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Economic Crime Analysis in the Regions of the Czech Republic in Relation to Macroeconomic Data

Abstract

Criminal activity is a serious but unfortunately inevitable phenomenon in society, which needs to be regulated or minimised. This paper analyses crime from 2008 to 2022, with the main objective of determining the relationship between solved crimes and the total number of crimes, as well as the relation between the severity of criminal offenses and unemployment and average wages. Furthermore, it aims to predict crime rates for the next six years. Additionally, based on multiple linear regression, crime in the Czech Republic is compared with its neighbouring countries. It has been found that there is a positive linear relationship between the number of crimes and the number of solved crimes. Similarly, there is a statistically significant negative relationship between the number of crimes and average wages. Regarding the analysis in relation to neighbouring countries of the Czech Republic, it can be observed that the development of criminality in the Czech Republic follows a similar trend to that of the Slovak Republic and Germany.

Keywords: Crime analysis; Prediction of criminality; International comparison of crime rates; Dependence of crime with macroeconomic data.

JEL Classification Codes: K42, R11

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Analiza przestępczości gospodarczej w regionach Republiki Czeskiej w odniesieniu do danych makroekonomicznych

Streszczenie

Działalność przestępcza jest poważnym, ale niestety nieuniknionym zjawiskiem, które należy uregulować lub zminimalizować. Niniejsza praca dotyczy analizy przestępczości w latach 2008–2022, a jej głównym celem jest określenie związku pomiędzy wyjaśnionymi przestępstwami a całkowitą liczbą przestępstw, a także związku pomiędzy wagą przestępstw a bezrobociem i przeciętnymi wynagrodzeniami. Ponadto ma na celu prognozowanie wskaźników przestępczości na najbliższe sześć lat. Dodatkowo, w oparciu o wielokrotną regresję liniową, porównuje się przestępczość w Czechach z krajami sąsiednimi. Stwierdzono, że istnieje dodatnia liniowa zależność pomiędzy liczbą przestępstw a liczbą przestępstw wyjaśnionych. Podobnie istnieje istotna statystycznie ujemna zależność pomiędzy liczbą przestępstw a przeciętnym wynagrodzeniem. Po przeprowadzeniu analizy w odniesieniu do krajów sąsiadujących z Republiką Czeską, można zauważyć, że rozwój przestępczości w Czechach wykazuje podobną tendencję jak w Republice Słowackiej i Niemczech.

Słowa kluczowe: analiza przestępczości, przewidywanie przestępczości, międzynarodowe porównanie wskaźników przestępczości, zależność przestępczości od danych makroekonomicznych

Kody klasyfikacji JEL: K42, R11

Introduction

Criminal activity in the Czech Republic has been mostly declining over the past nearly 15 years. The only exception was in 2013, when there was a significant increase in crime due to an amnesty declared by the then-president, and during the specific period of the Covid-19 pandemic. However, crime remains a serious social and pathological phenomenon that cannot be completely eliminated from society but can be regulated to some extent, thus keeping it within certain limits.

Legally, criminality encompasses a range of acts that violate the legal norms of a society within a specific territory and time. Criminal activity, in this sense, refers only to what is governed by criminal law (Criminal Code No. 40/2009 Coll., 2009). However, from a sociological perspective, the concept of criminal acts extends beyond the legal framework, reflecting multiple aspects and providing a broader insight into the issue.

In the Czech Republic, overall crime has been decreasing for a long time, which is attributed to several factors. According to Malík Holasová (2014), one of the main reasons is the improvement of the police work and the implementation of modern technologies in crime detection. Another important factor is demographic development, as an aging population leads to lower crime rates, given taht most crimes are committed by younger individuals. On the other hand, crime is increasing in some areas, particularly cybercrime. Another reason for the declining crime rate is economic stability and a lower unemployment rate, which reduce the economic motivation to commit crimes (Burian & Hřebík, 2017). Kudrlová & Vlach (2017) point out that with the increasing use of the Internet and digital technologies, the number of cyber-related crimes is also rising. However, it should be noted that statistics may also be affected by changes in the legal framework and the reporting of criminal activity.

Theoretical Background

The theoretical basis of this paper does not come directly from criminology, which is a scientific discipline that investigates the causes, consequences, prevention, and control of crime. On the contrary, they are based on econometrics, although these scientific disciplines complement each other in examining the complex relationships between crime and macroeconomic factors. Econometrics uses statistical methods to analyse economic data, in this case in crime.

According to the International Association of Crime Analysts (2014), crime analysis is defined as:„A profession and process in which a set of quantitative and qualitative techniques are used to analyse data valuable to police agencies and their communities". This encompasses the analysis of various aspects, including victims, social life quality, disorder, and others, as well as police operations, crime prevention, and police strategies.

In the Czech Republic, a criminal offense is defined in the Criminal Code No. 40/2009 Coll., §13, stating that„A criminal offense is an unlawful act designated as a crime by criminal law and exhibiting the characteristics specified by such law".

The analysis of crime data in the Czech Republic began more than 100 years ago, but most crime-related publications date from after 1989.

During the first half of the 20th century in the Czech Republic, Miřička (1902) examined forms of criminal offenses and the legal regulations of the time, Solnař (1931) discussed crime in the Czech lands in the years 1914–1922, and Kallab (1935) focused on substantive criminal law in the Czech and Moravian-Silesian region. In the second half of the 20th century, the analysis of criminal statistics, causes of criminal

offenses, and methods of committing crimes started to be explored (Jüttner, 1968). Krabec (1973) studied the development of criminality in the former Czechoslovakia. Holický & Březovský (1975) compiled a handbook for crime prevention and control. This period also saw an increase in youth crime, and researchers like Suchý (1972), Večerka (1985), and Vlček (1989a) explored this issue, including the utilization of youth's leisure time. Towards the end of the pre-revolutionary period, computer crime started to emerge and was subsequently analysed, with Vlček (1989b) being one of the early researchers in this area. It is also a question whether the crime data published in the Czech Republic before 1989 were reliable.

After the revolution in 1989, new crime-related topics emerged, such as crime committed by women (Šmausová, 1992; Válková, 1993) and economic crime and organized crime (Robinson, 1995; Liška, 1997; Budka, Dvořák & Zimmel, 2000). During this period, street crime and cases of domestic violence also increased. After 2000, more sophisticated analyses and statistics on criminal offenses were conducted, including influences such as drug-related crime (Štábová, 2002), gambling (Nešpor, 2007), cybercrime (Jirovský, 2007), terrorism-related crime (Pikna, 2006), insolvency-related crime (Kotlán, 2020), and tax found (Olexova & Sudzina, 2019). Additionally, social, and economic impacts of crime on state stability, crime committed by foreigners, and victimology (Velikovská, 2016) have gained importance.

It follows from the above that crime can take many forms and affects many areas of life. It traditionally includes violent crimes such as murder, robbery, and assault, as well as property crimes such as theft, burglary, and fraud. However, as society and technological develop, crime is continuously evolving. One of the most significant trends in recent years is the increase in cybercrime. Cyber-attacks, fraud, and identity theft are becoming more common with the increasing use of digital technologies, and the Internet. Cybercrime is now one of the fastest growing threats (Kudrlová & Vlach, 2017).

Crime also changes with demographic and economic shifts in society. For example, economic crime, including tax evasion and financial fraud, increases during periods of economic uncertainty and political instability. Scheinost et al. (2022) draw attention to the significant influence of economic factors such as inflation and unemployment on different types of criminal activity. In addition, the authors point out that the areas in which criminal activities are committed are also changing. Whereas crime was once primarily concentrated in urban areas, it is now increasing in smaller towns and the countryside. This trend relates to the increasing population mobility and the development of transport infrastructure. To understand the factors influencing crime trends, it is essential to map crime data.. The crime rate is a statistical indicator measuring the number of crimes committed within a certain period, usu-

ally a year, relative to the population. This indicator is often expressed as the number of crimes per 100,000 inhabitants (Becker, 1974).

Mapping contributes to detecting criminal offenses. Dağlar & Argun (2016) argue that technological advancements and the availability of geographic data resources enable investigators to map criminality, aiding in its detection and prediction. Similarly, Pánek et al. (2019) show that criminal offenses are spatially clustered, with certain places in cities having higher crime rates. Mapping also takes place in the Czech Republic at regional, district, city levels. Prague, the capital, is the most affected area in terms of criminality. Temelová et al. (2014) examine crime and safety in different districts of Prague, finding that despite higher crime rates in certain areas, residents of suburban districts feel safer. As shown in Figure 1, the least crime-affected regions are Highland Region, Zlín Region, and Karlovy Vary Region. On the other hand, the most affected regions, besides Prague, are Central Bohemian Region, Moravian-Silesian Region, and South Moravian Region. However, when data is recalculated per 1000 inhabitants, the least crime-affected regions remain the Highland Region, Zlín Region, and Pardubice Region, while the most affected regions, besides Prague, are the Ústí Region, Moravian-Silesian Region, and Karlovy Vary Region. Interestingly, the Karlovy Vary Region, despite having a lower absolute number of criminal offenses, emerges as a high-crime region when adjusted for population size.

One positive development in the first year of the Covid-19 pandemic, in 2020, was the recorded lowest number of criminal offenses in modern history. As mentioned above, this was due to the Covid-19 pandemic, during which a state of emergency was declared, leading to more stringent penalties for criminal activity. According to the Czech Police (2021), compared to the previous year, crime decreased by 33,696 offenses, representing a 16.9% decrease. However, the clearance rate increased by more than 3%, reaching a level of 56.3%. Figure 1 shows the overall crime scale in the first year of the pandemic and the percentage decrease in the number of criminal offenses compared to the pre-pandemic period.

The main causes of the decrease in criminal activity are likely due to restrictive measures implemented during the COVID situation, which resulted in reduced mobility of people in the Czech Republic and limited entry of citizens from other countries. Additionally, the amendment to the Criminal Code in October 2020, which raised the threshold for qualifying a criminal offense to 10,000 CZK, also contributed to the decline. When comparing the classification of criminal offenses by types, it was found that all observed categories experienced a decrease. For example, the number of thefts decreased by more than 23%, and economic crime decreased by nearly 25% compared to the previous year. The decrease in criminal activity was observed in all regions of the Czech Republic. The largest difference was recorded in the capital city

of Prague, where there were 23.7% fewer criminal offenses in comparison to 2019. Another significant decline, almost 23%, was noted in the Karlovy Vary Region, and nearly 19% in the Hradec Králové Region (Police of the Czech Republic, 2021).

Figure 1. **The total crime in individual regions of the Czech Republic in 2020 and the percentage decrease in the number of criminal offenses compared to 2019**
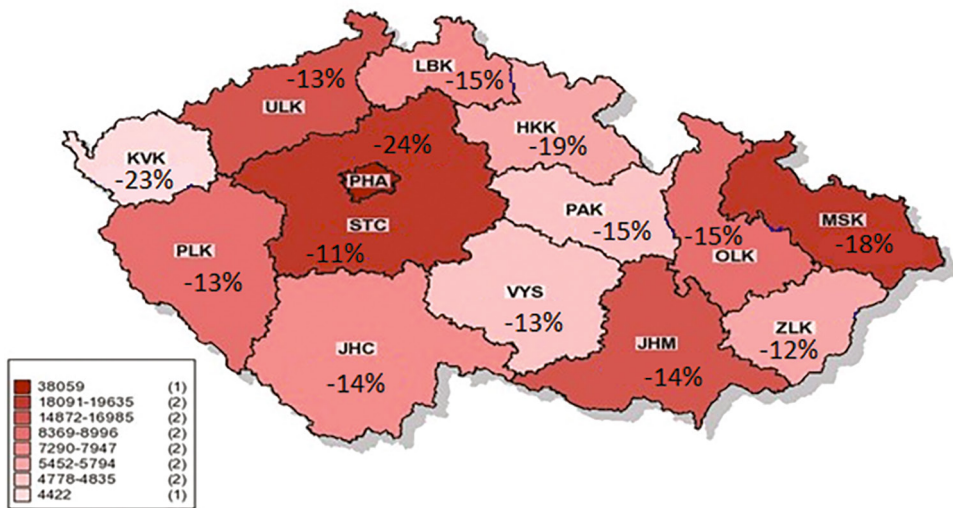
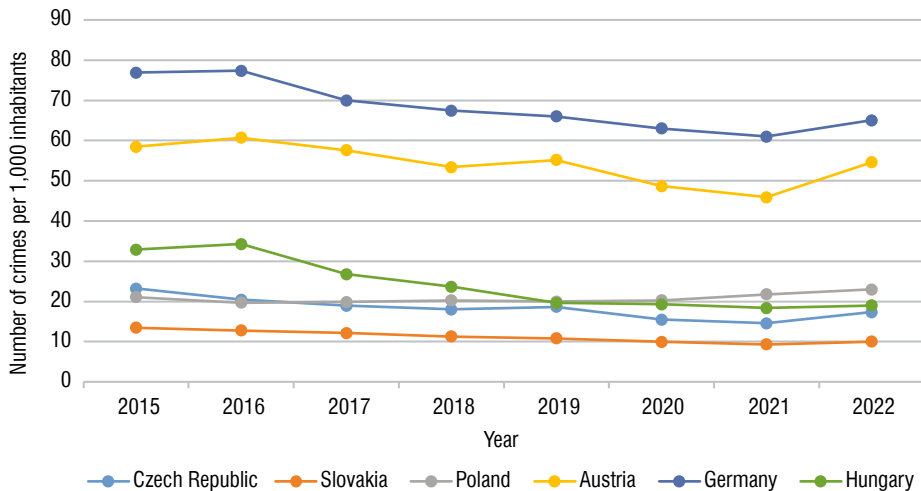
Source: Police of the Czech Republic (2021).

Comparing crime rates in the Czech Republic and neighbouring countries when adjusted for the number of offenses per 1,000 inhabitants (data selected from available sources: Slovakia, Poland, Germany, Austria, and Hungary), Germany and Austria are the most affected countries, while Slovakia is the least affected country (Ministerstvo vnútra Slovenskej republiky, 2022; Glówny Urzad Statystyczny, 2022; Bundesministerium Inneres, 2022; Bundeskriminalamt, 2022; Hungarian Central Statistical Office, 2022; Police of the Czech Republic, 2022). However, Suhányi et al. (2016) state that Slovakia might face crime more frequently over time, with diverse forms of criminal activity. The Czech Republic, along with Poland, falls among the second least affected countries.

Crime in the Czech Republic is a complex phenomenon that encompasses various types of criminal offenses, their frequency, extent, characteristics of perpetrators and victims, and other factors. Its development is influenced by many factors, with unemployment generally considered one of the most significant factors that can impact crime trends. By looking at Figure 1 and comparing the number of criminal offenses with the development of unemployment, it can be observed that in some

regions of the Czech Republic, where unemployment is higher, crime rates are also higher (with the exception of the capital city, Prague).

The relationship between unemployment and crime has been analysed since the early 20th century (see, e.g., Bonger, 1916; Glaser & Rice, 1959; Phillips et al., 1972). The relationship between crime, unemployment, and wages is a complex research area in criminology and econometrics. In recent years, several studies have focused on how economic conditions affect crime rates. Levitt (2004) points out that high unemployment is often associated with higher crime rates, as people without a stable income may be more prone to commit crimes as a means of securing the necessities of life.

Figure 2. **Comparison of crime rates in the Czech Republic and neighbouring countries from 2015 to 2022 (when adjusted for the number of recorded criminal offenses per 1,000 inhabitants)**

Source: Ministry of the Interior Slovak Republic (2022); Główny Urzad Statystyczny (2022); Bundesministerium Inneres (2022); Bundeskriminalamt (2022); Hungarian Central Statistical Office (2022); Police of the Czech Republic (2022); authors' processing.

Buonanno and Montolio (2008) examined data from Italy and found that increasing unemployment leads to an increase in property crime, which is consistent with the economic theory of crime proposed by Becker (1974) which states that individuals decide to commit crimes based on the analysis costs and benefits. Increased unemployment lowers the opportunity cost of committing crime, leading to an increase in crime.

In their study of crime in 39 countries, Fajnzylber, Lederman, and Loayza (2002) found that higher levels of income inequality and lower wages are strongly correlated

with higher rates of violent crime. This relationship is further supported by research by Raphael and Winter-Ebmer (2001), who found that crime rates in the US decrease as wages increase, which may be because higher wages reduce the economic pressure to commit crime. It is also important to mention that the relationship between unemployment, wages and crime is not always straightforward and may be influenced by other factors such as the effectiveness of the police force, social policies and cultural norms.

Cantor & Land (1985) examined the link between unemployment and criminality and found that unemployment affects crime in both the short term and the long term. In the short term, an increase in unemployment reduces crime through the opportunity effect. In the long term, however, an increase in unemployment leads to a rise in crime through the motivation effect. Their model was applied to crime data from the Czech Republic, however it was found to be unsuitable for analysing crime in the country. This conclusion was demonstrated by researchers such as Burian & Hřebík (2017).

However, varoius other factors influence the development of crime. Burian & Hřebík (2018) examined multiple variables such as population density, at-risk-of-poverty rate, less-educated population, more-educated population, total and long-term unemployment rate, the number of police officers, expenditures per police officer, gross domestic product per capita based on purchasing power, and clear-up rate (defined as the ratio of the number of solved crimes to total committed crimes). In this study, in addition to the impact of unemployment, we also focus on the influence of income levels on crime.

Crime rates are influenced by a wide range of factors that can be categorised into several categories: socio-economic factors (e.g., unemployment, income level and inequality, and education level); demographic factors (e.g., age structure, gender); cultural and social norms (e.g.; family relationships, culture and social values); political and legal systems (e.g., effectiveness of the legal system, political stability); and other external influences (e.g.; economic stability, migration). We can further divide these phenomena into controllable factors: unemployment, income inequality, education, age structure, family structure, and the effectiveness of the legal system, and further uncontrolled or difficult to control factors: cultural and social norms, political stability, external economic shocks, and natural disasters (Scheinost et al., 2022).

The relationship between the number of detected and recorded crimes is complex and depends on many factors. Detected crimes are those that have been successfully investigated and brought to a legal conclusion, while recorded crimes include all reported incidents, regardless of whether they have been resolved. The difference between these two indicators often reflects the effectiveness and capability of

the police. As Levitt (2004) states, high detection rates can be indicative of effective police tactics and sufficient resources. However, a certain percentage of crimes will always remain undetected. Reasons may include the complexity and nature of the crime, lack of evidence, or reluctance of witnesses to cooperate. Braga et al. (2019) point out that the structure of crime also plays a role – property crimes are often easier to detect than cybercrimes, which require specialised knowledge. Their study shows that detection rates are higher in areas with a higher number of police officers per capita. Detection rates are influenced by external factors such as the public's willingness to cooperate with the police and report crimes, as well as the size and structure of the police force.

The aim of the paper is to analyse crime in the Czech Republic, predict its development for the next six years, determine the relationship between solved crimes and the total number of crimes, and investigate the dependence between crime rates and macroeconomic data (unemployment and average wages). Additionally, the study aims to compare crime rates in the Czech Republic with those in Austria, Germany, Poland, and Slovakia through multiple linear regression.

The prediction of crime development in the Czech Republic and its regions will be done in two stages: a) prediction based on data from the period 2008–2019, and b) prediction based on data from the period 2008–2019 excluding the non-standard year 2013.

The analysis includes crime data for the years 2020 and 2021 (the latest available data for all analysed areas and countries). Due to the Covid-19 pandemic and the state of emergency declared during these years, crime rates were significantly lower. Therefore, these years are not included in all analyses to avoid distorting the trend development.

Based on the defined objectives, the following hypotheses have been established:

H1: Increased unemployment is associated with a higher rate of committed crimes.
   H1 assumes that higher unemployment may motivate individuals to resort to illegal means to obtain financial resources or address their economic needs. Conversely, lower unemployment generally provides better access to stable income sources and reduces motivation for committing crimes.

H2: Increasing average wages are associated with a decrease in the rate of committed crimes.
   H2 suggests that there is a negative relationship between average wages and the number of crimes. As average wages increase, a lower crime rate is expected, and vice versa, as average wages decrease, a higher crime rate is expected.

H3: The development of crime in the Czech Republic is similar to that in neighbouring countries.

H3 assumes that the development of crime in the Czech Republic is similar to the development of crime in neighbouring countries such as Slovakia, Germany, Austria, and Poland. Therefore, if there are changes in crime trends in one country, similar changes are expected to be observed in the Czech Republic and its other neighbouring states.

Research Methodology and Data

The data analysis was based on secondary data obtained primarily from the sources of the Czech Republic Police (Policie ČR, 2022) and its neighbouring countries' statistical offices (Ministry of the Interior Slovak Republic (2022); Główny Urząd Statystyczny (2022); Bundesministerium Inneres (2022); Bundeskriminalamt (2022); Hungarian Central Statistical Office (2022); Český statistický úřad (2023)). These sources provided information on the number and types of criminal offenses, their clearance rates, extent of damage, age and gender structure of offenders, unemployment rates, and average wages. Using available data sources allowed for a comprehensive analysis of crime in the area.

The paper analyses crime from 2008 to 2022. However, there were two non-standard fluctuations within these years. The first fluctuation occurred in 2013, which saw a significant increase in crime due to the amnesty declared by the former president of the Czech Republic. The second fluctuation was observed in the years 2020–2021, influenced by the Covid-19 pandemic and the declaration of a state of emergency, leading to a substantial decrease in crime. To avoid distorting trends in the development, not all years were included in the analysis.

Depending on the analysed data, an appropriate combination of methods was chosen to evaluate the data based on specific datasets and analysis goals to achieve relevant and informative results. Descriptive statistics were used to assess crime in a time series and in relation to selected EU countries. They were also used to evaluate individual types of crime (registered and solved) in the regions of the Czech Republic and at the national level, in combination with data synthesis.

Inferential and multivariate analysis were used as well. These methods were used to assess the dependency of solved criminal offenses on the overall criminal activity and the relationship between committed criminal offenses, unemployment and average wages. Additionally, multivariate linear regression was used for analysing crime trends in neighbouring countries of the Czech Republic. Multiple linear regression is a statistical method used to analyse the relationship between one dependent variable and multiple independent variables. The goal is to find a mathematical model

that best describes the linear relationship between the dependent variable and one or more independent variables (Freeman 2017; Devore, 2015).

Various statistical tests, such as t-tests or F-tests, are used to test the statistical significance of the regression coefficients. In this case, an F-test was used, which serves to test the overall significance of the model (Budíková 2010).

For predicting crime values in the near future, the ARIMA (Autoregressive Integrated Moving Average) was used. This model combines three components: autoregression (AR), integrability (I) and moving averages (MA). Based on historical data, future data are predicted.

Statistical analysis was performed in the STATISTICA program. Data were tested primarily at the p=0.05 significance level. For some analyses, the level of significance was increased to p=0.10, to increase the sensitivity of the test to detect effects that would not be statistically significant at a lower level. As Devore (2015) states, in socio-economic studies or in the behavioural sciences, the use of a higher level of significance may be more acceptable than in strictly scientific fields such as medicine or physics, where it is customary to use a more stringent level.

Data visualisation was used as a complementary method for data evaluation.

Empirical Data, Analysis, and Results

Analysis of Criminal Offenses and Damages in the Czech Republic and Their Dependency

When analysing the development of crime in the Czech Republic from 2008 to 2019, the highest increase in crime during the observed period was recorded in 2013. This was due to the fact that in January of that year, then-President Václav Klaus declared an amnesty. As a result, crime rates rose by 7%, with more than half of the offenders being repeat offenders. Aa a result, crime rates rose by 2019, when a 3.5% increase in crime was recorded (Foit, 2020). In the following two years, crime rates decreased again. The table below analyses the percentage changes in registered and solved crime in 2019 compared to the previous year, focusing on selected offenses such as overall crime, economic crime, property crime, moral crime, and violent crime.

The analysis shows that overall crime decreased in all regions except for the Zlín region. Economic crime increased overall across the entire Czech Republic, with the highest increase observed in the Olomouc region, South Bohemia region, and Highland region, while the largest decrease, by over 20%, occurred in the Pardubice region. Encouragingly, the clearance rate for economic crime generally increased.

As for property crime, it decreased in almost all regions, except for the Liberec region, which experienced a significant increase of nearly 13%. In the area of moral crime, it is important to highlight a decrease of over 28% in the Karlovy Vary region and 18% decrease in the South Bohemia region. However, the development of solved crimes is not very favourable, with, for example, the Karlovy Vary region experiencing a clearance rate decrease of nearly 40%, and the South Moravian region a decrease of over 33%. In terms of violent crime, it is noteworthy that the Karlovy Vary region experienced the highest increase, nearly 17%, but also had the highest increase in clearance rate, by almost 27%.

Table 1. Differences in registered and solved crime in 2019 in individual regions of the Czech Republic (in %)

Region	Overall crime		Economic crime		Property crime		Moral crime		Violent crime		Others	
	Registered	Solved	Registered	Solved	Registered	Solved	Registered	Solved	Registered	Solved	Registered	Solved
Czech Republic	−3.5	−0.3	1.0	9.0	−3.5	−3.1	−2.9	−8.6	−0.4	1.2	−6.4	−1.6
South Bohemian	−4.1	−1.1	12.6	11.7	−14.1	−13.3	−18.2	−26.4	4.8	4.8	−5.0	−1.2
South Moravian	−1.0	−4.1	−0.2	10.9	0.8	−13.4	−10.5	−33.3	1.5	−5.1	−5.6	−0.7
Karlovy Vary	−13.6	−4.9	−10.8	−2.8	−13.6	−16.6	−28.2	−39.3	16.6	26.8	−23.3	−5.8
Kralovehradec	−6.0	2.4	−5.8	4.2	−6.3	4.0	−2.2	−12.7	−8.0	−2.9	−5.6	3.2
Liberec	5.4	1.3	9.9	6.8	12.8	4.6	−8.9	−10.6	0.6	−2.6	−7.1	−1.9
Moravian-Silesian	−1.8	0.9	2.1	9.3	−1.8	−4.4	10.6	9.4	2.5	6.3	−5.1	1.0
Olomouc	−5.4	−1.7	13.6	17.3	−11.4	−14.4	0.0	−10.3	−5.5	2.2	−8.5	−4.2
Pardubice	−1.1	1.2	−20.3	−33.8	−4.3	−6.0	16.9	16.0	−10.5	1.4	8.0	10.5
Pilsen	−4.1	−2.9	0.4	0.9	−3.1	5.8	11.8	27.5	3.7	0.3	−10.2	−12.0
Prague	−4.6	5.9	−3.8	15.9	−5.6	6.0	1.7	−2.2	−4.0	3.5	−1.6	1.3
Central Bohemia	−6.3	−1.9	3.4	6.7	−7.7	0.3	−7.7	−15.0	−0.4	−0.1	−8.7	−4.7
Usti	−3.2	−3.3	−0.4	1.4	4.7	0.8	−7.1	−9.2	−7.3	−10.0	−14.1	−5.9
Highlands	−4.3	−9.7	10.6	19.9	−4.5	−31.8	−9.5	−15.4	1.3	0.2	−11.1	−12.8
Zlínský	0.3	6.3	−2.1	14.4	−2.4	0.4	−13.4	−28.0	1.6	0.4	3.7	9.2

Source: Police of the Czech Republic (2022); authors' processing.

The next section will analyse the relationship between the number of committed crimes and their clearance rate, as well as their dependence on unemployment and average wages. The results are for the year 2019 and are summarised in the following table.

Table 2. Dependency of solved crimes on overall crime and dependency of committed crimes on unemployment and average wages

Statistical Indicator	Dependency of Solved Crimes on Overall Crime	Dependency of Committed Crimes on Unemployment	Dependency of Committed Crimes on Average Wages
R	0.48910	0.06731	0.79242
R2	0.23922	0.00453	0.62793
Modified R2	0.18069	−0.07204	0.59931
F(1,13)	4.08772	0.05917	21.94025
p	0.064275	0.811598	0.000427
Standard error of estimation	1.9210	6.86406	4.19639

Source: Police of the Czech Republic (2022); authors' processing.

From the analysis, it can be concluded that the regression coefficients indicate the size and direction of the influence of independent variables on the dependent variable. A higher regression coefficient value indicates a stronger impact of the respective independent variable on the dependent variable. As part of the analysis, a graph showing a positive linear relationship between the number of crimes and the number of solved crimes was also evaluated. The coefficient of determination R^2 is 0.24, meaning that 24% of the variance in solved crimes there is explained by the overall number of crimes. The p-value shows that this relationship is statistically significant at the $p = 0.10$ significance level. Regarding the hypothesis H1, which examined the relationship between the number of committed crimes and overall unemployment, no statistically significant difference was found, as the p-value is too high (0.81), and the relationship is weak, as indicated by the very small coefficient of determination $R^2 = 0.005$. This hypothesis assumes that unemployment may have a negative impact on the social and economic stability of individuals and communities, leading to increased stress, frustration, and economic hardship. H1 was neither confirmed nor rejected.

In contrast, for hypothesis H2, which analysed the relationship between the number of committed crimes and the average wage, the relationship was highly significant. The p-value is well below the established significance level, indicating that this relationship is statistically significant. Also, the coefficient of determination R^2 is 0.63, meaning that 63% of crimes are dependent on the average wage. The graphical analysis shows a decreasing trend, indicating that with increasing average wage, the number of crimes decreases. This hypothesis is based on the theory that a higher average wage may have a positive impact on the socio-economic stability of individuals and communities, reducing the motivation to engage in criminal activities. Higher wages may reduce the financial motivation for committing crimes, decrease

the risk of poverty and deprivation, which are often associated with criminal activity, and provide more opportunities for legal means of financial gain. H2 was confirmed.

Similarly, an analysis of the number of damages in relation to unemployment and the average wage was conducted. Regarding the analysis of the relationship between the number of damages and unemployment, no statistically significant difference was found at the 0.05 significance level, and even when the significance level was moved to 0.10. The p-value is 0.34, and R2 is low at 0.07. In contrast, in the analysis of the relationship between the number of damages and the average wage, a statistically significant difference was found at the 0.05 significance level, with the p-value being almost zero (0.0000024). The coefficient of determination R2 is very high at 0.83, indicating that 83% of the number of damages is dependent on the average wage.

Damages from criminal activities were further analysed by cause, i.e., the type of criminal offense. Property crime and economic crime were selected for analysis because they have the highest damages. The total amount of damages was converted to per one criminal offense, and the results are shown in the following figure. The blue line represents property crime, and the brown line represents economic crime.

Figure 3. Number of damages in thousands of CZK per 1 crime
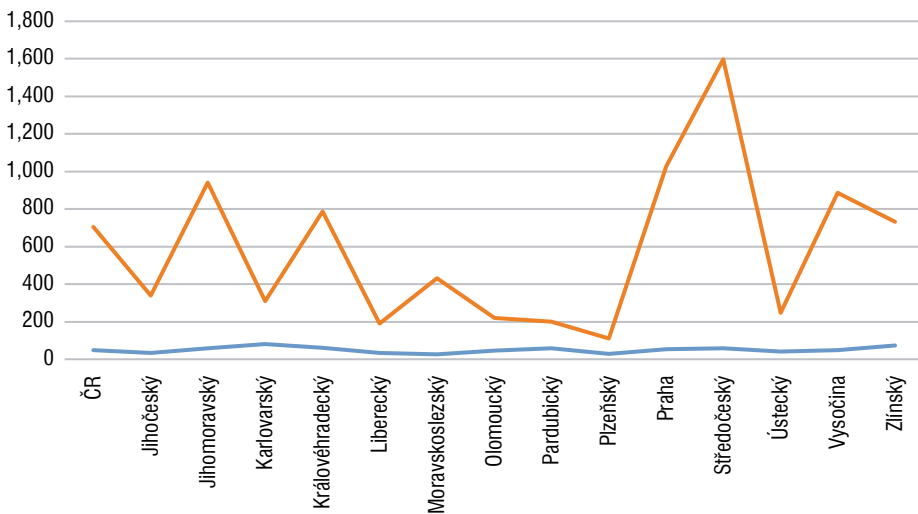
Source: Police of the Czech Republic (2020); authors' processing.

The average amount of damages per one criminal offense in property crime is relatively consistent across the regions, ranging from 26,000 CZK in the Moravian-Silesian Region to 81,000 CZK in the Karlovy Vary Region. However, significant fluctuations are observed in economic crime, where the best-performing regions are

the Pilsen Region, Liberec Region, and Pardubice Region. On the other hand, the most affected areas in terms of the number of damages are the Central Bohemian Region, the capital city Prague, and the South Moravian Region. The average range of damages in these regions varies from 110,000 CZK per one criminal offense in the Pilsen Region to 1,598,000 CZK per one criminal offense in the Central Bohemian Region. When analysing the relationship between the number of damages per one criminal offense in property crime and economic crime, no statistically significant difference in their dependence was found. Thus, we can conclude that the number of damages in the areas of property crime and economic crime is independent of each other.

Predictions in the Czech Republic

Within the analysed data, the future development of overall crime was also predicted for both the Czech Republic and individual regions. The analysis was conducted in two perspectives: a) prediction based on data from the period 2008–2019, and b) prediction based on data from the period 2008–2019 excluding the non-standard year 2013. For predicting crime values, the ARIMA (AutoRegressive Integrated Moving Average) was used. Past data and data broken down by individual regions of the Czech Republic were considered in the analysis. Below, in the table, are the predictive values derived from data excluding the year 2013, as this data is considered to have higher predictive power. Data from 2023 have been predicted, as the data for this year are not yet published at this moment.

Table 3. Prediction of the number of crimes per 1000 inhabitants in the period 2023–2028

Region / Year	2023	2024	2025	2026	2027	2028
Czech Republic	15.364	15.119	14.649	14.693	15.145	16.829
South Bohemian	12.673	11.898	11.583	11.305	10.891	12.650
South Moravian	14.414	14.037	13.599	13.596	14.181	15.406
Karlovy Vary	14.139	14.438	14.387	15.148	16.438	17.122
Kralovehradecky	10.506	10.255	10.022	10.014	10.451	11.533
Liberec	18.372	16.202	15.874	15.948	16.270	17.974
Moravian-Silesian	16.104	15.446	14.479	14.691	15.641	17.762
Olomouc	14.370	13.913	13.197	12.798	12.731	14.193
Pardubice	8.936	8.654	8.286	8.302	8.780	9.749
Pilsen	14.515	14.535	14.641	15.180	15.887	16.375
Prague	32.072	32.407	31.331	30.697	30.495	34.077
Central Bohemia	10.184	10.119	9.952	10.336	11.391	12.918

cont. Table 3

Region / Year	2023	2024	2025	2026	2027	2028
Usti	16.286	15.606	15.147	15.790	16.540	18.576
Highlands	8.961	8.728	8.459	8.349	8.642	9.655
Zlin	9.638	9.592	9.414	9.283	9.163	10.092

Source: Police of the Czech Republic (2022); authors' processing.

The trend in the development of crime is initially declining, but subsequently, it starts to rise. This is influenced by certain economic cycles and economic trends that correlate with the development of crime. To illustrate the difference in prediction with and without the inclusion of the year 2013, the figure below shows the prediction for the entire Czech Republic. The figure clearly shows a significant difference, especially in the years 2027 and 2028, and it is evident that if the non-standard year 2013 is included in the analysis, the fluctuations in crime prediction will be higher.

Figure 4.　**Prediction of the number of crimes per 1,000 inhabitants in the period 2023–2028 in the Czech Republic**
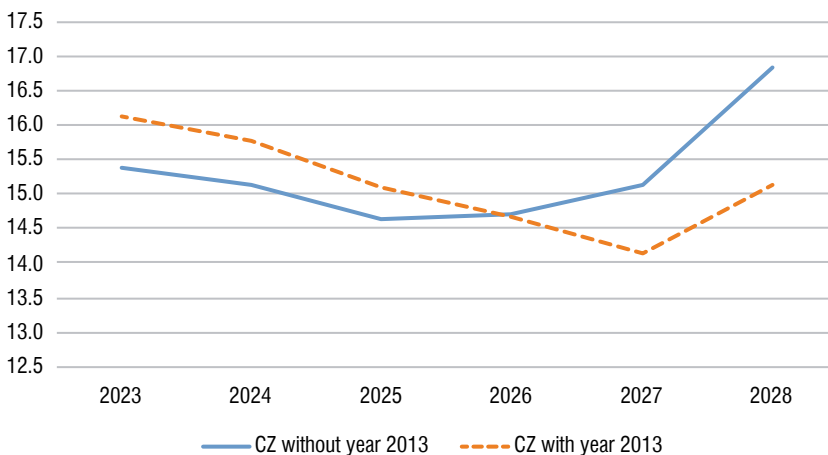
Source: Police of the Czech Republic (2022); authors' processing.

Analysis of Crime Development in Neighbouring Countries Compared to the Czech Republic

As part of further analysis, neighbouring countries of the Czech Republic, namely Slovakia, Poland, Austria, and Germany, were analysed. Comparing crime rates across European countries is difficult and can be unreliable. The main problem is the difference in legal definitions and classifications of crimes between individual

countries. Each country has its own legal systems and definitions of what constitutes certain crimes, which can lead to inconsistencies in statistics. For example, what is considered a serious crime in one country may be classified as a less serious crime in another country. Another problem is the different level of reporting and registration of crimes. Some countries have better crime registration systems, which may lead to higher official statistics compared to countries where victims do not report crimes or the systems are less effective (Aebi et al., 2021). Another problem is represented by different data collection and processing methodologies. Different statistical offices and research organizations use different methods for collecting, analysing, and presenting crime data. This may include differences in the inclusion or exclusion of certain types of crime and different ways of categorising the data. Socioeconomic factors and the level of development also play a significant role. Countries with higher incomes and better social systems may have lower rates of certain types of crime, such as property crimes, while countries with lower incomes may have higher rates of these crimes due to higher rates of poverty and unemployment. However, for the purposes of this analysis, different factors were not considered.

For this analysis, a multiple linear regression was performed, and the results are presented in the table below.

Table 4. Analysis of crime development in neighbouring countries compared to the Czech Republic

Statistical Indicator	Comparison Czech Republic vs. Slovakia	Comparison Czech Republic vs. Poland	Comparison Czech Republic vs. Austria	Comparison Czech Republic vs. Germany
R	0.88578	0.27731	0.64594	0.83857
R2	0.78460	0.07690	0.41723	0.70321
Modified R2	0.71280	−0.23079	0.22298	0.60428
F(1,13)	10.92799	0.24992	2.14790	7.10823
p	0.045536	0.651492	0.239011	0.075940
Standard error of estimation	1.1082	2.2943	1.8229	1.3009

Source: Police of the Czech Republic (2022); authors' processing.

The Czech Republic has relatively lower values of crime rate per capita compared to other countries, and these values are similar to those in Poland or Slovakia. On the other hand, crime rates in Austria and Germany are at higher levels. However, in this analysis, the level of criminality was not assessed (which is visible in Figure 2), but rather the trend of development. From the analysis, it is evident that the Czech Republic correlates the most with the Slovak Republic. This was confirmed at a significance level of 0.05, and we can say that the two countries are similar in terms of

crime development by 78%. Similarly, the Czech Republic also correlates with Germany, with a 70% similarity in crime development at a significance level of 0.10. When comparing the Czech Republic with Poland and Austria, no statistically significant difference in the trend of crime development was found. As for confirming or refuting H3, which states that the development of crime in the Czech Republic is similar to that in neighbouring countries, H3 was confirmed for Slovakia and Germany. However, for Poland and Austria, H3 was not confirmed.

Discussion

According to the statistics published by the Police of the Czech Republic (2021), there has been a decline in the overall number of criminal offenses in recent years. However, crime still occurs at different levels and in different areas, involving various types of offenses. Among the most common types of crimes in the Czech Republic are property offenses, such as theft, robbery, burglary, fraud, and other property-related crimes. Other frequent offenses include crimes against health, such as assault, murder, and crimes against public order and peace, such as property damage, disorderly conduct, threats. The paper highlights the need for incorporating sociological aspects into crime studies to understand the factors influencing crime rates more comprehensively.

Factors such as low economic conditions, high unemployment, lack of economic opportunities, unequal distribution of wealth, and social inequality may be associated with higher crime rates. Economic conditions can influence the motivations and opportunities for individuals to engage in criminal activities. However, both the geographic situation and demographic trends also influence criminal activity. Research by Stankevic et al. (2013) demonstrated that green spaces in dense residential areas contribute to crime prevention, while commercial or industrial areas are associated with increased crime. Our own research confirmed similar findings, showing that less densely populated regions like the Liberec region, Karlovy Vary region, and Highland region have lower crime rates compared to densely populated and industrial areas like Prague, Central Bohemian region, or Moravian-Silesian region.

Janák (2012) states that criminal activity is influenced by a specific social reality and its factors. These factors represent aspects of social life that significantly affect individuals' behaviour, such as economic conditions, living conditions, or religion. They are of a supra-individual nature and exert moral pressure on individuals, resulting from the societal norms and values. Other studies, for instance, Burian & Hřebík (2018), revealed that a higher level of education is often associated with lower crime

rates because educated individuals usually have better job opportunities and are less motivated to engage in illegal activities. The number of children in a family and divorce rates can also influence family stability and function, which may impact individual behaviour within the family and their likelihood of engaging in criminal behaviour. Our analysis confirmed both of these findings, as the number of crimes correlated with the average wage level (where the average wage is directly proportional to the level of education and also affects individuals' living conditions), and similarly, the number of damages correlated with the average wage level.

Comparing crime rates between countries can be challenging due to different statistical systems, data collection methodologies, and definitions of criminal offenses. Additionally, crime is influenced by numerous factors, including social, economic, cultural, and historical contexts. Based on the previous analysis, when comparing crime rates in the Czech Republic and neighbouring countries, we can assert that the Czech Republic generally has lower crime rates when adjusted for population size. In most analysed countries, property offenses, such as theft, robbery, burglary, and fraud, are the most common types of crimes. It is essential to emphasise that each country has its own crime prevention and punishment systems, including legal frameworks, investigation, court processes, imprisonment, and other measures. The significance of this issue is highlighted by the fact that new and more dangerous forms of criminal activity have been increasing in recent years (Suhányi et al., 2016).

Another problem is that registered crime, i.e., crime recorded by the police, may not always accurately reflect the actual crime rate. This factor must be considered when analysing crime statistics. One of the main differences between recorded and actual crime is the rate of crime reporting. Certain types of crime, such as domestic violence or sexual abuse, are often underreported because victims do not report these acts out of fear of consequences, shame, or distrust of the justice system. In constrast, crimes that are more visible or have a direct economic impact, such as theft and burglary, are reported more often (Police of the Czech Republic, 2023). Another important factor is the effectiveness of law enforcement and legislative changes.. Improvements in police technology and methods can lead to higher rates of detection and recording of crimes, which can create the appearance of an increase in crime, even though the actual crime rate may remain the same or even decrease. Changes in legal definitions and procedures may also affect statistics. For example, new legislation may broaden the definition of certain crimes, leading to a higher number of registered cases. Additionally, during periods of economic recession or increased unemployment, there may be an increase in property crime, which is better recorded, while during periods of economic growth, there may be a decrease in this crime (Scheinost et al., 2022).

A recommendation for other researchers in the field of crime would be to incorporate sociological aspects into crime studies, as they may have an impact on the occurrence of criminal behaviour. Including factors such as education levels family size, and divorce rates can provide a more comprehensive and in-depth understanding of the determinants of crime rates. This approach could facilitate more targeted crime prevention strategies and contribute to the development of more effective interventions aimed at reducing crime and improving safety and quality of life within society. Additionally, analysing the costs of solving crimes in relation to the number of solved cases would offer valuable insights.

However, many unanswered questions remain in the field of crime, such as: How will the development of artificial intelligence affect the prevention and detection of criminal activity? How will new forms of cybercrime evolve,and how will law enforcement agencies effectively address them? What impact does global migration have on crime in individual countries? How will legal systems adopt to changes in social and technological conditions? These questions remain open and require further research and expert attention.

Conclusion

The development of crime in the Czech Republic appears to be stable and has gradually decreased in recent years. However, serious criminal offenses persist, and various types of crimes, such as theft, robbery, violent crimes, and fraud, continue to occur. Crime is more pronounced in certain areas, particularly in large cities and tourist attractions. When adjusted per 1,000 inhabitants, the most affected areas are the capital city, Prague, and the regions of Ústí nad Labem, Moravian-Silesian, and Karlovy Vary. In the first year of the Covid-19 pandemic, i.e., in 2020, there was a positive development in crime rates, as this period recorded the lowest number of crimes in modern history, with a decrease of nearly 17%. An interesting comparison emerges when analysing crime rates in the Czech Republic relative to its neighbouring countries (Slovakia, Poland, Germany, Austria, and Hungary). Adjusting the number of crimes per 1,000 inhabitants revealed that Germany and Austria are the most affected countries, while Slovakia is the least affected. Hungary, on the other hand, exhibits significant fluctuations across different periods.

The statistical analysis revealed that:a) there is a positive relationship between the number of solved crimes and the total crime rate, b) there is no relationship between the number of committed crimes and unemployment, c) there is a negative relationship between the number of committed crimes and average wages, d) there is no rela-

tionship between the amount of damages from crimes and unemployment, e) there is a negative relationship between the amount of damages from crimes and average wages.

During the statistical analysis of crime trends in neighbouring countries compared to the Czech Republic, it was found that crime trends in the Czech Republic most closely correlate with those in Slovakia, followed by Germany. In contrast, no similar crime trend correlation was confirmed between the Czech Republic and Poland or Austria.In summary, low economic conditions, high unemployment rates, lack of economic and financial opportunities, and social inequalities may contribute to higher crime rates. To minimise crime, it is essential to leverage the strong position of law enforcement in criminal proceedings and further strengthen their competence in identifying and preventing criminal activities.

Author Contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of Interest

The author declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethics Statement

The author certifies that the research published in the text was carried out in accordance with the research ethics of the affiliated university.

Research Data Availability Statement

The original data presented in the study are found in the article. Further inquiries may be made to the author.

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