2006 to 2021, and try to answer the social question: "Is this general feeling of concern and danger, constantly fed by politicians and the media, well-founded? What is the general crime trend observed over the years on our territory?". This work is proposed as a quantitative research based on secondary data. Multiple datasets were combined, all downloaded (and downloadable for everyone) through the ISTAT web application².

¹ ISTAT is the Italian National Institute of Statistics. The full report can be seen at the following link: <https://www.istat.it/it/files/2018/06/Report-Percezione-della-sicurezza.pdf>

² Data of this project was obtained through the following datasets:

- [Crimes reported by the police to the judicial authority's dataset;](#)
- [Reconstructed resident population, years 2001-2019 dataset;](#)
- [Resident population on 1 January, years 2020-2023 dataset.](#)

METHODOLOGY

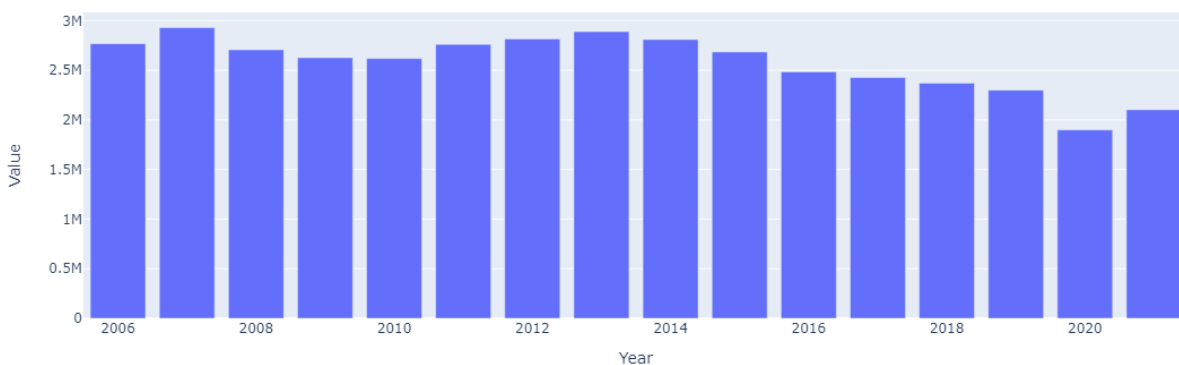
Once the data was obtained, the cleaning and analysis work was done entirely using Python libraries. In particular: Pandas and NumPy were used for data manipulation and analysis while Streamlit and Plotly were used to create interactive dashboards for data visualisation (including one obtained with the help of shapefiles of Italian provinces). All data manipulation and analysis work can be observed in detail, with explanations, in the Jupyter Notebook file called “data_manipulation.ipynb” located in the project folder. The work was conducted considering four units of analysis: provinces, regions, macro-areas (north-west, north-east, centre, south and islands) and Italy as a whole. The variables correspond to fifty-four diverse types of crimes (other than these 54 types, there are two more variables: one is listed as “others” and contains multiple crimes not previously considered within it; the other represents the “total” amount) committed from 2006 to 2021 (a total of 15 years). Furthermore, to try to limit what I would call the population bias (large units of analysis tend to have more crimes than smaller units of analysis) a metric was manually introduced to measure the incidence of the values per one hundred thousand inhabitants. This introduction required the addition of data concerning the resident population, variable that was absent in the initial dataset.

As can be seen by observing the interactive dashboards built with Streamlit, the possible conclusions that can be drawn from this project are almost unlimited. Nonetheless, some conclusions have been drawn as a demonstration by considering the data at the national level, at the macro-area level (with a focus on North-East), at the regional level (with a focus on Emilia Romagna) and, lastly, at a provincial level (with a focus on Ferrara). The comparison among different levels of units of analysis leads to a better understanding of the problem, without the need for generalization. It is important to remember that relying solely on the data made available in the tables above is not the best approach to gaining a deeper understanding of the problem at hand. In order to get a more complete overall idea of the problem, the data in the tables should be supplemented with the visualisation tools made available. For example, some large reductions or huge increases (-100% or +100%, for instance) could most likely concern crimes with few reports and which, therefore, do not pose a particular danger to the community. Other cases, on the other hand, might concern crimes that, yes, show a decrease compared to previous data, but which show an up-and-down trend over time rather than a real downward trend.

FINDINGS

The first unit of analysis taken into consideration is Italy as a whole. From 2006 to 2021 a total of 41196129 crimes were reported over the national territory, with an average of 2574758 per year and 7054 per day. The highest peak was reached in 2007, with 2929755 crimes reported, meanwhile the lowest number was observed in 2020, with a total of 1898784. The data observed in 2021 saw a decrease of -24,06% compared to the data observed in 2006. In particular, the crimes that decreased the most³ were: “rapine in banca” (-96,81%), “violazione della proprietà intellettuale” (-96,53%), “furti di automezzi pesanti trasportanti merci” (-87,46%), “rapine in uffici postali” (-85,66%), “furti di ciclomotori” (-83,16%), “omicidi volontari consumati di tipo mafioso” (-80,73%). Other crimes with a downward trend worth mentioning are: “furti” (-48,79%), “omicidi colposi” (-17,16%), “omicidi colposi da incidente stradale” (-44,28%), “omicidi volontari consumati” (-51,05%), “rapine” (-56,06%), “tentati omicidi” (-36,78%). Nevertheless, not all crimes show a decreasing trend. Among the crimes that increased the most⁴ we can find: “delitti informatici” (+823,49%), “pornografia minorile e detenzione di materiale pedopornografico” (+258,66%), “truffe e frodi informatiche” (+170,75%), “estorsioni” (+86,38%).

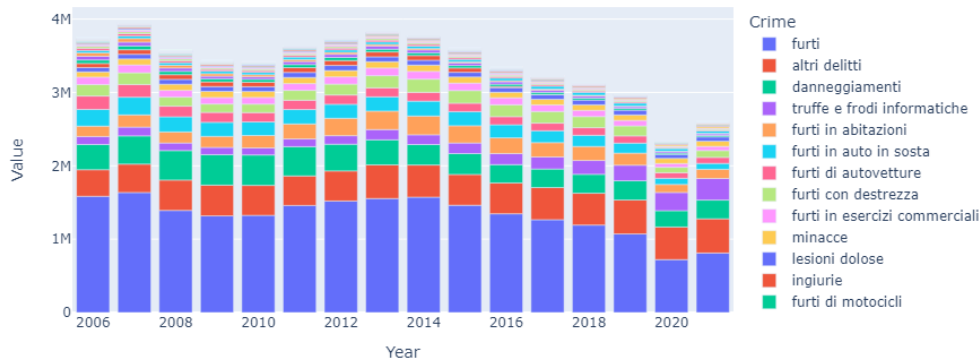
Trend of the total crimes over the years in Italy



³ Only the crimes with a decrease higher than -80% were listed. The complete list can be seen in the Jupyter Notebook file located in the project repository.

⁴ Only the crimes with an increase higher than 80% were listed. The complete list can be seen in the Jupyter Notebook file located in the project repository.

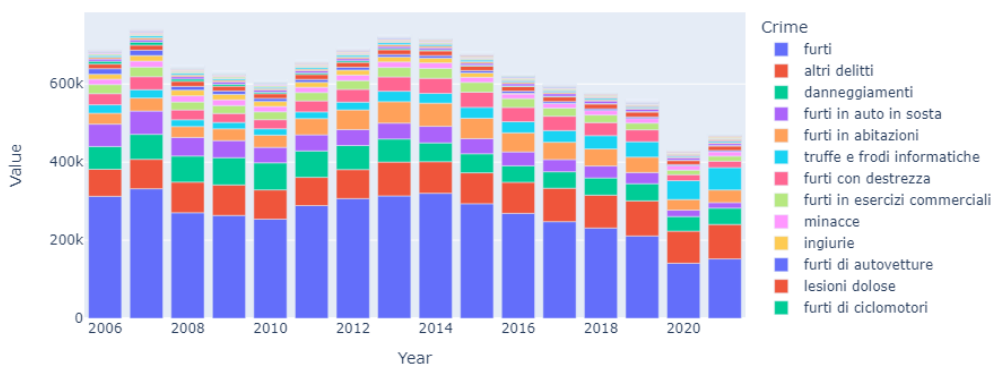
Trend of the different crimes over the years in Italy



1. INCREASING AND DECREASING CRIME RATES IN THE NORTH-EAST AREA FROM 2006 TO 2021

Considering the macro-areas as the units of analysis, a similar trend to that observed at national level can be noticed. Compared to 2006, in 2021 the North-West saw an overall reduction of -28.68%, the North-East -26.14%, the Centre -24% meanwhile the South and Islands saw a reduction of -16.21%. Focusing on the North-East area, the crimes that have experienced the greatest decrease are basically the same as those observed at national level.

Trend of the different crimes over the years in the North-East Area of Italy



The crimes with a percentage decrease higher than -50% can be seen in the following table, compared to the respective percentage measured at the national level:

Crime	North-East	Italy
Rapine in banca	-98,48%	-96,81%
Contrabbando	-97,56%	-54,78%
Furti di ciclomotori	-87,89%	-83,16%
Rapine in uffici postali	-87,30%	-85,66%
Furti di automezzi pesanti trasportanti merci	-85,53%	-87,46%
Furti di opere d'arte e materiale archeologico	-79,72%	-76,54%
Furti di autovetture	-79,11%	-54,98%
Furti in auto in sosta	-75,29%	-64,61%
Associazione di tipo mafioso	-75%	-7,44%
Omicidi volontari consumati a scopo di furto o rapina	-75%	-79,41%
Violazione della proprietà intellettuale	-71,63%	-96,53%
Sfruttamento e favoreggiamento della prostituzione	-67,50%	-73,74%
Incendi	-55,93%	-44,74%
Furti di motocicli	-54,94%	-58,66%
Furti	-51,29%	-48,79%

Instead, the crimes in the North-East area with an increasing trend from 2006 to 2021 are listed in the following table:

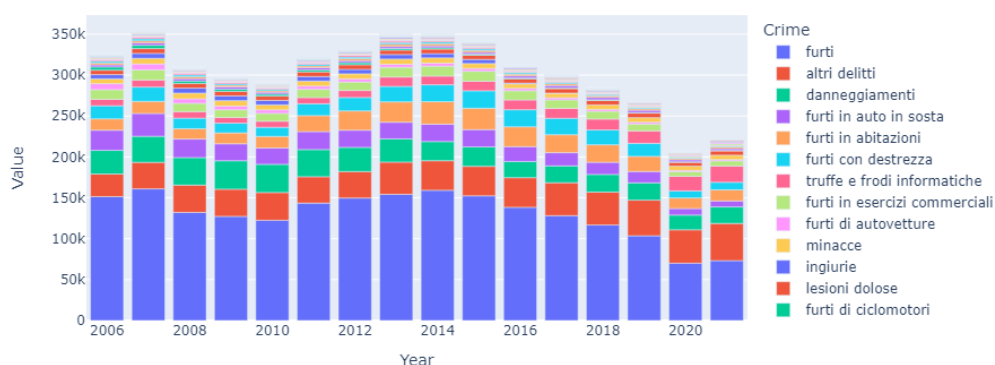
Crime	North-East	Italy
Delitti informatici	+632,28%	+823,49%
Pornografia minorile e detenzione di materiale pedopornografico	+216,28%	+258,66%
Estorsioni	+191,85%	+86,38%
Truffe e frodi informatiche	+166,75%	+170,75%
Contraffazione di marchi e prodotti industriali	+159,38%	+55,69%
Riciclaggio e impiego di denaro, beni o utilità di provenienza illecita	+111,11%	+14,46%
Incendi boschivi	+59,81%	-9,76%
Corruzione di minorenni	+36,84%	-14,06%
Altri delitti	+27,71%	+28,76%
Violenze sessuali	+26,27%	+16,91%
Rapine in pubblica via	+25,75%	-50,62%

Furti in abitazione	+15,48%	-11,92%
Rapine in abitazione	+5,14%	-22,43%
Percosse	+1,77%	+9,55%

2. INCREASING AND DECREASING CRIME RATES IN THE EMILIA-ROMAGNA REGION FROM 2006 TO 2021

During the years taken into consideration, the Emilia Romagna region observed 3692612 crimes reported, an average of 230788 per year and 632 per day. The peak was observed in 2007, with 265337 crimes reported, meanwhile the lowest number of reports belongs to 2020, with 166773 crimes reported. The region saw an overall decrease in the crime rates of -25,71%, a result like the one observed at the national and macro-area level (considering the North-East macro-area in which the region belongs).

Trend of the different crimes over the years in the Emilia Romagna region



The types of crime that in 2021 saw a decrease higher than -50% compared to the 2006 rates can be seen in the following table.

Crime	Emilia Romagna	North-East	Italy
Associazione di tipo mafioso	-100%	-75%	-7,44%
Contrabbando	-100%	-97,56%	-54,78%
Rapine in banca	-98,59%	-98,48%	-96,81%
Furti di ciclomotori	-87,73%	-87,89%	-83,16%
Furti di automezzi pesanti trasportanti merci	-86,81%	-85,53%	-87,46%
Rapine in uffici postali	-82,93%	-87,30%	-85,66%

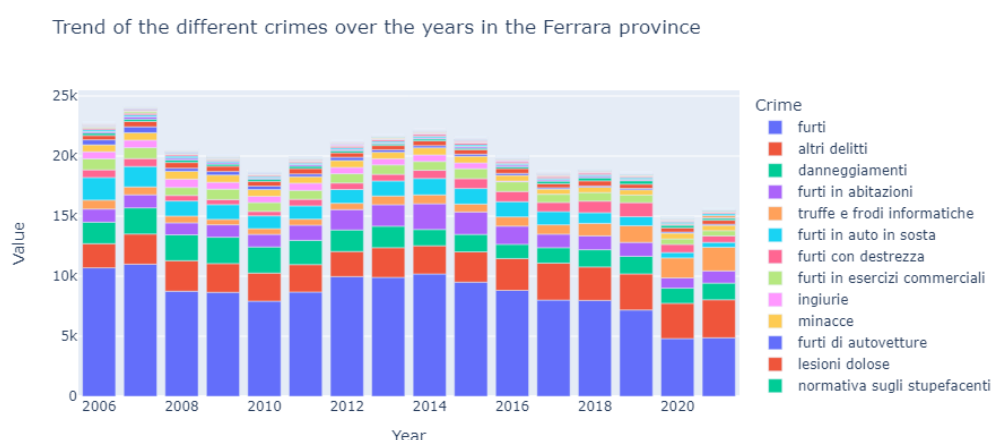
Furti di autovetture	-78,73%	-79,11%	-54,98%
Furti di opere d'arte e materiale archeologico	-75%	-79,72%	-76,54%
Sfruttamento e favoreggiamento della prostituzione	-72,73%	-67,50%	-73,74%
Furti in auto in sosta	-70,03%	-75,29%	-64,61%
Attentati	-65,62%	-45,45%	-65,52%
Sequestri di persona	-62,16%	-47,09%	-52,16%
Usura	-52,63%	-44,44%	-52,65%
Furti	-51,70%	-51,29%	-48,79%
Violazione della proprietà intellettuale	-51,65%	-71,63%	-96,53%
Ricettazione	-50,66%	-47,43%	-58,95%

Instead, the types of crime that in 2021 saw an increase compared to the 2006 rates can be seen in the following table.

Crime	Emilia Romagna	North-East	Italy
Delitti informatici	+969,33%	+632,28%	+823,49%
Pornografia e detenzione di materiale pedopornografico	+217,86%	+216,28%	+258,66%
Riciclaggio e impiego di denaro, beni o utilità di provenienza illecita	+207,89%	+111,11%	+14,46%
Estorsioni	+206%	+191,85%	+86,38%
Contraffazione di marchi e prodotti industriali	+178,43%	+159,38%	+55,69%
Truffe e frodi informatiche	+154,21%	+166,75%	+170,75%
Incendi boschivi	+122,41%	+59,81%	-9,76%
Altri delitti	+65,05%	+27,71%	+28,76%
Rapine in pubblica via	+36,26%	+25,75%	-50,62%
Violenze sessuali	+34,40%	+26,27%	+16,91%
Rapine in abitazione	+21,26%	+5,14%	-22,43%
Corruzione di minorenne	+14,29%	+36,84%	-14,06%
Percosse	+13,87%	+1,77%	+9,55%
Omicidi volontari consumati	+3,45%	-27,63%	-51,05%

3. INCREASING AND DECREASING CRIME RATES IN THE PROVINCE OF FERRARA FROM 2006 TO 2021

During the years taken into consideration, the province of Ferrara observed 251587 crimes reported, an average of 15724 per year and 43 per day. The peak was observed in 2007, with 18963 crimes reported, meanwhile the lowest number of reports belongs to 2020, with 12224 crimes reported. The province saw an overall decrease in the crime rates of -25,97%, a result like the one observed at the national, macro-area (considering the North-East macro-area in which the region belongs) and regional level (considering the Emilia Romagna region in which the province belongs).



The types of crime that in 2021 saw a decrease higher than -50% compared to the 2006 rates can be seen in the following table.

Crime	Ferrara	Emilia Romagna	North-East	Italy
Atti sessuali con minorenne	-100%	-13,64%	-9,18%	+6,09%
Incendi boschivi	-100%	+122,41%	+59,81%	-9,76%
Rapine in banca	-100%	-98,59%	-98,48%	-96,81%
Usura	-100%	-52,63%	-44,44%	-52,65%
Violazione della proprietà intellettuale	-96,30%	-51,65%	-71,63%	-96,53%
Furti di ciclomotori	-91,38%	-87,73%	-87,89%	-83,16%
Furti di opere d'arte e materiale archeologico	-90%	-75%	-79,72%	-76,54%
Rapine in uffici postali	-83,33%	-82,93%	-87,30%	-85,66%
Furti in auto in sosta	-78,18%	-70,03%	-75,29%	-64,61%

Furti di motocicli	-77,78%	-49,86%	-54,94%	-58,66%
Furti di autovetture	-77,78%	-78,73%	-79,11%	-54,98%
Omicidi colposi da incidente stradale	-68,75%	-39,88%	-41,82%	-44,28%
Ricettazione	-60,71%	-50,66%	-47,43%	-58,95%
Furti	-54,43%	-51,70%	-51,29%	-48,79%
Furti in esercizi commerciali	-52,61%	-46,95%	-45,69%	-43,84%

The types of crime that in 2021 saw an increase compared to the 2006 rates can be seen in the following table.

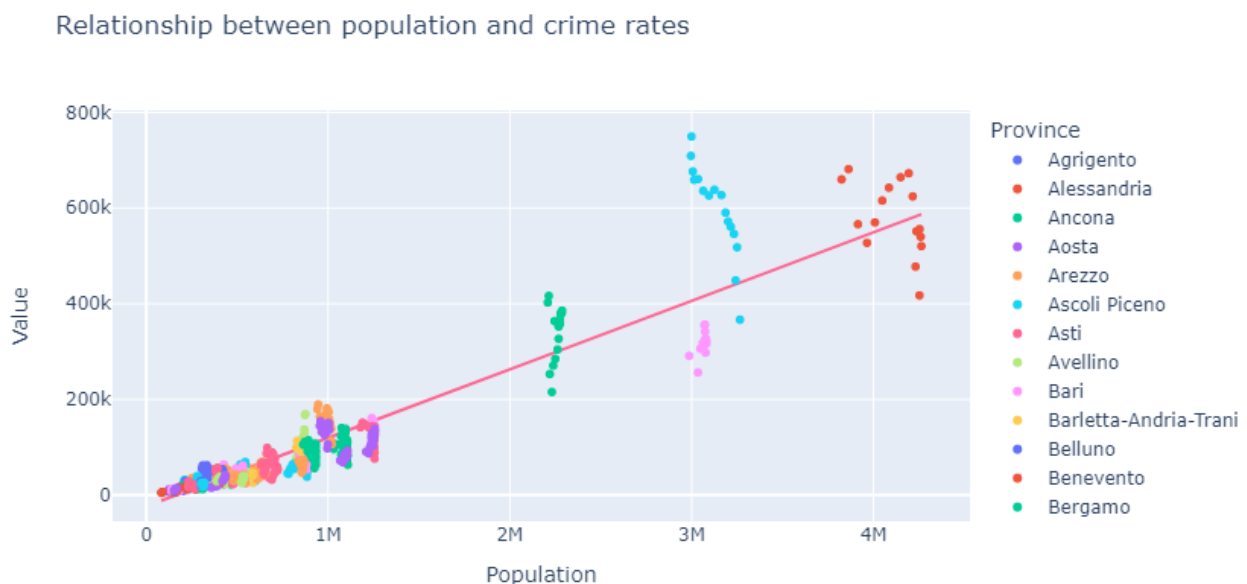
Crime	Ferrara	Emilia Romagna	North-East	Italy
Delitti informatici	+2112,50%	+969,33%	+632,28%	+823,49%
Riciclaggio e impiego di denaro, beni o utilità di provenienza illecita	+900%	+207,89%	+111,11%	+14,46%
Pornografia minorile e detenzione di materiale pedopornografico	+500%	+217,86%	+216,28%	+258,66%
Associazione per delinquere	+300%	-42,37%	-48,24%	-40,53%
Sfruttamento e favoreggiamento della prostituzione	+250%	-72,73%	-67,50%	-73,74%
Truffe e frodi informatiche	+163,27%	+154,21%	+166,75%	+170,75%
Estorsioni	+145%	+206%	+191,85%	+86,38%
Omicidi volontari consumati	+100%	+3,45%	-27,63%	-51,05%
Sequestri di persona	+66,67%	-62,16%	-47,09%	-52,16%
Altri delitti	+57,33%	+65,05%	+27,71%	+28,76%
Furti con strappo	+37,14%	-24,22%	-24,09%	-48,05%
Rapine in abitazione	+30%	+21,26%	+5,14%	-22,43%
Rapine in esercizi commerciali	+23,53%	-14,08%	-11,08%	-60,73%
Violenze sessuali	+20%	+34,40%	+26,27%	+16,91%
Rapine in pubblica via	+15%	+36,26%	+25,75%	-50,62%
Percosse	+12,98%	+13,87%	+1,77%	+9,55%

LINEAR REGRESSION APPLICATIONS

In this chapter we are going to see two linear regression applications. The first one will concentrate on the relationship between population and crime rates over the years, while the second one will focus on the explosive growth of cybercrimes over the years (considering the whole Italian territory).

1. RELATIONSHIP BETWEEN POPULATION AND CRIME RATES

The aim of this application is to demonstrate the assumption that bigger provinces tend to have higher crime rates compared to provinces with less inhabitants. I grouped the data by province, year and population and then took the summation of the crime rates of the given province in the given year. It can be shown that with these conditions, population and crime rates have a 0.94 rate of correlation.

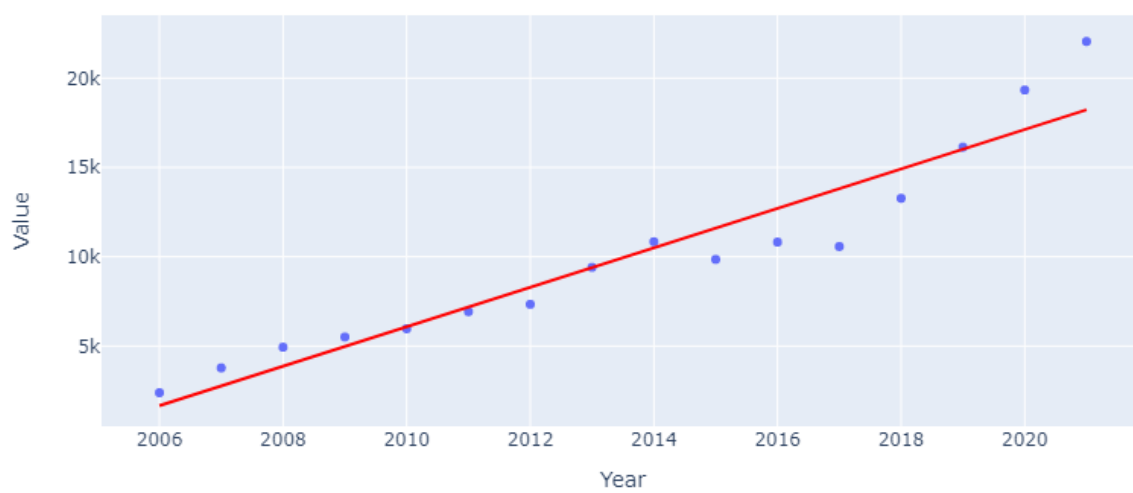


The plot confirms our “population bias” assumption. It is indeed true that bigger provinces tend to have more crime rates rather than provinces with less inhabitants. By taking a closer look at the plot, the main findings that can be seen are the following: Rome, the province with the most inhabitants, has had years with rates over the trendline and year with rates below the trendline; Naples, instead, has constantly had crime rates below the trendline meanwhile Milan, with a population like Naples, has had crime rates over the trendline (only one point under the trendline).

2. THE GROWTH OF CYBERCRIMES OVER THE YEARS

The aim of this application is to analyse the explosive growth of cybercrimes, the type of crime that increased the most over the Italian territory during the 16 years taken into consideration (+823,49%).

Trend of cybercrimes over the years (OLS)



Trend of cybercrimes over the years (Lowess)

