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Article

What Determines the Crime Rate? A Macroeconomic Case Study

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Abstract: This study examines the relationship between economic indicators and crime rates in six European countries: Lithuania, Germany, Greece, Portugal, Finland and Sweden. By examining macroeconomic factors such as GDP, security spending and per capita consumption, the study aims to understand how these variables affect crime dynamics. Using robust econometric techniques, including panel regression with fixed effects, the study identifies significant correlations and patterns. The findings reveal that the crime rate has a high degree of inertia and is significantly influenced by the previous level. Contrary to expectations, increased per capita consumption is associated with higher crime rates, which may indicate that wealthier societies are experiencing an increase in economic crime. Furthermore, higher spending on security does not necessarily reduce crime, suggesting that types of crime evolve as detection capabilities improve. This study highlights the complexity of the nexus between crime and the economy, highlighting the need for multifaceted, long-term policies to effectively combat crime and increase public safety. The results offer valuable insights for policymakers to develop comprehensive crime prevention and economic development strategies.

Keywords: Lithuania; Germany; Greece; Portugal; Finland; Sweden; regression; crime index; per capita consumption; GDP share of security spending



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1. Introduction

Crime is a complicated social phenomenon that not only disrupts social harmony but also affects economic stability (Tonkonoff 2014). This is a major challenge for policymakers, as it affects public safety, economic investment and overall quality of social life. Understanding the dynamics of crime in relation to economic indicators is critical to developing effective prevention and intervention strategies (McCrary 2010). For example, higher unemployment or slower economic growth may increase crime rates because individuals may experience economic hardship, which may lead them to engage in criminal activity (Nurbasuni and Khoirunurrofik 2024). Conversely, a stronger economic situation, characterized by high employment and better living standards, can reduce crime by providing more opportunities and reducing incentives for illegal activity (Remeikiene et al. 2022). By analyzing economic indicators such as gross domestic product (GDP), unemployment rate and per capita income, policy decision-makers can identify potential risk indicators and implement targeted crime prevention measures. Finally, by integrating economic data into crime prevention strategies, governments, communities, non-governmental organizations and think tanks can create a more stable and safer environment that promotes economic, commercial, cultural and social well-being.

This study embarks on a detailed macroeconomic analysis to examine the relationship between crime rates and economic growth in six different European countries: Lithuania, Germany, Greece, Portugal, Finland and Sweden.

The selected countries have a unique combination of economic environment, geographical location, legal framework and social context, making them ideal for comparative analysis. Each country’s approach to crime management and economic policy provides insight into broader regional trends and specific local challenges. By analyzing crime rates alongside economic growth indicators such as GDP, share of security spending in GDP and level of consumption per capita, this research aims to uncover patterns and correlations that can help create more effective crime prevention strategies tailored to both economic realities and societal needs.

The research used robust econometric methods, including panel regression with fixed effects to control for time-invariant characteristics of different states and tests of stationarity and random effects (Levin, Lin and Chu t test and Breusch–Pagan/King–Wu tests) to secure data reliability. Also, the research mostly used dynamic modeling and time series analysis to examine longitudinal relationships between economic indicators and crime rates. These detailed methodologies have allowed for a detailed understanding of how economic conditions influence crime in different geographic contexts and over time.

Through this analysis, this study addresses a gap in the existing literature, which often focuses on single-country scenarios or narrower economic variables. This helps to better understand how macroeconomic factors can affect crime rates and, conversely, how high or low crime rates can affect economic development. From this dual perspective, this study hopes to provide valuable information to policymakers, economists and social scientists seeking to promote a safer and more prosperous society.

This research is carefully structured, beginning by examining the theoretical aspects of crime, economic growth and the relationship between crime and economic growth. As a result, the formulation of specific hypotheses regarding crime dynamics and economic indicators can be found. The analysis uses a rich data set from selected European countries to apply robust econometric methods, ensuring comprehensive testing of these hypotheses. The results are then discussed in detail, comparing the results across countries and integrating them into the wider context of economic and criminological research.

2. Literature Review

The literature review attempted to examine the recent literature related to crime rate measurement and definition, economic growth measurement and definition and economic growth and crime rate. Efforts were also made to examine similar studies and the methods used within them to highlight the limits in order and offer more relevance and novelty to this study.

2.1. Definition of Crime Rate

Crime is one of the main sources of discomfort and insecurity in modern society, harming the sense of public safety (Metu and Maduka 2018). Increasing crime increases public fear and anxiety and disturbs the social structure and harmony of the country (Butkus et al. 2019). Crime is unacceptable in society, yet the phenomenon began at the dawn of human history (Nairobi et al. 2021). Various definitions of crime can be found in Table 1.

Table 1. Crime definitions.

Reference	Definition
Dictionary (1989)	<i>“An action or omission which constitutes an offence and is punishable by law.”</i>
Britannica (2007)	<i>“[...] the intentional commission of an act usually deemed socially harmful or dangerous and specifically defined, prohibited, and punishable under criminal law.”</i>
Tappan (1947)	<i>“[...] an intentional act or omission in violation of criminal law [...], committed without defense or justification, and sanctioned by the state as a felony or misdemeanor.”</i>
Blackstone (1884)	<i>“Crime as an act committed or omitted in violation of public-law either forbidding or commanding it.”</i>

There is no universal and permanent definition of crime, but crimes can be statistically calculated and evaluated (Kathena and Sheefeni 2017). A crime rate is a statistical measure of the level of crime in a particular area, country or community over a period of time (Wang et al. 2016). This indicator includes different types of crimes such as theft, violent incidents, burglary, fraud and other crimes (Lee and Cho 2018).

A crime, broadly defined, is any deviance punishable by a sentence under state law (Raj and Kalluru 2023). In legal terms, a crime is associated with a violation of laws and regulations that may ultimately lead to a conviction by a certain authority (Metu and Maduka 2018). Crimes are divided into various categories based on their nature and consequences; one way to categorize is by the type of victims (Figure 1) (Kusuma et al. 2019).

Crimes against persons	Property crimes	Economic crimes
<ul style="list-style-type: none"> • Murders • Abductions • Assaults and rapes 	<ul style="list-style-type: none"> • Theft • Robberies • Vandalism • Other actions that violate property rights 	<ul style="list-style-type: none"> • Money laundering • Fraud • Corruption • Drug trafficking • Tax evasion

Figure 1. Categories of crimes. Based on Kusuma et al. (2019).

- Crimes against persons who are direct victims (Rocque et al. 2019). These can include serious crimes such as murder, kidnapping, assault and rape (Ajide 2019).
- Property crimes, where criminals seek to profit from property or material gain (Ogun-dari 2021). These can include theft, robbery, vandalism and other acts that violate property rights (Perez 2022).
- Economic crimes, which include money laundering, corruption, drug trafficking, fraud, tax evasion, corporate fraud and cybercrime (Brici 2022). These crimes often involve financial or business schemes (Kusuma et al. 2019).

When it comes to the definition of crime, it is important to mention the causes of crime, which sometimes make it possible to create separate segments of the description of crimes. The causes of crime are diverse and often complex, involving both individual and social, economic and psychological factors. In the scientific literature, there is usually a division into the following causes (Sowmya 2014):

- Social causes (Fajnzyblber et al. 2002) (poverty, economic inequality, social exclusion and discrimination, lack of education, family environment, unemployment);
- Economic causes (Fergusson 2013) (economic crises, market and regulatory weaknesses, wage level, economic exclusion);
- Psychological causes (Mullins 2019) (mental disorders, poor socialization, stress, psychological trauma, aggression, impulsivity);
- Biological causes (Raine 2002) (neurochemical factors, physiological factors, heredity, genetics, brain structures);
- Geographical causes (Rottman 2020) (urbanization, access to resources, physical environment, transport infrastructure);
- As claimed by Remeikiene et al. (2022), crimes of any type or category threaten the social cohesion of society and have a negative impact on economic development.

The theoretical concept of crime rate includes methods to measure and evaluate crime in a given area or country (Anser et al. 2020). This concept is based on a statistical approach to crime rates in order to develop indicators to help understand and compare the extent and types of crime (Mulok et al. 2016).

The crime rate is often described as a number or ratio that shows how many crimes have been reported or have occurred in a given area (Anser et al. 2020). This provides an opportunity to assess and compare the level of crime in different areas or to monitor its changes over time (Debnath and Das 2017). High crime rates can cause difficulties for

developing countries, which are under pressure due to poor infrastructure and low incomes (Raj and Kalluru 2023).

Crime rates are collected and analyzed to gain insight into safety levels and crime trends (Anser et al. 2020). Crime indicators can also be useful to the public; by providing information about the safety of a certain place, they allow people to better understand the risks and take appropriate precautions (Debnath and Das 2017).

It is important to note that crime rates can be influenced by various factors. For example, different law enforcement agencies may have different methods and criteria for recording or reporting crimes (Mulok et al. 2016). In addition, some crimes may not be reported or are reported improperly, so the actual crime rate situation may be different from what the statistics show (Debnath and Das 2017).

Crime rate estimation uses various methods and tools to estimate the level of crime in a certain area or country (Mulok et al. 2016). These methods may vary depending on the data available, the objectives of the analysis and the desired results. Some of the methods that can be used to estimate the crime rate are as follows:

1. Statistical analysis: This involves analyzing data to identify trends, forecasts or benchmarks in a given area. This can include calculations of different types of crime, calculations of relative rates and time course analysis (Zaini et al. 2021).
2. Geographic information system (GIS): GIS is a useful tool for visualizing and analyzing data based on a geographic location. This allows the sources of crime to be identified, linking them to specific areas, and helps form effective preventive measures (Ali and Rais 2017).
3. Multivariate analysis methods: These methods include more sophisticated analysis techniques that may include socio-economic, demographic and other contextual factors in addition to statistical data. These allow for a deeper analysis of the crime situation (de Frutos and García 2018).
4. Surveys and research: These are sometimes used to obtain additional information about crimes that may not be reported or are reported improperly and also to understand the attitudes and experiences of the community (Dijk et al. 2021).
5. Dynamic analysis and modeling: This includes more sophisticated models that can predict future crime trends based on past data and context (Ogundari 2021).

These methods can be used alone or in combination to obtain a more comprehensive and accurate assessment of crime. The crime rate helps the authorities and the public in making decisions about security measures and planning law enforcement actions (Mulok et al. 2016). For example, an increasing level of crime in a specific area may require additional law enforcement resources to be devoted to prevention or to respond by strengthening the operational work of law enforcement (Ajide 2019).

A high crime rate indicates the extent of violent crime in society (Mulok et al. 2016). This undermines citizens' trust in the rule of law, reduces trust in law enforcement institutions and in certain extreme circumstances can even lead to the emigration of individuals (Raj and Kalluru 2023). Remeikiene et al. (2022) state that every type of crime leads to insecurity, which requires additional costs for its prevention, but all this in turn hinders faster economic development.

2.2. Nexus between Crime Rate and Economic Growth

According to Metu and Maduka (2018), the relationship between crime and economic growth was already analyzed by the "father of economics", Adam Smith, who examined how people are encouraged to commit crimes through the accumulation of wealth. The relationship between the crime rate and the country's economic (GDP) situation is quite complex, as it involves two indicators from very different areas (Parida et al. 2017). Although there is no direct or simple connection between the two, several theories and observations reveal possible connections:

- Income inequality: Greater income inequality in society has been associated with increased crime (Ajide 2019). Ogundari's (2021) study of the effects of economic condi-

tions on crime rates in the United States concluded that when there is a large wealth gap, it can lead to social unrest, dissatisfaction and potentially increased criminal activity, especially among individuals in lower-income areas.

- Economic conditions: During an economic downturn or recession, when unemployment rates increase and opportunities decrease, certain types of crime may increase (Priyadarshani et al. 2023). Financial stress and limited opportunities may lead some individuals to engage in criminal activities (Ajide 2019).
- Investment in social programs: Higher GDP or economic prosperity can lead to more funding for social programs, education and community development (Abdulkarim 2023). These initiatives can reduce crime rates by addressing underlying social issues and empowering residents (Ajide 2019).
- Crime prevention strategies. Economic stability can allow governments to invest more in law enforcement and crime prevention strategies. This can lead to a reduction in crime rates (Kusuma et al. 2018).
- Specific types of crime: Certain types of crime may be more sensitive to economic conditions (Itskovich and Factor 2023). For example, property crimes such as theft may increase during times of economic hardship (Priyadarshani et al. 2023).
- Economic policy of the state: Some crimes refer exclusively to the economic component, when a part of the population or business entities evade the payment of taxes according to various schemes that have different degrees of legality (Giedraitis et al. 2023).

According to Torres-Tellez and MonteroSoler (2023), the relationship between economic conditions and crime can be explained in three ways: motivational, opportunity and lifestyle. The first two approaches relate to economic analyses of crime, as both assume that people value legal and illegal actions and make choices to maximize their own profits (Ajide 2019). Motivation and opportunity approaches differ in how they assess the benefits or costs of criminal acts. It is distinguished in the research that economic inequality is also correlated with various undesirable consequences, including crimes (Itskovich and Factor 2023). The relationship between economic inequality and crime is generally reflected in data showing that areas with high economic inequality experience higher crime rates (Widyastaman and Hartono 2022).

Table A1 (Appendix A) describes the results of studies conducted by various researchers examining the relationship between crime and economic growth in different countries. Studies use various methods, such as ARDL or regression analysis, to understand this relationship. Most researchers used the ARDL method as the main method to determine the relationship between economic growth and crime (Mulok et al. 2016; Raj and Kalluru 2023; Ajide 2019). Mulok et al. (2016) indicate that good economic growth can reduce crime in the long term, while Ajide (2019) suggests that the negative effects of crime can be more pronounced in the short term. Also, Raj and Kalluru (2023), Ogundari (2021) and Butkus et al. (2019) observe that certain economic indicators, such as investments or the unemployment rate, can influence the level of crime.

A study by Priyadarshani et al. (2023) shows that crime can have a negative impact on economic growth; others highlight the negative impact of economic growth on crime. This suggests that this relationship may be twofold and highly dependent on specific country or regional conditions and research methods used. In addition, a study by Ajide (2019) found that institutional structures and economic difficulties may contribute to higher crime rates in certain countries. But it can be seen that all researchers have concluded that crime slows down economic (GDP) growth, reduces the ease of doing business and discourages investment.

In summary, research shows that crime and economic growth have a complex relationship that can be very open to interpretation and depends on many factors. Thus, despite certain observations or trends, it is difficult to unequivocally identify this relationship due to different methods and specifics of countries, but the vast majority of researchers, such as Ajide (2019), Kusuma et al. (2019), Ogundari (2021), Raj and Kalluru (2023) and Mulok et al. (2016), confirm the relationship between economic growth and crime rate.

3. Economic Modeling Methodology

We formulate the following hypotheses for conducting this research:

H1: *The level of crime depends on the level of crime in previous periods.*

H2: *The level of crime is related to the well-being of the population.*

H3: *Increased spending on crime prevention and law enforcement can lead to a reduction in the overall crime rate.*

The hypotheses are interconnected through a feedback loop where past crime rates (H1) influence current crime levels, which are also affected by socio-economic conditions (H2). Effective interventions (H3) can break this cycle, reduce the impact of past trends and improve well-being, thereby leading to lower crime rates over time.

To test these hypotheses, a database was formulated for several European countries. Lithuania, Sweden, Finland, Germany, Portugal and Greece were chosen. First of all, we were interested in the spread of crime in Lithuania. Scandinavia and Germany, which are actual neighbors of Lithuania, were chosen for comparison. On the other hand, southern countries with a different mentality (the states mentioned—Lithuania, Sweden, Finland, Germany, Portugal and Greece—differ in mentality due to their unique cultural, historical and socio-economic backgrounds, which influence their attitudes toward crime and law enforcement) were also chosen to look at the difference in crime rates: Portugal and Greece, which are in different parts of Europe.

In view of the findings of the literature review, we consider that it is appropriate to use three main variables:

Crime—crime index, which is calculated for all countries of the world since 2012. It is based precisely on the assessment of the level of crime in a specific country. Its values may differ slightly from official government statistics, but given the lack of or limited data for many countries, it provides a comparative tool to assess the safety of different locations and help make informed decisions. The crime index is defined within several categories: very low (less than 20), low (21–40), moderate (41–60), high (61–80) and very high (more than 80). The data utilized in this study were gathered in accordance with the methodology outlined by Numbeo, which provides a comprehensive explanation of the indices used in the analysis (Numbeo 2024).

C_Real—level of consumption per capita in the country in US dollars in 2015 prices. This makes it possible to identify the increase in the standard of living of the population without taking into account inflation.

EXP2GDP—share of security spending in GDP. This value was calculated based on expenditure and GDP data for each country. Data source is Eurostat (2024) and World Bank (2024).

In addition to the mentioned variables, others were also considered that could be factors explaining the level of crime, in particular, the level of unemployment, female fertility, the level of GDP, the level of GDP per capita, etc. However, these variables were found to be insignificant in the constructed models.

Thus, a data panel of 66 observations, six countries and 11 periods was created. The complete list of variables and their values is presented in Appendix A, Table A2. The methodological approach was chosen for its ability to handle the complexity of the data (Appendix A, Table A3) and the diversity of the countries involved. We provide the corresponding calculations of correlation matrix (Appendix A, Table A4).

4. Results

The indicated variables were tested for stationarity using the Levin, Lin and Chu t test for panel data with Newey–West automatic bandwidth selection and Bartlett kernel (Levin et al. 2002). The test results are presented in Table 2. As we can see, for all considered

variables, the hypothesis of the presence of a unit root is rejected, and therefore, the variables are stationary; that is, they can be used in the model in levels.

Table 2. Checking data for stationarity.

Variable	Levin, Lin and Chu t^*	Prob
Crime	−4.68650	0.0000
EXP2GDP	−2.69065	0.0036
C_Real	−1.82663	0.0339

* All are significant at 0.95 level of significance.

The model was estimated in EViews using LS for panel regression. Since we were interested specifically in differences in outcomes across countries, period and country fixed effects were included.

Fixed effects take into account the influence of non-variables, namely cross-section (different observations) and period (different time points), on the dependent variable. Thus, testing for fixed-effects redundancy (Hausman 1978) means testing whether the cross-sectional and period effects on the dependent variable are significant after accounting for other variables in the model. The results of hypothesis testing are presented in Table 3.

Table 3. Redundant fixed-effects tests.

Effects Test	Statistics	df.	Prob.
Cross-section F	4.967904	(5.42)	0.0012
Cross-section Chi-squared	27.877495	5	0.0000
Period F	0.885484	(9.42)	0.5459
Period Chi-squared	10.424418	9	0.3172
Cross-section/period F	2.148291	(14.42)	0.0284
Cross-section/period Chi-squared	32.403150	14	0.0035

Cross-section F and cross-section Chi-squared test (Baltagi 2005) the significance of fixed cross-sectional effects. Both tests show that the cross-section fixed effects are significant, as the p -value is less than 0.05 (or 0.01 in the case of cross-section F), indicating the importance of accounting for the effects of different observations.

Period F and period Chi-squared test (Baltagi 2005) the significance of period fixed effects. Both tests show that the period fixed effects are not significant, as the p -value is greater than 0.05, indicating that the consideration of different time points does not affect the dependent variable.

Cross-section/period F and cross-section/period chi-squared test the significance of interactions between cross-sectional and period fixed effects. Both tests show that the interaction is significant, as the p -value is less than 0.05, indicating the importance of considering the effects of different time points and different observations simultaneously.

Given that the joint effect of the fixed effects was significant, it was decided to keep both types of effects in the model.

Next, tests were conducted for the presence or absence of random effects (Table 4). The Breusch–Pagan (Breusch and Pagan 1979), Honda (Honda 1985) and King–Wu tests (King and Wu 1997) and standardized Honda and King–Wu tests simultaneously showed (in all these tests, the p -value was greater than 0.05) that the null hypothesis of the absence of random effects in the model is not rejected. Thus, there is no statistical evidence of random effects from these tests.

Table 4. Lagrange multiplier tests for random effects.

Test	Test Hypothesis		
	Cross-Section	Time	Both
Breusch–Pagan	0.135753 (0.7125)	1.934360 (0.1643)	2.070113 (0.1502)
Honda	0.368447 (0.3563)	−1.390813 (0.9179)	−0.722921 (0.7651)
King–Wu	0.368447 (0.3563)	−1.390813 (0.9179)	−0.535754 (0.7039)
Standardized Honda	2.095088 (0.0181)	−1.293894 (0.9021)	−3.691915 (0.9999)
Standardized King–Wu	2.095088 (0.0181)	−1.293894 (0.9021)	−3.454528 (0.9997)

Thus, a panel regression with fixed effects was estimated (Table 5).

Table 5. Evaluation of the model.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	−76.43632	32.78975	−2.331104	0.0246
CRIME(−1)	0.605845	0.084235	7.192296	0.0000
EXP2GDP(−1)	1674.828	519.2407	3.225532	0.0024
C_REAL(−1)	0.003681	0.001508	2.440448	0.0190
R-squared	0.893394	Mean dependent var		35.89000
Adjusted R-squared	0.850244	SD dependent var		7.115695
SE of regression	2.753656	Akaike info criterion		5.107061
Sum squared residue	318.4702	Schwarz criterion		5.735365
Log likelihood	−135.2118	Hannan–Quinn criter.		5.352825
F-statistic	20.70433	Durbin–Watson stat		1.771890
Prob (F-statistic)	0.000000			

All coefficients of the model are significant, and the model itself is adequate, which allows us to draw certain conclusions based on the model. First, the model showed that the level of crime is a rather inertial value; almost 61% of its value is determined by the level of the previous year.

Second, the real standard of living of the population is indeed an important component for explaining the level of crime. For our set of countries, the level of consumption per capita in the previous period had a positive effect on the level of crime. Specifically, a \$100 increase in consumption in 2015 prices led to an increase in the crime index of about 0.37. At first glance, this may be surprising, because in low-income countries, when the standard of living increased, as a rule, crime decreased.

Third, the level of security spending in GDP surprisingly does not disincentivize crime; on the contrary, it slightly increases it. In particular, an increase in the share of security costs in GDP by 0.0001 (0.01% of the ratio) increases the crime index in the next year by 0.17. There are several explanations for this. On the one hand, the increase in costs increases the law enforcement system's ability to detect crimes, which formally increases their number. On the other hand, over time, crimes become completely different in type. If earlier, the lion's share of crimes represented physical robberies, murders, etc., today, most crimes

occur in the economic sphere based on information technologies, which security forces do not always keep up with.

The analysis of fixed effects for countries showed differences in their mentality (Table 6).

Table 6. Country fixed effects.

Country	Effect
Germany	−17.43798
Greece	10.90643
Lithuania	30.15615
Portugal	10.85699
Finland	−19.89992
Sweden	−14.58166

Estimates of fixed effects show how much a country's crime index changes compared to the baseline. Negative values, such as those for Germany (−17.4), Finland (−19.9) and Sweden (−14.6), indicate that these countries have crime rates below the baseline. At the same time, positive values for Greece (10.9), Lithuania (30.2) and Portugal (10.9) indicate that these countries have a higher crime rate. As we can see, the Scandinavian countries and Germany showed a fairly strong difference from Lithuania, with a difference of about 45 points. This is partly explained by the difference in the level of consumption but also by the inertia of the index itself. As expected, wealthier countries performed better.

The analysis of fixed effects for time periods (Figure 2) shows that in general, there was a fall in the crime index. During 2013–2017, its growth was constantly decreasing, and since 2018, the level has been decreasing. A significant jump occurred in 2020, which was due to the COVID-19 pandemic. But in general, a downward trend can be seen for the considered countries.

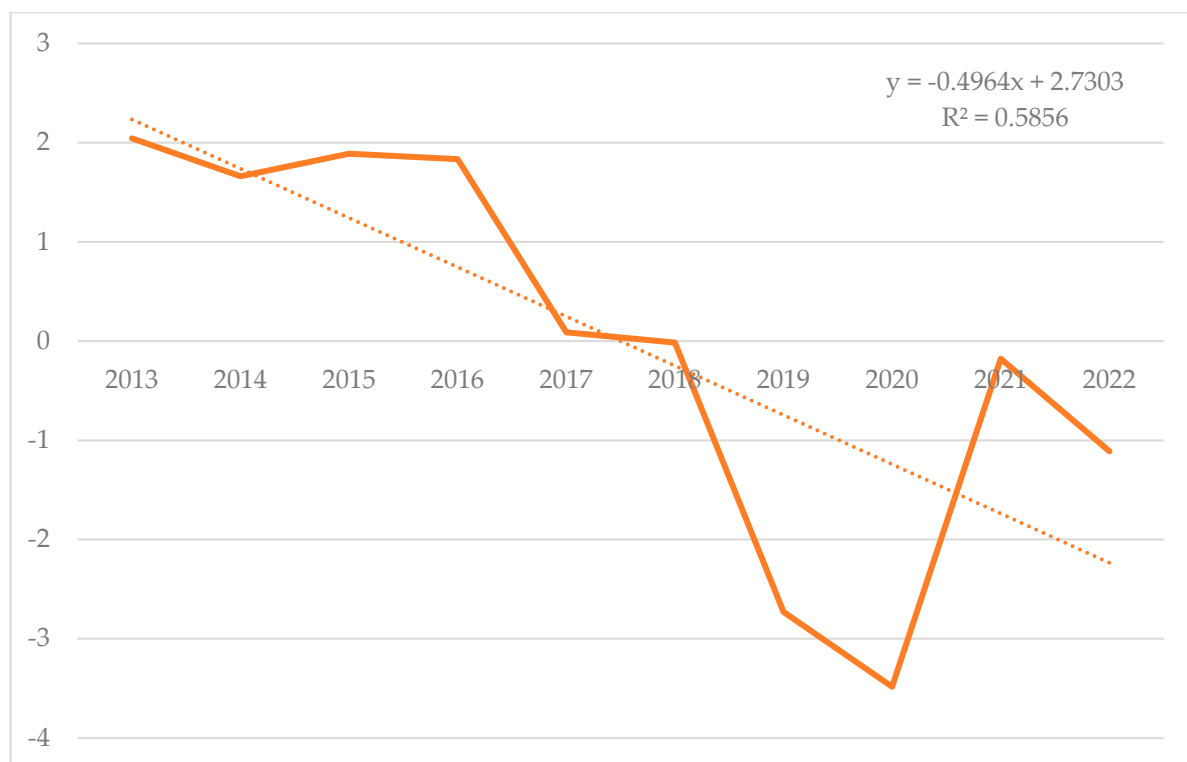


Figure 2. Dynamics of fixed effects for time periods.

In summary, it can be noted that based on the analysis of the considered model, the first two hypotheses can be confirmed and the third rejected. However, as shown in Figure 2, the impact of security costs is likely to be evident only in the long term and cannot be determined in a short-term sample.

Thus, the lack of a significant relationship between GDP and investments may suggest that other factors, such as political stability, regulatory environment or level of financial development, play a more crucial role in determining investment levels in these countries. In other words, the significant impact of GDP on exports could reflect an export-led growth strategy in the countries studied. This strategy implies that as these countries grow, they focus more on producing goods for international markets rather than on domestic investment.

5. Discussion

It is not possible to significantly reduce the level of crime only by means of state policy, which confirms the results obtained by Nagasubramaniyan and Joseph (2024), Torres-Tellez (2023), Misztal (2020), Egger (2022), Kyrkopoulou et al. (2022), Anser et al. (2020) and Raj and Rahman (2023).

However, for our countries, which are countries with medium and high incomes, another trend is beginning to appear, which consists of the growth of economic crimes. Thus, it can be assumed that in reality, the relationship between the standard of living and the level of crime is parabolic: for the poorest countries, an increase in the standard of living discourages crime, but after a certain level of consumption per capita, the reverse process begins.

As limitations of the research, one could assume following:

- (1) The research suggests that economic growth and crime rates are interdependent, with crime potentially slowing economic growth by reducing the ease of doing business and discouraging investment. Conversely, certain economic conditions, such as higher unemployment or slower economic growth, may increase crime rates as individuals face economic hardship and may resort to criminal activities.
- (2) Higher spending on security does not always correlate with reduced crime rates. This may be because as crime detection and prevention methods improve, criminals may adapt, leading to new types of crime that are not easily mitigated by increased security expenditure.
- (3) The interdependent nature of crime and economic growth adds complexity to the analysis. It is challenging to determine causality due to the potential bidirectional relationship between these variables, where economic growth can influence crime rates, and crime can, in turn, impact economic growth.
- (4) Reliable and comprehensive data on crime and economic indicators are crucial for robust conclusions, but such data may not always be available, especially in less developed regions.
- (5) The paper could benefit from a discussion on the importance of regional coherence in country selection. Future studies might consider grouping countries not only by GDP per capita but also by geographical proximity and cultural similarities to minimize the impact of extraneous variables. This approach could lead to more robust and regionally applicable findings.

These limitations suggest that while the findings of the paper contribute to the understanding of the crime–growth relationship, they should be interpreted with caution, and further research is needed to address these challenges. Future research should explore the specific types of crime that are most influenced by economic factors and investigate the potential for different economic indicators to predict crime trends more accurately. Additionally, longitudinal studies that examine the long-term effects of economic policies on crime rates could provide deeper insights into the mechanisms driving these relationships.

6. Conclusions

The study examines in detail the interaction between crime rates and economic factors in six European countries, focusing on the multifaceted nature of crime, which is affected

by various economic indicators. The analysis revealed that the crime rate is characterized by high inertia and is strongly influenced by the level of the previous year. This shows that sudden policy changes cannot immediately reduce crime rates, which highlights the need for sustainable and proactive strategies.

The relationship between crime and economic variables such as per capita consumption and government spending on security has been complex. For example, increased per capita consumption has been associated with higher crime rates, which may indicate economic disparities or a greater propensity for economic crime in wealthier and more economically strong societies. Conversely, increased security spending has not necessarily reduced crime rates, perhaps due to better detection technologies or evolving crime prevention techniques for which conventional security measures remain intractable.

Based on these findings, we recommend that policymakers adopt a holistic and multi-faceted approach to crime prevention. This should include long-term economic policies aimed at reducing economic disparities and increasing educational and employment opportunities, which could help mitigate the conditions that encourage crime. In addition, there is a clear need to modernize crime detection and prevention strategies to adapt to new crime trends, especially those facilitated by technology. This outcome highlights the need for more nuanced crime prevention strategies that go beyond simply increasing financial investment in law enforcement.

In addition, the importance of international cooperation in the fight against crime is emphasized, as comparisons between different countries reveal different effects of similar economic conditions on crime rates. Therefore, it can be beneficial to share best practices and strategies across the European Union and even globally.

This study sheds light on the intricate nexus between economics and crime, revealing that higher economic well-being does not necessarily equate to lower crime rates and that simply increasing security spending is insufficient to curb crime effectively. A more holistic approach, incorporating economic, social and law enforcement strategies, is essential to reduce crime and enhance public safety.

In conclusion, although economic growth and stability can affect crime rates, the direct and indirect effects are complex and require robust, adaptive policies and ongoing evaluation to effectively combat crime and improve public welfare.

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Appendix A

Table A1. Research conducted by authors to identify the relationship between economic growth (GDP) and crime.

Scientists	Aim	Research Methods	Results Obtained During the Study
Mulok et al. (2016)	To examine the relationship between crime and economic growth in Malaysia between 1980 and 2013.	The ARDL method is used to determine the long-term and short-term relationships as well as the direction of causality between variables.	Strong long-term cointegration evidence suggests that the effect of economic growth on crime in the long term is positive and statistically significant. Bidirectional causality between crime and economic growth was also found to be significant in the short term. Finally, this research is consistent with economists' arguments that good economies tend to create less crime, while bad economies do the opposite.
Raj and Kalluru (2023)	To examine the empirical relationships between crime rate and economic growth, controlling for other growth determinants in the Indian economy from 1990 to 2019.	A marginal test of cointegration in the ARDL framework is used to analyze long-term and short-term dynamic relationships between variables.	The study showed that the level of crime, related to the number of murders, together with investments, direct foreign investments and exports, determines the real GDP per capita in the long term. The negative impact of homicides on economic growth was more pronounced in the short term. Furthermore, unidirectional causality was found from homicide rates to real export values in both the long and short term. Given the focus of developing countries on increasing the relative share of exports in global trade, the finding that homicide rates and exports are correlated is significant.
Ogundari (2021)	The purpose of the study is to analyze the effect of economic conditions on crime rates in the United States based on balanced data on violent and property crime rates for all 50 states and the District of Columbia from 1976 to 2019.	The study uses econometric procedures that take into account the serial correlation of the error terms and the cross-sectional dependence of the data to reduce overestimation of the effect of economic variables on crime rates.	The empirical results of the study showed that the examined economic indicators significantly affected the crime rates in the study. It was also found that unemployment rates and income inequality increased crime rates, while personal income and economic growth decreased crime rates.
Kusuma et al. (2019)	The purpose of the study is to investigate the relationship between crime and economic growth in Indonesia.	The study used panel data.	It was found that crime and corruption in particular have a negative impact on economic growth.
Priyadarshani et al. (2023)	The study aimed to analyze the relationship between crime and economic growth in 23 selected countries in the Asian region.	Correlation and regression analysis of 23 selected countries in the Asian region was used in the study.	It was found that there is a negative relationship between the crime rate and the rate of economic growth. Therefore, from the selected association of countries in the Asian region of the world, it can be concluded that there is a negative relationship between crime and economic growth. This means that as crime increases, the rate of economic growth does not increase.

Table A1. Cont.

Scientists	Aim	Research Methods	Results Obtained During the Study
Butkus et al. (2019)	The aim of the study was to find out whether negative changes in the economy increase crime while positive changes reduce the indicators of criminal activity.	The study used real GDP per capita and unemployment rate as the main indicators of economic conditions and the GMM framework as the main estimation strategy. To ensure the accuracy of these findings, extensive reliability testing was performed, and an attempt was made to find a form of relationship other than a simple linear relationship.	The results of this study showed that there is no clear evidence of a relationship between economic growth and the type of crime. The general estimates, using real GDP per capita and unemployment rate as the main indicators of economic conditions and system GMM as the main estimation strategy, do not indicate a statistically significant relationship between economic conditions and crime rate within the framework of the proposed model. In the EU group, no evidence of an effect of economic conditions on crime rates was found, except for intentional homicide in some model specifications.
Ajide (2019)	The main objective of the study is to investigate the effects of institutional quality and economic distress on crime in Nigeria from 1986 to 2016.	The study examines the effects of institutional quality and economic distress on crime in Nigeria between 1986 and 2016 using the ARDL estimation method.	The results showed that institutional quality reduces crime, while the index of economic hardship significantly increases crime in the short term. However, the study does not confirm any significant long-term effects of the two variables. The study concludes that economic hardship and an ineffective institutional framework contribute to higher levels of crime in Nigeria.
Adekoya and Razak (2017)	The aim of the study is to evaluate the effects of crime and deterrence on economic growth in Nigeria.	This study uses annual time series data from 1970 to 2013. The study is based on using a bounds test dynamic approach to cointegration.	This study confirms that crime is a major detriment to Nigeria's economic development, as it diverts funds from growth initiatives meant to combat its effects, highlighting the urgent need to strengthen law enforcement and education reforms to promote a more productive economy and deter criminal activity.
Kumar (2013)	The purpose of the paper is to empirically examine the causal relationship between crime rates and economic growth using state-level data in India.	Taking the period of 1991–2011 in India for crime statistics, the study used the following methods: bivariate and multivariate methods, reduced form approach, instrumental variable dynamic panel data approach, panel unit root tests (first and second generation), Sargan-type tests and serial correlation tests.	The study reveals the significant negative impact of violent crime on India's economic growth, quantifying how reducing homicide and robbery rates could significantly increase per capita income growth and highlighting the urgent need for criminal justice reform and inclusive development policies.
Jeke et al. (2021)	This study aims to examine the impact and consequences of criminal activity on the development of South Africa.	In order to assess the economic impact of crime in South Africa in 1994–2019, the study analyzed the impact of different types of criminal activity on economic indicators such as growth, investment and property value. The study used multiple panel regression analysis techniques to examine the implications and the importance of crime in economic development.	This study used a pooled mean group approach, and the findings of the econometric analysis show that crime generally inhibits development. Specifically, property crimes negatively affect human development and investment, while contact crimes negatively affect investment alone.

Table A2. Data for model evaluation.

Country—Year	C_REAL	EXP2GDP	CRIME
Germany—12	21,390.6	0.01542	21.2
Germany—13	21,409.5	0.01574	23.9
Germany—14	21,544.4	0.01559	27.1
Germany—15	21,772.4	0.01540	28.5
Germany—16	22,124.4	0.01550	33.0
Germany—17	22,353.8	0.01557	32.0
Germany—18	22,621.4	0.01583	36.7
Germany—19	22,927.9	0.01620	34.5
Germany—20	21,568.2	0.01710	34.8
Germany—21	21,881.9	0.01691	35.4
Germany—22	22,575.8	0.01661	36.4
Greece—12	12,585.3	0.01879	52.0
Greece—13	12,243.3	0.01875	49.8
Greece—14	12,312.6	0.02123	43.0
Greece—15	12,350.7	0.02095	41.4
Greece—16	12,326.6	0.02174	38.5
Greece—17	12,659.3	0.02150	40.3
Greece—18	12,906.8	0.02279	39.1
Greece—19	13,151.9	0.02100	38.6
Greece—20	12,199.1	0.02383	40.3
Greece—21	13,062.3	0.02201	44.1
Greece—22	14,226.7	0.01996	47.4
Lithuania—12	7703.1	0.01759	39.1
Lithuania—13	8116.8	0.01625	34.6
Lithuania—14	8489.3	0.01651	34.7
Lithuania—15	8917.1	0.01621	36.7
Lithuania—16	9400.0	0.01466	43.2
Lithuania—17	9872.2	0.01470	40.0
Lithuania—18	10,328.8	0.01370	37.6
Lithuania—19	10,640.1	0.01388	36.5
Lithuania—20	10,282.0	0.01511	33.1
Lithuania—21	11,094.8	0.01275	33.8
Lithuania—22	11,197.2	0.01229	33.3
Portugal—12	12,025.0	0.01856	40.6
Portugal—13	11,965.1	0.02050	35.0
Portugal—14	12,316.2	0.01900	35.1
Portugal—15	12,619.3	0.01854	35.8
Portugal—16	12,983.2	0.01783	35.1
Portugal—17	13,288.4	0.01703	35.4

Table A2. *Cont.*

Country—Year	C_REAL	EXP2GDP	CRIME
Portugal—18	13,657.8	0.01708	34.5
Portugal—19	14,100.1	0.01647	32.1
Portugal—20	13,096.3	0.01879	29.6
Portugal—21	13,629.7	0.01756	29.9
Portugal—22	14,320.0	0.01639	30.6
Finland—12	23,205.0	0.01360	17.6
Finland—13	22,977.8	0.01348	32.7
Finland—14	23,021.7	0.01285	29.2
Finland—15	23,314.7	0.01239	29.5
Finland—16	23,812.5	0.01187	28.1
Finland—17	23,936.4	0.01127	24.6
Finland—18	24,313.8	0.01109	23.7
Finland—19	24,465.1	0.01174	22.8
Finland—20	23,511.0	0.01159	23.3
Finland—21	24,222.8	0.01160	27.0
Finland—22	24,508.3	0.01151	27.3
Sweden—12	22,447.7	0.01350	36.2
Sweden—13	22,657.5	0.01345	31.8
Sweden—14	23,079.7	0.01320	38.3
Sweden—15	23,733.3	0.01261	42.1
Sweden—16	23,976.2	0.01276	43.1
Sweden—17	24,271.9	0.01274	46.6
Sweden—18	24,435.3	0.01295	49.3
Sweden—19	24,363.1	0.01302	49.3
Sweden—20	23,421.5	0.01382	47.1
Sweden—21	24,753.8	0.01333	47.2
Sweden—22	25,033.2	0.01342	49.0

Table A3. Descriptive statistics for variables.

CRIME							EXP2GDP						C_REAL					
Country	Mean	Median	StDev	Min	Max	Count	Mean	Median	StDev	Min	Max	Count	Mean	Median	StDev	Min	Max	Count
Germany	31.23	33.00	5.29	21.20	36.70	11	0.02	0.02	0.00	0.02	0.02	11	22,015.48	21,881.89	538.18	21,390.61	22,927.87	11
Greece	43.14	41.40	4.69	38.50	52.00	11	0.02	0.02	0.00	0.02	0.02	11	12,729.51	12,585.27	598.77	12,199.10	14,226.71	11
Lithuania	36.60	36.50	3.18	33.10	43.20	11	0.01	0.01	0.00	0.01	0.02	11	9640.10	9872.18	1202.41	7703.05	11,197.19	11
Portugal	33.97	35.00	3.22	29.60	40.60	11	0.02	0.02	0.00	0.02	0.02	11	13,091.00	13,096.25	801.10	11,965.09	14,319.99	11
Finland	25.98	27.00	4.12	17.60	32.70	11	0.01	0.01	0.00	0.01	0.01	11	23,753.55	23,812.53	577.63	22,977.79	24,508.26	11
Sweden	43.64	46.60	5.94	31.80	49.30	11	0.01	0.01	0.00	0.01	0.01	11	23,833.93	23,976.21	848.11	22,447.74	25,033.24	11

Table A4. Correlation matrix for variables.

	C_REAL	CRIME	EXP2GDP
C_REAL	1	−0.23	−0.62
CRIME	−0.23	1	0.33
EXP2GDP	−0.62	0.33	1

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