Life Quality Analysis

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Abstract

This study represents an analysis of existing data spanning from 2013 to 2020, where we processed and plotted the information to draw conclusions and insights on the relationship between population dynamics, crime rates, and smart city development trends in European countries. Employing a user-centric approach, our project provides a nuanced exploration of these dynamics, utilizing regional segmentation and customizable Smart Index filters. Our findings suggest potential decoupling between smart urban features and crime reduction in Western European cities, revealing the need for further in-depth analysis. This study underscores the importance of ongoing research and emphasizes the potential for states to invest in such analyses to inform targeted interventions, aligning with the objectives outlined by the World Health Organization.

Introduction

Research Questions

In our analysis from 2013 to 2020, we conducted a comprehensive comparative study of European countries. Our focus was understanding the relationship between population and crime rates. We aimed to extract valuable insights that highlight the unique characteristics of each country and identify prevalent trends in population and crime.

The Main Target

This user-centric approach empowers stakeholders to uncover nuanced insights, fostering a deeper understanding of Smart City development trends across Europe. The combination of regional segmentation and customizable Smart Index filters ensures a comprehensive and engaging exploration of our dataset.

Desired Outcome

See the correlations between an index regarding the smartness, population rate and crime index, in particular we are interested in the relationship between smart index and how the other being affected from it .

Data Sources

- Smart:
    - https://www.kaggle.com/datasets/magdamonteiro/smart-cities-index-datasets
- Criminality:
    - https://ec.europa.eu/eurostat/databrowser/view/ilc_mddw06/default/table?lang=en
    - https://ec.europa.eu/eurostat/databrowser/view/crim_off_cat/default/table?lang=en
- Population:
    - https://ec.europa.eu/eurostat/databrowser/view/tps00001/default/table?lang=en

Data Pre-Processing

Smart – Criminality

To analyse the relationship between crime rates and smart city development, we merged two datasets and eliminated unnecessary columns. Additionally, we added a new column indicating whether each city is part of Europe. To simplify the analysis, we calculated the average values for cities within the same countries, considering capitals or the biggest cities. Using this data, we created a graph where the x-axis represents the crime index, the y-axis represents the Smart City Index, and each data point is differentiated by countries and Europe parts distinction (colour). By dividing the graph into four quadrants, patterns within the data can be more easily identified. This comprehensive analysis provides insights into the correlation between crime rates and smart city development across different cities, countries, and regions, enhancing our understanding of these important factors in urban environments.

Criminality – Population

We carefully collected data from Eurostat, using two distinct datasets. The first dataset included population figures from 2012 to 2020 for European countries, while the second dataset focused on crime rates for the same time range. To ensure accuracy, we scaled the data appropriately, considering the variations in country sizes.

Smart – Population

The two datasets were merged, ensuring compatibility and all the unnecessary columns were eliminated to keep the data clean. The smart index was averaged among cities of the same country, retaining only the capital or one of the largest if no capital was present. While for the population dataset, from the absolute values were computed the difference from one year to the precedent one to keep only the variation.

Smart City Index

In the data processing protocol, a meticulous approach was taken to enhance the dataset for our Smart City Bubble Chart. First, we eliminated superfluous columns, streamlining the data for clarity and efficiency. To provide a geographical context, a new column, "Part of Europe," was introduced, enabling insightful categorization based on the region to which a city belongs.

To ensure an accurate representation, we performed the same average index calculations as in the Smart-Population dataset.

Data Visualizations

Crime score vs Smart index scatter

- Flourish chart: https://app.flourish.studio/visualisation/16392222/

Using the pre-processed data, we created a graph where the x-axis represents the crime index, the y-axis represents the Smart City Index, and each data point is differentiated by countries and Europe parts distinction (colour). By dividing the graph into four quadrants, patterns within the data can be more easily identified. This comprehensive analysis provides insights into the correlation between crime rates and smart city development across different cities, countries, and regions, enhancing our understanding of these important factors in urban environments.

Population variance and Smart index

- Flourish chart: https://public.flourish.studio/visualisation/16201907/

This chart provides a quick overview of the smartest European cities, as the columns are clearly ordered from highest to lowest. Additionally, this interactive chart allows users to discover the population variation between the years 2019 and 2021 with just a few clicks of the mouse. To further enhance our understanding of the data, the column for each city also includes the capital of the corresponding country. The interactive and visual nature of this chart allows for a more engaging exploration of the data and a deeper understanding of the trends in smart city development across Europe.

Crime variance and population

- Flourish chart: https://public.flourish.studio/visualisation/16193316/

To analyze the data, we calculated yearly differences to show changes within each country. Initially, we created a basic visualization, but recognizing the need for more insights, we used Excel to generate trend lines for population and crime metrics. These trend lines were incorporated into our visualization, enhancing it with trajectories. This dynamic display offers valuable insights into how population and crime rates evolve over time in European countries, helping us understand specific changes within each nation. It also allows us to identify positive or negative trends, indicating whether rates are increasing or decreasing. This comparative visualization goes beyond observation, enabling us to draw parallels and distinctions between countries, revealing potential correlations between population and crime rates. Essentially, our visualization serves as a historical record and a tool for uncovering complex interrelations that shape the socio-demographic landscape of European nations.

Smart City index bubble

- Flourish chart: https://app.flourish.studio/visualisation/16133786/

With our interactive bubble chart, it's easy to see the differences in the Smart City Indices of European cities. Each bubble represents a city, and you can use the mouse to group them by region or select specific indices for a personalized view.

The resulting dynamic bubble chart is tailored for an immersive exploration experience. Categorized by country, the size of each bubble corresponds to the Smart Index values, allowing users to intuitively grasp the relative standings.

This approach helps stakeholders gain detailed insights and better understand Smart City development trends in Europe. By using regional segmentation and customizable filters, users can explore our dataset thoroughly and conveniently.

Interface Design

We decided to use a [free Bootstrap 5 template](#) to create a smart and clean one-page website report quickly. We took the existing sections and edited them to make it look good for our purpose, adding more sections and editing the style to fit the charts.

Then we edited the descriptions and checked that the page worked well with the embedded flourish charts.

Future use

Moving forward, our project, born out of a comprehensive study from 2013 to 2020, holds promise for shaping the trajectory of Smart City development in Europe. The user-centric approach and customizable Smart Index filters offer a unique lens to explore the nuanced relationship between population rates, crime indexes, and the smartness index. This tailored exploration aims to unravel the impact of smart city initiatives on crime rates, empowering people to make informed decisions. Looking ahead, the project stands ready for continual evolution, embracing emerging data sources and technologies. In the future, more countries could delve more into this topic to get deeper and more accurate insights to then improve the overall life quality for its citizens.

Conclusions

After the analysis, we found some correlations between smart index and crime index: Cities in Central Europe exhibit lower crime rates coupled with high Smart City Indices. On the contrary, cities in Western Europe form a cluster with high crime rates, despite having elevated Smart City Indices. This intriguing observation suggests a potential decoupling between smart urban features and crime reduction in Western European cities.

While talking about population, is been difficult to highlight a significant pattern, this might be influenced by multiple factors. The smart index by country could be slightly biased, as some nations may have high smart indexes but limited to the city itself, while other countries may have multiple cities with a low index, which represent better the reality, thus the smart index per country might be slightly biased.

In conclusion we can affirm a strong interest in this area, the continued development of this kind of analysis could only improve the knowledge related to the aspects covered by the world health organization.