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Links between crime and economic development: EU classification

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Abstract

Research background: Although some authors propose that economic growth should reduce crime rates as wider opportunities to earn money in a legal way diminish the incentives to commit illegal activities and lead to rising costs of the latter, the results of many studies indicate that an increase in crime rates is also possible under the conditions of economic growth. There are also differing views on the relationship between various economic indicators and crime rates as well

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as the nature of the relationship between the above-mentioned phenomena in the long and short run.

Purpose of the article: After classifying the EU member states by their crime and economic indicators, the main objective of the article is to assess the relationship between the crime and economic development and identify the causes of this relationship.

Methods: Systematic and comparative literature analysis, the Promethee and Entropy methods, Spearman's correlation coefficient.

Findings & value added: The Promethee method, together with the Entropy method, were used to estimate the weights of the EU member states with respect to their crime and economic development indicators. The most pronounced differences were recorded in Portugal, Spain, and the Slovak Republic. The rankings estimated for the EU member states revealed that although economic situation affects crime rate, it can also be affected by the differences in cultural and political development. Scientific novelty lies in complementing the theory of the shadow economy with the results showing that compared to other crimes, corruption has the greatest weight when examining the relationship between economic development and crime. The practical significance of the research lies in classifying the EU member states into 4 groups with consideration of the relationship between crime and economic development, which may help public authorities to devise the target measures for the effective fight against crime given the nature of the relationship between crime and economic development.

Introduction

According to the principles of criminology, crime is the conflict of behavioural norms determined by 'poverty, misery and depravity' (Sutherland *et al.*, 1992, p. 71). Meanwhile, in economic terms, committing crimes is associated with the opportunities and choices available to an individual (Sarvaria, 2019). This means that although committing crimes cannot be completely separated from the personality of an offender (way of thinking, obedience or disobedience to social and legal norms), philosophers of law (Goswami, 1964) recognize that the second no less important aspect of crime is external — these are economic conditions, i.e. the circumstances that may vary depending on the economic opportunities available to an individual (for example, the potential to earn a living, to do business, to pay or evade taxes). On this basis, it can be assumed that there is a link between crime and the economy.

The analysis of the latest literature allowed to identify three types of the relationship between the economy and crime:

- economic development tends to reduce crime and/or the probability of crime is decreasing under favourable economic conditions (inverse relationship) (Sarvaria, 2019; Santos *et al.*, 2022; Kusuma *et al.*, 2018; Wang, 2020);
- during the periods of economic downturn, crime rates tend to increase and/or the probability of crime is increasing under unfavourable eco-

conomic conditions (inverse relationship) (Sarvaria, 2019; Santos *et al.*, 2022; Kusuma *et al.*, 2018; Wang, 2020);

- the probability of crime is increasing with economic growth (direct relationship) (Sarvaria, 2019; Freedman & Owens, 2016; James & Smith, 2017; Street, 2019; Debnath & Das, 2017; Mulok *et al.*, 2016).

The literature analysis revealed the gap in previous studies that hardly consider the fourth type of the relationship: when crime is decreasing with the declining economy. This research attempts to investigate all types of the relationship between the economy and crime.

The major purpose of this research — after classifying the EU member states by their crime and economic indicators, was to assess the relationship between the crime and economic development and identify the causes of this relationship. To fulfil the defined purpose, the following objectives were raised: 1) to review previous findings concerning the relationship between the economy and crime; 2) to select and substantiate the methodology used for classifying the states by their crime and economic indicators and assessing the relationship between the economy and crime; 3) after ranking the countries by their crime rates and economic indicators, to identify the most significant differences among the countries and assess the strength of the relationship between the crime and economy within the EU. The research methods include systematic and comparative literature analysis, the Promethee and Entropy methods, Spearman's correlation coefficient.

The theoretical section of this article focuses on the economic rationale of crime and the nature of the relationship between the economy and crime. The second section reviews good and bad practices of the countries in terms of the relationship between crime and economic development. The third section presents and substantiates the methodology of the research, and the fourth section is dedicated for the analysis of the empirical results.

Literature review

The economic rationale of crime

From an economic point of view, crime is seen as the result of a rational consideration when an individual weighs the costs and benefits of legal and illegal forms of employment (Becker, 1968). According to Rocque *et al.* (2019), when the legitimate (official) economy is healthy, it is characterized by a comparatively high employment rate and a relatively high average wage. Therefore, individuals can meet their food, housing and other essen-

tial needs simply by participating in the labour market and earning a formal wage. However, when the economy is weak, the labour market ceases to function efficiently, the unemployment rate is rising, and individuals driven by rational needs may begin to look for alternative sources to meet their basic needs. Crime may become one of those sources. Thus, with limited resources, the economic rationale of crime is survival.

Limited resources are not necessarily associated with unmet basic needs. Lower availability of resources can also be caused by rising prices (inflation) that lead to bankruptcy and insolvency of a large number of economic entities, which worsens the economic situation of individuals and can thus push them into crime (Bonger, 1916). Becker (1968) suggests that crime rates should grow during the periods of economic downturn due to lower opportunity costs and greater crime benefits. In the studies conducted by Cantor and Land (1985), and Jalles and Andresen (2017), the economic dimension is largely represented by the unemployment factor. A rising unemployment rate that usually accompanies an economic downturn is linked to a rising crime rate. The unemployment factor used in the analysis is equated with the possibility of crime, and the possibility is believed to dominate motivation.

Bonger (1916) is one of the early theorists to believe that the capitalist system itself stimulates people's selfishness and the pursuit of wealth. It means that an individual can be inclined to commit crimes in the hope of gaining greater economic benefits than from legitimate activities. The profit that can be obtained from a criminal act is the factor that can push an individual to delinquent behaviour, and the painfulness of a punishment is the factor that can deter an individual from committing crimes. If the first of these forces is stronger, a crime will be committed; if the second force is stronger, a crime will not be committed. In the case of committing a crime, the expected benefits outweigh the costs of being convicted (Sarvaria, 2019). So, in essence, the decision to commit or not to commit a crime is a cost-benefit analysis. The rate at which individuals discount the future also affects the expected gains and costs of crime. The gains are expected to be received immediately, while the potential for punishment is associated with the future and uncertainty. Therefore, if an individual applies a high discount rate, he/she is likely to commit crimes because the present gains from criminal activities are prioritized over the potential costs (Becker, 1968).

Kusuma *et al.* (2018) note that general crimes are not limited to criminal acts. They also cover illegal collection activities which may raise unexpected costs for perpetrators. According to Vidal (2015), crime leads to insecurity, which generates extra protection costs; the latter, in their turn, are holding back faster economic growth.

The relationship between the economy and crime

According to Sarvaria (2019), the relationship between the economy and crime is usually analysed on the basis of two main assumptions: first, the likelihood of crime is decreasing under favourable economic conditions (that is the relationship between crime and the economy is reversed); second, the likelihood of crime is thought to increase in an environment favourable for economic growth (that is the relationship between crime and the economy is direct). This is reflected in the results of previous studies (see Table 1).

Having exploited the effects of the 2005 Base Realignment and Closure (BRAC) program in San Antonio (Texas) by applying the difference-in-differences methodology, Freedman and Owens (2016) argue that when the economy is growing, crime rates may increase as the range of opportunities for criminal activities is expanding, and the income that can be used to commit criminal activities is also increasing. James and Smith's (2017) results indicate that the growing extraction of tight oil and shale gas in the U.S. positively correlates with the levels of various property and violent crimes in the states rich in the above-mentioned resources. The authors note that these results are not easily explained by changes in demographics (such as gender or age), but there is evidence that people with criminal records tend to move to these states.

Street (2019) explains that during the periods of economic growth (the so-called production periods), an increase in crime rates is possible due to demographic changes and the development of illegal markets (the case of North Dakota in the USA). People tend to leave a particular region or country when living and labour market conditions are deteriorating and move to the regions or countries where the economy is expanding. As a result, with the expansion of the labour market and rising wage levels, more and more people tend to come to particular regions in search of better jobs and better living opportunities. In this way, the migration of young people, especially men prone to crime, to these regions is increasing, which promotes an increase in the overall crime rate. Thus, the relationship between economic growth and rising crime rates can be linked to migration processes.

Santos *et al.* (2022) confirmed the hypothesis that economic development tends to reduce violent crime. By employing the method of fixed-effects regression to research a sample of 88 developed and developing countries in the period 1993–2015, the authors found that economic development can explain the negative direct relationship between international migration and homicide. They conclude that an increase in international

migration and a decrease in homicide rates can be a consequence of a broader process of economic development.

The statistical data presented by Finklea (2011) in the report addressing the relationship between economic strength and crime in the USA (the national level data) confirm that the violent crime and property crime rates tend to increase during the periods of economic recession, while during other periods they tend to remain stable or actually decrease. Nevertheless, this approach is criticized for the use of a single variable (unemployment) representing the economy (Ha, 2015). Having examined the effect of multiple economic measures on eight separate crime types, Ha (2015) confirmed that Cantor and Land's (1985) model can be used to assess the relationship between the economy and property and violent crime rates, but for 6 of the 8 crime types this model was not approved. Mohammed *et al.* (2022) also did not confirm the relationship between crime and economic growth: having conducted a panel study of 11 countries in the Economic Community of West African States (ECOWAS), they found that organized crime does not have a significant impact on economic growth, while corruption (an economic crime) significantly reduces economic growth. By using a combination of regression, cluster and discriminant analysis to research the situation in the Asia-Pacific region, Bajada and Shashnov (2019) find a statistically significant inverse relationship between the level of corruption and the national economic development, i.e. a higher level of economic development is associated with a lower level of corruption. According to DiRienzo and Das (2022), the impact of corruption as an economic crime depends on the level of the national economic development and is stronger in developing economies. When the level of economic development is increasing, the detrimental effects of corruption are decreasing (the study is based on a series of cross-country regressions).

The U.S. crime rate review, published by *The Economist* (2011), provides the data showing that crime rates tend to drop in the states with declining GDP per capita, that is crime rates tend to fall during the periods of economic recession.

Detotto and Otranto (2010) employed the time varying parameter approach to investigate the impact of crime on the overall economic performance in Italy over the period 1979–2002 and found that criminal acts discourage domestic and foreign investment, reduce business competitiveness and lead to inefficient allocation of resources. Cardenas (2007) focused on the situation in Colombia between 1950 and 1980. The time series analysis shows that huge sums of money earned in Colombia, which is considered one of the world's largest producers of cocaine, have a detrimental effect on the country's productivity and economic growth. The cross-country

evidence indicates that economic underperformance is explained by the high homicide rate.

Debnath and Das's (2017) study of the relationship between crime and economic welfare in India between 1982–2013, based on the unit root test, co-integration and the two-stage least square technique, confirmed that the economy and crime are interrelated, but their results suggest that the nature of this relationship may depend on the time span. The empirical research disclosed that economic growth has a positive effect on the violent crime rate in the long run, but in the short run the relationship between these variables is reversed. Mulok *et al.* (2016) confirmed the positive and statistically significant relationship between economic growth and crime in Malaysia for the period 1980–2013. The authors used the ARDL approach to verify the relationship between the variables and identify the direction of causation (if any). Their models provided the strong evidence of the long-run cointegration between the variables. The impact of economic growth on crime was found to be statistically significant and positive in the long run, although the short run was found to be characterised by the bidirectional causation between the variables under consideration.

According to Kusuma *et al.* (2018), if a country is rich in natural and human resources, it leads to its economic growth, more intensive consumption and higher household income, which should theoretically reduce the crime rate. Santos *et al.* (2022) suggest that the major reasons why economic development can reduce the number of homicide are as follows: first, economic development is often accompanied by stronger social welfare systems that reduce the harm of economic deprivation; second, economic development may be accompanied by improvements in criminal justice infrastructure and the legitimacy of social institutions, both of which are expected to reduce criminal behaviour; finally, economic development is linked to poverty reduction, which alleviates economic hardship and relieves stress in the most vulnerable segments of society.

Nevertheless, an increase in the crime rate can be attributed not only to economic growth itself. Wang (2020), who researched the impact of the one-child policy on female crime in China, argues that this policy structurally changed gender socialization in the family and created specific strain for women which resulted in correspondingly rising female crime rate. The research did not confirm the hypothesis proposing that the economic development tends to raise female crime contemporaneously, according to the emancipation theory, but confirmed the hypothesis proposing that the economic development tends to raise female crime in the offspring generation, according to the power-control theory.

Kusuma *et al.* (2018), who invoked the panel data to investigate 31 provinces in Indonesia in the period 2008–2016, argue that the relationship between crime and economic development significantly depends on the quality of human resources, that is the ability of the population to access the results of economic development, to obtain income, to maintain health, to obtain education, and so forth. Therefore, the authors focus on the relationship between the crime rate and the Human Development Index, investment and the level of corruption. They found that the Human Development Index promotes economic growth through community income and welfare. Investment tends to raise production capacity and thus promotes economic growth; at the same time, services are improving, and infrastructure is expanding. However, economic crimes, such as corruption, reduce the level of Gross Domestic Product (GDP), which, in its turn, slows economic growth. After conducting a quantitative synthesis of 103 scientific studies, Saddiq and Abu Bakar (2019) confirmed that economic and financial crimes have a negative impact on emerging and developing economies. The evidence of the negative impact of crime on developing economies (the Indian case) was also provided by Parida *et al.* (2018) who find that higher crime rates (including terrorist attacks) tend to greatly reduce the flows of tourism, which impedes economic development of the countries dependent on the tourism industry.

In general, the crime rate can be determined by a combination of economic, political and security stability factors (for example, GDP per capita, unemployment rate, wages, inflation, functioning of the labour market, business conditions, poverty rate), while the relationship between the economy and crime can depend on a method selected for measuring the economy and consideration of the short or the long run.

Good and bad practices in terms of the relationship between crime and economic development

Crime in the Nordic countries (Finland, Denmark, Sweden) has long been closely linked to the unique cultural and philosophical characteristics of this region. Lappi-Seppälä (2012) notes that the Scandinavian countries have improved their crime statistic and, consequently, criminal policies through the welfare state model. In this way, the Scandinavian countries are characterized by a relatively small number of prisoners, the use of alternative punishments and a focus on the social sector and social policies for crime prevention. Nowadays Finland, Sweden and Denmark are seen as exemplary welfare states with an extremely high quality of life and a strong social security system. As a result, crime rates in these societies are low,

and their criminal policies are largely humane and lenient. According to Vuorela (2017), the early system of criminal justice in Sweden (and at the same time in Finland) was established on the basis of the Swedish Civil Code of 1734. The Civil Code followed the principles of *lex naturalis*, which supported severe penalties for offenders. As a result, the penal code was strict and many crimes, including aggravated theft and brutality/animalism, were punishable by death. The criminal justice system was gradually transformed into a more modern and softer system, and Sweden's reform efforts culminated in 1864 with the adoption of the new Strafflagen Penal Code. In the twentieth century, wars began again in Europe. World War I and Sweden's neutrality in it helped Sweden revive its economy, and in the 1940s, Sweden became a rich country to the best of its ability. Finland, on the other hand, regained its independence, and in 1918 took part in World War II, fighting alongside Germany against the Soviet Union. After losing the war, Finland was forced to pay war reparations to the Soviet Union. The reparations, however, turned out to be favourable, as they helped to develop the Finnish industry very quickly (Vuorela, 2017).

After industrialization, the Scandinavian countries began to build their societies on the model of the welfare state (Sweden — in 1940, and Finland — in 1960). Wealth was being accumulated, and the material quality of life was improving rapidly. In the 21st century, both countries were among the richest countries in the world. One clear trend in their social progress was and has been the development of the education system. The Finnish education system is often regarded in scientific debate as the best system in the world.

Corruption in Bulgaria and Romania — and, in the case of Bulgaria, widespread organized crime — has become a serious problem for the European Union, often overshadowing other issues (Ivanov, 2010). According to their Corruption Perceptions Index for Western Europe & European Union (2021), Bulgaria is placed 78th, and Romania — 66th among 180 countries worldwide. Comparing the data for 2021, it can be seen that Bulgaria, Romania and Hungary remain the worst looking countries in the EU region in terms of the fight against corruption, although they accessed the EU earlier than, for example, Croatia.

Bulgaria is a country “where major institutional checks and balances seem to have been put in place, but actual improvement in integrity is slow to come” (Pashev, 2011, p. 413). For more than a decade, before its accession to the EU, the country focused on institutional reforms, supported by multilateral and bilateral donation programs. According to the evaluation reports, the capacity and integrity building projects were relevant and ambitious. Most institutional safety measures and control mechanisms are in

place (Pashev, 2011), but corruption, organized crime and money laundering are among the biggest obstacles impeding foreign investment and economic growth; they also shelter terrorism and violent crime. Widespread corruption and crime in Romania and Bulgaria are higher than in any other part of the EU, and enforcement of criminal and civil law, while progressive, remains weak and ineffective.

Although the relationship between judicial corruption and organized crime in post-communist societies has serious implications, previous literature is still limited to the general analysis of the patterns and consequences of corruption and organized crime, but pays little attention to the situation in individual countries (Zhillia, 2011). Previous studies focused on the relationship between economic development and crime are mostly based on the quantitative synthesis, the panel data analysis, the ARDL approach, unit root test, time series analysis and regression methods.

Taking into account that organized crime and economic situation are multidimensional issues, it is necessary to use multi-criteria methods for performing comparative analysis among EU countries using various indicators together. PROMETHEE method, as one of the most commonly used methods for multi-criteria analysis, synthetize all indicators in one value — preference level, which enable ranking of countries according to all observed criteria.

Data

In order to perform analysis of organized crime spreading and economic situation in EU countries, the very important step is selection of relevant indicators. For organized crime, authors selected indexes from World competitiveness report: Business Costs of Crime and Violence, Organized crime, Crime, Homicides, Business Costs of Terrorism, Corruption Executive Bribery and Corrupt Exchanges Irregular Payments and Bribes, and Public sector theft. These indicators considered all together give comprehensive picture of organized crime level in one country. On the other side, for comparative analysis of EU countries according to economic situation, following indicators are used: Export (percent GDP), GDP per capita PPP, as an indicator of economic growth, Gross fixed capital formation (percent GDP), as an indicator of domestic investments, GDP per person employed, as an indicator of labour productivity, GINI coefficient, as an indicator of income dispersion and, indirectly, wellbeing in country, Inflation, and Unemployment rate. These are the most commonly used indicators in economic analysis.

Research methods

Considering the purpose of this research, ranking of alternatives will be performed using the PROMETHEE method in combination with Entropy method, which is used to calculate objective weights of the criteria for both rankings. The empirical analysis includes the following factors (see Table 2).

The PROMETHEE method

Considering that the purpose of this research is to rank the EU member states by their crime rate and economic situation, and the ranking will be based on several criteria, it can be stated that this analysis is within the scope of multi-criteria analysis. The number of Multi-Criteria Decision Making (MCDM) methods is growing constantly. The methods incorporate the specific requirements raised for different decision makers (Kumar *et al.*, 2017; Villacreses *et al.*, 2017; Siksnyte-Butkiene *et al.*, 2020; Lak Kamari *et al.*, 2020). The PROMETHEE method is one of the most common MCDM methods. It has a number of advantages acknowledged in previous literature. It is a ranking method that, in comparison to many other MCDM methods, is considered to be simple in conception and computation. The most significant distinction between the PROMETHEE and other MCDM methods is the PROMETHEE's inner relationship during the decision-making process (Murat *et al.*, 2015). This method is well-suited to decision-making issues in which a finite set of alternatives should be ranked with consideration of multiple conflicting criteria (Tuzkaya *et al.*, 2010). It is also a user-friendly outranking method that is adaptable to a wide range of real problems and includes a variety of preference functions for assigning the differences in the alternatives under research (Abdullah *et al.*, 2019).

The PROMETHEE method begins with evaluation of the alternatives with respect to particular criteria. The evaluations essentially require the numerical data to represent the information on the relative importance of the criteria and the information to reflect preference functions of a decision maker. This information is obtained when a decision maker compares the contribution of particular alternatives with respect to each criterion.

The computational procedure in the PROMETHEE method consists of the following steps (Brans *et al.*, 1986; Behzadian *et al.*, 2010; Polat, 2016; Abdullah *et al.*, 2019):

Step 1. Development of the evaluation matrix (based on the selected criteria and the set of alternatives) with parameters of multi-criteria analysis

(direction of preferences, weights, preference functions and appropriate thresholds).

Step 2. Identification of the differences by pairwise comparisons:

$$d_j(a,b) = g_j(a) - g_j(b) \tag{1}$$

$d_j(a,b)$ represents the difference between evaluations a and b with respect to each criterion.

Step 3. Application of the selected preference function:

$$P_j(a,b) = F_j[d_j(a,b)] \tag{2}$$

$P_j(a,b)$ denotes preference of alternative a compared to alternative b with respect to all criteria under consideration; it is presented as function $d_j(a,b)$ ranging from 0 to 1. The function value close to 0 represents indifference of a decision maker. If it is closer to 1, it means a greater preference of a decision maker.

Step 4. Calculation of the multi-criteria preference index:

$$\forall a,b \in A \quad \pi(a,b) = \sum_{j=1}^k P_j(a,b)w_j \tag{3}$$

$\pi(a,b)$ denotes the level of preference for alternative a compared to alternative b with respect to all criteria under consideration.

Step 5. Calculation of the positive and negative preference flows:

$$\varphi^+(a) = \frac{1}{m-1} \sum_{x \in A} \pi(a,b) \tag{4}$$

$$\varphi^-(a) = \frac{1}{m-1} \sum_{x \in A} \pi(b,a) \tag{5}$$

Step 6. The net preference flow is calculated as a difference between the positive and negative preference flows:

$$\varphi(a) = \varphi^+(a) - \varphi^-(a) \tag{6}$$

$\varphi(a)$ reflects the net preference flow for each alternative. The final ranking of the alternatives is performed with consideration of their value. The net preference flow value varies from -1 to +1, with the top ranked alternative

having the highest positive net flow of preferences, and the worst ranked alternative having the highest negative net flow of preferences.

The Entropy method

The Entropy method, which is based on the concept of entropy from the basic information theory, is a method for calculating the weight of each indicator in a composite indicator system. Information is a measure of the degree of order, whereas entropy is a measure of the degree of disorder in a system. Thus, the lower is the entropy value, the more information an indicator provides, and the greater is its impact on the overall evaluation (Wang *et al.*, 2019). The entropy method is an objective weighting method that uses the amount of the data information load to generate weights. It enables minimizing the effects of human subjectivity on evaluation outcomes and makes them more realistic (Quan *et al.*, 2021).

When using the Entropy method to calculate weights, the following steps are followed (Jin *et al.*, 2020; Krstić & Fedajev, 2020):

Step 1. Normalization of the evaluation matrix by applying an appropriate formula that is dependent on the preference direction:

$$\tilde{X}_{ij} = \frac{X_{ij} - \min X_{ij}}{\max X_{ij} - \min X_{ij}} \quad (7)$$

$$\tilde{X}_{ij} = \frac{\max X_{ij} - X_{ij}}{\max X_{ij} - \min X_{ij}} \quad (8)$$

\tilde{X}_{ij} represents normalized value of an indicator for one of the alternatives under consideration. The Entropy method proposes that various indicators expressed in different units must be related on a dimensionless scale ranging from 0 to 1. If an indicator should be maximized, formula (7) is applied for normalization, whereas for indicators that should be minimized, formula (8) is applied.

Step 2. Calculation of the entropy value for each indicator:

$$H_j = -k \sum_{i=1}^m X_{ij} \ln X_{ij} \quad (9)$$

H_j denotes the entropy value for each indicator; $k = 1/\ln(n)$ should be taken into account.

Step 3. Calculation of the weights:

$$w_j = \frac{d_j}{\sum_{j=1}^n d_j} = \frac{1 - H_j}{\sum_{j=1}^n (1 - H_j)} \quad (10)$$

here $d_j = 1 - H_j$ represents the diversification level given the following relations: $0 \leq w_j \leq 1$ and $\sum w_j = 1$.

Definition of the parameters of multicriteria analysis

As it was stated above, application of the PROMETHEE method requires definition of the necessary parameters which are presented in Table 3.

The weights for all indicators under consideration, calculated by applying the Entropy method, the direction of preference and a usual function selected to increase objectivity of the analysis are also presented in Table 3.

Research limitation: since the World Bank's database provides the crime rates in all EU member states only till 2017, and the year 2017 is considered to be the peak of economic growth in the EU, the crime rates and economic indicators representing the EU member states in this research were ranked with consideration of the data for 2017 only.

Results

Based on the results presented in Table 4, it can be concluded that the best-ranked country is Finland. Besides Finland, the countries with positive net preference flows (meaning that the advantages in these countries outperform the disadvantages) are Luxembourg, Sweden, the Netherlands, Austria, Denmark, Ireland, Estonia, Germany, Portugal, Spain, Belgium, and Slovenia. It should be noted that there are only two new member states with positive net preference flows — Estonia and Slovenia. In general, the crime rate in Estonia dropped during the period from 2004 to 2017 as a result of the declining number of thefts in particular, whereas the sense of security increased. The results revealed that the declining trend of crimes came to a halt, as did the number of recorded crimes, even though the variations over consecutive years were generally insignificant (Ahven, 2018). Estonia seems to be a success story against all odds: it has not implemented its safety and police related measures in accordance with prescriptions of the relevant internationally acknowledged models, but has, nevertheless, achieved

the aims for which those policy models are designed in the first place (Suve *et al.*, 2016). In 2017, Slovenia continued investing in training crime investigators, as well as modernising the technical equipment. In the fight against corruption and organized crime, and recognizing the positive effects of international cooperation, the Slovenian police started investing in strengthening international cooperation with partner countries in the European region and beyond (Lindav, 2019).

The above-mentioned countries are followed by those with negative net preference flows (meaning that their disadvantages outperform advantages) — France, Poland, the Czech Republic, Lithuania, Malta, Latvia, Cyprus, the Slovak Republic, Croatia, Greece, Hungary, Italy, Romania, and, at the very end, Bulgaria. It should be emphasized that these countries are mostly new member states and only three of them are old member states — France, Greece, and Italy. The fact that Italian organized crime is known around the world is revealed by the widespread use of the term 'Mafia' as an organized crime. Mafia groups have a monopoly on crime in the areas of their origin; they also tend to prioritize drug trafficking, money laundering, corruption, waste/toxic substance trafficking and smuggling (Europol, 2013), thus threatening the security not only of Italy, but also of the EU.

As the vast majority of domestic and international observers of the Greek crisis report, corruption has been a key factor contributing to the emergence of the country's financial crisis, organically related to over-expenditure and mismanagement of public funds. Since 2008, public fears of violent and property crime have risen sharply, not only due to political corruption, but also to illegal immigration. Researchers (Xenakis & Cheliotis, 2012) single out three crucial factors leading to the increase in violent and property crimes: the financial crisis and its consequences; the impunity of corrupt officials which has led to public attention being drawn to crime; the clientelism crisis intended to reduce socio-economic tensions in the society.

Table 5 presents the rankings of the EU member states based on their economic situation represented by the relevant indicators, such as GDP per capita, GDP per person employed, export, inflation, gross fixed capital formation, unemployment and GINI index.

The results in Table 5 indicate that the best-ranked country in terms of the economic situation is Ireland. It is followed by other countries with positive net preference flows: the Netherlands, Malta, Denmark, Luxembourg, Belgium, the Czech Republic, Austria, Finland, the Slovak Republic, Slovenia, Sweden, and Germany. In this group of countries, only two are new member states — the Slovak Republic and Slovenia. Slovakia is benefitting from the strong links with the global economy, especially the

EU member states, and has been catching up with higher-income countries. Its unemployment rate dropped below 7%, a historically low level recorded in 2017. Wages have been growing fast, and inflation is increasing due to the rising demand pressure and higher food prices (OECD, 2019). Slovenia has maintained its price-competitiveness, and its improving external environment is clearly reflected in the growth of exports. The account surplus was 5.9% of GDP in 2017, and the country's net international investment position significantly improved. Slovenia performed relatively well concerning the indicators of the Social Scoreboard supporting the European Pillar of Social Rights. Income inequalities were low in 2017. The risk of poverty and social exclusion has decreased over the last years (European Commission, 2018).

The above-mentioned 13 countries with positive net preference flows are followed by 14 countries with negative net preference flows: France, Estonia, Hungary, Cyprus, Poland, Croatia, Italy, Romania, Portugal, Lithuania, Spain, Greece, Latvia, and Bulgaria. There are two results worth noting. First of all, Bulgaria is ranked at the last position in both cases (in terms of its crime and economic situation). In this group, most countries are new member states, and the list of old member states is expanded (compared to the ranking in terms of the crime rate) by Portugal and Spain. Portugal and Spain, along with Greece and Italy, were ranked among the EU member states hardest hit by the 2008 crisis, when their economies suffered from high levels of unemployment, domestic and external debt, and high government deficits. The case of Spain was further complicated in economic terms by the huge real estate bubble. Over the decade (from 2008 to 2018), Portugal made a significant progress and returned to the economic growth and budgetary stability, but the major recovery can be seen in the growth of temporary tourism. Unfortunately, the negative demographic situation and low productivity reduced unemployment but worsened medium-term economic expectations. Although Spain is showing better macroeconomic performance, it should sort out the problems of standardization, coordination and simplification of its administration in order to thrive and compete in global markets because at the moment the state's territorial administrations manage 50 percent of expenditures and make up 77 percent of the state employees (Puig & Sanchez, 2018). Together with France, Italy, and Greece, the above-mentioned countries are the worst performers in terms of their economic situation. The main reasons for the slowdown in the French economy are high taxes, low savings and long-term revenue, and expenditure imbalances. Since 1974, France has not had a positive account balance. In 2013, the governmental spending accounted for 57 percent; the country's GDP was also ranked first in the euro area in terms

of social security expenditure. The French are accustomed to prosperity and a comfortable life, so the government is not ready for any cost-cutting policy for fear of public reaction.

To make the comparison of the two rankings clearer, Table 6 presents the difference in the rankings representing the criminal and economic situation in the sample countries.

It could be seen from Table 6 that there are more or less pronounced differences between the two rankings across the sample countries. The most pronounced differences are recorded in Portugal, Spain, and the Slovak Republic. Also, it should be noted that France and Bulgaria recorded no differences in their rankings.

Apart from their different sizes, Spain and Portugal are very similar countries in terms of their sociodemographic characteristics and economic conditions. At first, it should be noted that Spain and Portugal also tend to have low crime rates in comparison to other European countries (Redondo *et al.*, 2020), which means that these countries differ significantly from other EU member states in terms of their worse economic and better crime situation. The opposite trend is observed in the Slovak Republic: the economic situation is better, while the crime rate is high.

The correlation analysis was conducted to identify a correlation between the rankings representing the criminal and economic situations, and the results are presented in Table 7.

Based on the results presented in Table 6, it can be concluded that the correlation between the two rankings is positive, strong and statistically significant since the Spearman's coefficient amounts to 0.609, and p-value is 0.001.

Discussion

The research results confirmed the findings provided by Sarvaria (2019), Santos *et al.* (2022), Finklea (2011), Kusuma *et al.* (2018), and Wang (2020): crime tends to decrease under favourable economic conditions (1st country group: Finland, Luxembourg, Sweden, the Netherlands, Austria, Denmark, Ireland, Germany, Belgium, Slovenia), and, on the contrary, a worse economic situation stimulates a higher crime rate (2nd country group: France, Hungary, Cyprus, Poland, Croatia, Italy, Romania, Lithuania, Greece, Latvia and Bulgaria). There were a few exceptions in the sample of EU-27: although Malta, the Czech Republic and the Slovak Republic (3rd country group) had favourable economic conditions, the crime rates in these countries were high, which is in line with the findings provided by

Sarvaria (2019), Freedman and Owens (2016), James and Smith (2017), Street (2019), Debnath and Das (2017), and Mulok *et al.* (2016) who state that the probability of crime can increase in an environment favourable to economic growth.

The 4th country group (comprising Estonia, Portugal and Spain) is characterised by the unfavourable economic situation, but low crime rates. This phenomenon is confirmed by Ahven (2018), Suve *et al.* (2016), and Redondo *et al.* (2020) who argue that having been able to reduce its crime rate and promote the sense of population's security under relatively difficult economic conditions, Estonia can be considered a success story. Although characterized by high unemployment rates and indicators of an aging society, Spain and Portugal tend to have low crime rates in comparison to other European countries, which means that these countries differ significantly from other EU member states in terms of their worse economic and better crime situation.

Scientific novelty of the research manifests itself in two directions: first, the research proves that compared to other crimes, represented by Business Costs of Crime and Violence, Organized crime, Crime (Homicides), and Business Costs of Terrorism, corruption, represented by Executive Bribery and Corrupt Exchanges, and Irregular Payments and Bribes, has the greatest weight in the relationship between economic development and crime. Corruption significantly slows down economic growth (Mohammed *et al.*, 2022), and this argument can explain the nature of the relationship between economic development and crime in 2 country groups; second, the researchers classified the EU member states into 4 groups in terms of the relationship between economic development and crime, which may help public authorities to devise the target measures for the effective fight against crime given the nature of the relationship between crime and economic development.

Conclusions

Literature analysis suggests that various scenarios of the relationship between crime and economic development are possible, that is economic growth/decline can reduce/raise crime rates or, conversely, economic growth can raise crime rates because of inflation when high prices lead to bankruptcy of businesses and insolvency of individuals, which pushes them into crime and illegal activities. Indeed, the analysis of the relationship between the economy and crime without considering the cultural, political and historical environment in the target countries would be ineffective. The

Promethee method, together with the Entropy method, were used to estimate the weights of the EU member states with respect to their crime and economic development indicators in 2017. The calculations revealed that the nature of the relationship between crime and economic development is not unidirectional and confirmed the results of previous studies. Classification allowed to form 4 country groups: the 1st group includes the countries with crime rates decreasing under favourable economic conditions; the 2nd group includes the countries where slower economic development tends to raise the crime rate; the 3rd group includes the countries where favourable economic situation tends to increase the crime rate; the 4th country group includes the countries with low crime rates and difficult conditions for economic development. This classification of the EU member states, given that all of them have gone through a stage of economic growth, revealed that perception of the nature of the relationship between economic development and crime could help national governments identify the major causes why crime rates tend to increase/decrease at a given stage of economic development. Economic development and better living conditions are related to a strong social system, a well-developed criminal justice infrastructure, legitimacy of social institutions and reduction of poverty. Thus, the governments of the EU member states with slower economic development should primarily focus on the latter aspects.

Limitation of the research is related to the statistics presented from different perspectives, which makes it difficult to compare the results for several years, i.e. the authors could not include the crime rate data for 2007 and 2010 due to discontinuity of the record of these data.

To the best of the authors' knowledge, this is the first research of the relationship between crime and economic development based on the PROMETHEE method. The research complemented the theory of the shadow economy with the results showing that compared to other crimes, corruption has the greatest weight in the relationship between economic development and crime. Thus, countries characterized by slower economic development should focus on devising the measures to reduce the level of corruption.

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Annex

Table 1. Review of some previous findings concerning the relationship between the economy and crime

Relationship between crime and economy	Literature sources
Economic growth is associated with higher crime rates	Bonger (1916); Freedman and Owens (2016); Mulok <i>et al.</i> (2016); James and Smith (2017)
Economic growth is associated with lower crime rates	Cardenas (2007); Detotto and Otranto (2010)
Economic decline is associated with higher crime rates	Becker (1968); Cantor and Land (1985); Finklea (2011); Jalles and Andresen (2017)
Economic decline is associated with lower crime rates	<i>The Economist</i> (2011)
Economic growth can be associated with both higher and lower crime rates	Debnath and Das (2017); Kusuma <i>et al.</i> (2018); Street (2019); Sarvaria (2019)

Table 2. Description of the factors in the empirical analysis

No.	Factor	Value meaning	Source
Crime factors for 2017			
1.	Business Costs of Crime and Violence, Index	1 = to a great extent; 7 = not at all	World Bank database
2.	Organized crime, index	1 = bad; 7 = best	
3.	Crime, Homicides, value	1 = bad; 7 = best	
4.	Business Costs of Terrorism, Index	1 = bad; 7 = best	
5.	Corruption	Scale to range from 0 (lower score) to 1 (highest score)	
6.	Executive Bribery and Corrupt Exchanges	Scale to range from 0 (lower score) to 1 (highest score)	
7.	Irregular Payments and Bribes, Index	1 = bad; 7 = best	
8.	Public sector theft	Scale to range from 0 (lower score) to 1 (highest score)	
Economic factors for 2017			
1.	GDP per capita, PPP (constant 2017 international \$)	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. Data are in constant 2017 international dollars.	World Bank World Development Indicators database, World Bank Eurostat-OECD PPP Programme.
2.	GDP per person employed (constant 2017 PPP \$)	GDP per person employed is gross domestic product (GDP) divided by total employment in the economy. Purchasing power parity (PPP) GDP is GDP converted to 2017 constant international dollars using PPP rates.	Derived using data from International Labour Organization, ILOSTAT database.

Table 2. Continued

No.	Factor	Value meaning	Source
3.	Inflation, consumer prices (annual %)	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.	International Monetary Fund, International Financial Statistics and data files.
4.	Exports of goods and services (percent of GDP)	Exports of goods and services represent the value of all goods and other market services provided to the rest of the world.	World Bank national accounts data, and OECD National Accounts data files.
5.	Gross fixed capital formation (percent of GDP)	Gross fixed capital formation includes land improvements; plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings.	World Bank national accounts data, and OECD National Accounts data files.
6.	Gini index	The Gini index measures the extent to which the distribution of income or consumption among individuals or households within an economy deviates from a perfectly equal distribution. A Gini index of 0 represents perfect equality, while an index of 100 implies perfect inequality.	World Bank, Poverty and Inequality Platform.
7.	Unemployment, total (percent of total labour force) (modelled ILO estimate)	Unemployment refers to the share of the labour force that is without work but available for and seeking employment.	International Labour Organization, ILOSTAT database.

Source: compiled by the authors based on ILOSTAT (2017), World bank (2017), OECD (2019); IMF (2017).

Table 3. Parameters of multi-criteria analysis

Rankings for crime			
<i>Criteria</i>	<i>Weights</i>	<i>Direction of preference</i>	<i>Preference function</i>
Business Costs of Crime and Violence	0.086	max.	Usual
Organized crime	0.083	max.	Usual
Crime (Homicides)	0.112	max.	Usual

Table 3. Continued

Rankings for crime			
Business costs of terrorism	0.107	max.	Usual
Corruption	0.196	max.	Usual
Executive bribery and corrupt exchanges	0.107	max.	Usual
Irregular payments and bribes	0.168	max.	Usual
Public sector theft	0.141	max.	Usual
Rankings for economic situation			
<i>Criteria</i>	<i>Weights</i>	<i>Direction of preference</i>	<i>Preference function</i>
Export (percent GDP)	0.196	max.	Usual
GDP per capita PPP (constant 2017 international \$)	0.152	max.	Usual
Gross fixed capital formation (percent GDP)	0.155	max.	Usual
GDP per person employed (constant 2017 PPP \$)	0.151	max.	Usual
GINI coefficient	0.097	min.	Usual
Inflation, consumer prices (annual percent)	0.142	min.	Usual
Unemployment rate (percent of total labour force)	0.108	min.	Usual
Gross fixed capital formation (percent GDP)	0.155	max.	Usual
GDP per person employed (constant 2017 PPP \$)	0.151	max.	Usual
GINI coefficient	0.097	min.	Usual
Inflation, consumer prices (annual percent)	0.142	min.	Usual
Unemployment rate (percent of total labour force)	0.108	min.	Usual

Table 4. Ranking results for crime

Rank	Country	Phi	Phi+	Phi-
1	Finland	0.7493	0.8667	0.1174
2	Luxembourg	0.6711	0.821	0.1499
3	Sweden	0.5111	0.7496	0.2385
4	Netherlands	0.4664	0.7236	0.2572
5	Austria	0.4644	0.7226	0.2582
6	Denmark	0.4366	0.7162	0.2795
7	Ireland	0.3896	0.6804	0.2907
8	Estonia	0.3575	0.6691	0.3116
9	Germany	0.2988	0.6311	0.3323
10	Portugal	0.2768	0.6304	0.3536

Table 4. Continued

Rank	Country	Phi	Phi+	Phi-
11	Spain	0.0782	0.5253	0.4471
12	Belgium	0.0755	0.5275	0.4520
13	Slovenia	0.0291	0.4964	0.4673
14	France	-0.0726	0.4589	0.5316
15	Poland	-0.1121	0.4253	0.5374
16	Czech Republic	-0.1453	0.4053	0.5506
17	Lithuania	-0.1657	0.4114	0.5771
18	Malta	-0.1786	0.4064	0.5850
19	Latvia	-0.1807	0.3994	0.5801
20	Cyprus	-0.3315	0.3279	0.6594
21	Slovak Republic	-0.3394	0.3093	0.6487
22	Croatia	-0.3568	0.3012	0.658
23	Greece	-0.4326	0.2649	0.6974
24	Hungary	-0.4630	0.2536	0.7165
25	Italy	-0.4695	0.2545	0.7240
26	Romania	-0.7096	0.1377	0.8473
27	Bulgaria	-0.8471	0.0651	0.9123

Table 5. State rankings in terms of their economic situation

Rank	Country	Phi	Phi+	Phi-
1	Ireland	0.6584	0.8263	0.1679
2	Netherlands	0.4770	0.7385	0.2615
3	Malta	0.4324	0.7162	0.2838
4	Denmark	0.4298	0.7149	0.2851
5	Luxembourg	0.3744	0.6872	0.3128
6	Belgium	0.3567	0.6755	0.3187
7	Czech Republic	0.2523	0.6262	0.3738
8	Austria	0.2478	0.6210	0.3732
9	Finland	0.2302	0.6122	0.3820
10	Slovak Republic	0.1535	0.5768	0.4232
11	Slovenia	0.1509	0.5754	0.4246
12	Sweden	0.1490	0.5745	0.4255
13	Germany	0.1159	0.5579	0.4421
14	France	-0.0221	0.4889	0.5111
15	Estonia	-0.0374	0.4784	0.5158
16	Hungary	-0.0502	0.4749	0.5251
17	Cyprus	-0.0704	0.4619	0.5323
18	Poland	-0.2163	0.3890	0.6052

Table 5. Continued

Rank	Country	Phi	Phi+	Phi-
19	Croatia	-0.2678	0.3611	0.6289
20	Italy	-0.2969	0.3495	0.6464
21	Romania	-0.3686	0.3157	0.6843
22	Portugal	-0.3831	0.3084	0.6916
23	Lithuania	-0.3916	0.3042	0.6958
24	Spain	-0.3961	0.3019	0.6981
25	Greece	-0.4585	0.2708	0.7292
26	Latvia	-0.5298	0.2351	0.7649
27	Bulgaria	-0.5397	0.2302	0.7698

Table 6. Comparison of ranking results

Country	Rank for crime	Rank for Economic situation	Difference in rankings
Finland	1	9	+8
Luxembourg	2	5	+3
Sweden	3	12	+9
Netherlands	4	2	-2
Austria	5	8	+3
Denmark	6	4	-2
Ireland	7	1	-6
Estonia	8	15	+7
Germany	9	13	+4
Portugal	10	22	+12
Spain	11	24	+13
Belgium	12	6	-6
Slovenia	13	11	-2
France	14	14	0
Poland	15	18	+3
Czech Republic	16	7	-9
Lithuania	17	23	+6
Malta	18	3	-15
Latvia	19	26	+7
Cyprus	20	17	-3
Slovak Republic	21	10	-11

Table 6. Continued

Country	Rank for crime	Rank for Economic situation	Difference in rankings
Croatia	22	19	-3
Greece	23	25	+2
Hungary	24	16	-8
Italy	25	20	-5
Romania	26	21	-5
Bulgaria	27	27	0

Table 7. Spearman's correlation coefficient

		Correlations	
		Rank_Economy	Rank_crime
Spearman's rho	Rank_Economy	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	27
	Rank_crime	Correlation Coefficient	.609**
		Sig. (2-tailed)	.001
		N	27

Note: **. Correlation is significant at the 0.01 level (2-tailed).