Research article

Impact of fraud in Europe: Causes and effects

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ABSTRACT

This research aims to explore the impact of fraud on society, in general, and in the European Union, in particular. Methodologically, this research is divided into two analyses. Firstly, a theoretical analysis based on a systematic literature review of fraud and its impact on society and the economy. Subsequently, an empirical analysis using a structural equation model to estimate its causes and effects, with a sample of key performance indicators (KPI) from 27 European Union countries between 2012 and 2020. The results present relevant KPI that are identified as causing fraud and provide sustainable evidence about their effects, which impact on the society. This research contributes, on the one hand, to identifying the causes of fraud so they must be avoided through measures and contribute to a paradigm shift. On the other hand, the literature review provides evidence of causes and effects of fraud, through several reasons why fraud is committed, identifying the effects that arise from fraud and the impact it causes on society, the economy, and the well-being of the citizen. These findings guide managers and researchers in approaching measures and public policies to mitigate fraud and improve citizen safety and well-being.

1. Introduction

Fraud is a global challenge that affects various types of economies, businesses, and societies. Despite the existence of more and more means and tools, the results of fraud are devastating for companies, banking systems, capital markets and economies [1]. There are many types of fraud, which can range from petty employee theft and unproductive behavior to misappropriation of company assets and funds and fraudulent financial reporting [2]. According to Ref. [3] the diffusion and persistence of the problem requires a sustained effort to gradually increase the accumulated knowledge base of this phenomenon, so that effective preventive measures can be designed. In this way, identifying the causes and effects of fraud allows not only to mitigate this crime but also to contribute to the sustainable development of all interested parties.

Although it is true that knowing the causes and effects of fraud can restore confidence and transparency in markets and thus combat fraud crimes, it allows us to guarantee the sustainable development of all interested parties. However, it is also true that fraudulent practices have not diminished due to its fertile area for the opportunistic behaviour of its perpetrators and many other areas associated with social inequalities and new phenomena of exclusion and social unrest. Detecting and identifying the reasons behind fraud are

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crucial to prevent the financial damage caused to citizens' economies and well-being [1]. The European Union (EU), like the rest of the world, faces problems of fraud and corruption; however, there are still no precise indicators for this type of crime [4]. Corruption varies depending on the nature of a political system, as well as the degree of economic development [5], increasingly creating the need to promote sustainable development. As [6] states in his research, sustainability is a social commitment that allows minimizing harmful socio-environmental and economic impacts that contribute to sustainable development.

Economic growth improves well-being and economic development around the world, but it always brings risks, such as corruption, fraud, organized crime, as well as the parallel economy that is currently on the rise around the world [7]. In the literature, fraud is referred to as an economic crime and, according to the [8], economic crimes encompass a wide range of crimes, including fraud and fraud, money laundering, corruption, intellectual property crimes and environmental crimes. Depending on the type of crime, victims may suffer fewer or greater financial, physical, emotional, and psychological consequences, which triggers different levels of emotional intensity [9].

There is a lack of literature that examines the causes of fraud and the effects it causes on society, the economy, and individuals, therefore, this research seeks to enrich current knowledge by providing empirical evidence on how an individual makes the decision to commit fraud and the various problems caused by fraudulent practices, through the theory of agency, interested parties and the fraud triangle. Following previous studies, fraud has a negative and severe impact on the well-being of individuals [10], therefore, identifying the factors that affect well-being is increasingly important to ensure social and economic stability in society and in individuals. Therefore, this research aims to investigate the causes and effects of fraud in the European Union and identify the impact it causes on society and the economy and in turn contribute to scientific knowledge.

The results reveal a consensus in the literature that the impact of fraud can be devastating for society, the economy and, in turn, for individuals, highlighting the damage it causes to social growth and the sustainable development of countries. However, there is a lack of literature that examines the causes of fraud and the effects it has on society, the economy and individuals, so this investigation must be undertaken to fill this gap. Thus, this research seeks to enrich current knowledge by providing empirical evidence on how an individual makes the decision to commit fraud and the various problems caused by the fraudulent practices, through agency theory, stakeholders and the fraud triangle, contributing to the existing literature.

The findings have implications for influencing the causes of fraud and the effects it causes. Our research makes several contributions to the literature. Firstly, it helps to identify the causes of fraud so that they can be avoided through measures that can contribute to a paradigm shift. Therefore, this research helps to expand this literature by providing evidence of the causes of fraud, through the various reasons why fraud is perpetrated, identifying the effects that arise from fraud and the impact it has on society, the economy and the in the well-being of the citizen. Subsequently, these findings can guide professionals and researchers in approaching measures and public policies to mitigate fraud and improve citizen safety and well-being.

Methodologically, it was carried out a theoretical analysis was carried out based on a systematic review of the literature on fraud and the impact it can have on society and the economy. Subsequently, the research aims to reveal possible causes and effects of fraud through an empirical analysis, using a MIMIC structural equation model that has been applied as a reliable model to measure unobservable latent variables [4]. This model is used by several authors to evaluate the hidden economy [5,11–22]. To estimate the determining factors of fraud, the causes and effects, a sample of indicators from 27 European Union countries was used in the period between 2012 and 2020. The selection of variables to be applied in this research is based on a literature review and according to Ref. [23], this methodology is confirmatory insofar as the structural model can confirm the role of causal factors as determinants of fraud.

This research is divided into five parts, starting with this introduction. The second part presents a systematic review of the literature on fraud and the impact it can have on society and the economy. The third part describes the methodology used in empirical research. The fourth part describes the empirical analysis and presents results, reflections, and implications of fraudulent practices. Finally, the fifth part presents conclusions, limitations, and future research.

2. Literature review

Understanding and evaluating the factors that cause fraud and the impact they have on society, the economy and individuals is important, on the one hand, to be able to prevent them from occurring, but it is also important to understand how they affect the well-being of being in society. The impact of fraud can be devastating, from unbearable personal losses suffered by vulnerable victims to public and private organizations to the financial and economic development of a country. According to Ref. [10], the impact of fraud on victims goes beyond financial difficulties and can even result in stress, anger, disturbance, worries, fear of future victimization, shame, loss of self-esteem, deterioration of health, loss of trust in financial issues, suicidal ideation, unemployment, homelessness, less happiness and life satisfaction, and broken relationships. These effects can spill over into other types of problems, even leading to the practice of other types of crimes.

Therefore, it is important to understand what fraud consists of and how it is used. For [24], fraud is a global problem that affects all organizations around the world, stating that it is often undetected or never reported, and it is difficult to determine the full scope of global losses. For [1] fraud and corruption are closely interconnected, representing a persistent global problem in all countries, and affecting financial and economic development [25]. explains that fraud encompasses any profit-making crime that uses deception as its main modus operandi. It is also considered to be an abuse of the expectation of fair treatment by other human beings, and one of the central results of fraud is financial loss [26].

According to the Protection of the European Communities and Financial Interests, fraud is defined as a matter of expenditure, as any intentional act or omission relating to.

- the use or presentation of false, incorrect, or incomplete statements or documents, which has as its effect the misappropriation or wrongful retention of funds from the general budget of the European Communities or budgets managed by, or on behalf of, the European Communities:
- non-disclosure of information in violation of a specific obligation, with the same effect.
- the misuse of such funds for purposes other than those for which they were originally granted [2,27]

There are different authors who rely on three categories of occupational fraud — asset misappropriation, corruption, and financial statement fraud — to understand this phenomenon, including [25,28]. [29,30]. The Association of Certified Fraud Examiners (ACFE) reports three main categories of occupational fraud, also known as the Fraud Tree: misappropriation of assets, corruption, and financial statement fraud. For [31] companies engage in earnings management practices to manipulate their financial statements, leading to misleading false information. According to Ref. [1], asset misappropriations are performed most frequently but cause the least loss. However, financial statement fraud is the least frequent, but it causes the most damage. Corruption is in the middle, considering both the frequency and the financial costs defrauded.

The literature is very confusing when it comes to the causes and effects of fraud. Therefore, our research shows the importance of understanding what fraud consists of and identifying its impact, in order to expand knowledge and fill gaps related to the topic. To understand this phenomenon and why this crime is committed, the authors resorted to the fraud triangle theory developed by Cressey, based on studies that explain this theory (e.g., Refs. [24,25,28–30,32,33]. All report that fraud crime convictions have certain characteristics, such as pressure, rationalisation, and opportunity. For [34,35], fraud is a global problem. The fraud triangle model should adequately explain fraud in different societies, and it is suited for international use. According to Ref. [36], this model is developed based on the claim that the probability of fraud is due to the combination of three elements [37]. explain that the fraud triangle is composed of three interactive factors that determine the likelihood of fraud, including opportunity, incentive, and rationalisation.

Financial pressure is caused by certain personal problems the fraudster has that create the need and motivation to commit fraud [29,32,33]. According to Ref. [29], these problems can be due to drug or gambling addiction or financial necessity. According to Ref. [38], among EU member states, the percentage of people unable to cope with unexpected financial expenses was highest in Croatia (52 %), followed by Latvia (50 %), Greece and Cyprus (both 48 %), Lithuania (47 %), and Romania (44 %). Thus [39], state that motivation begins with the desire to satisfy one's fundamental needs, leading to behaviours that the individual believes will result in the satisfaction of such needs. To this extent, rationalisation is a cognitive process of self-justification [33], with fraudsters justifying this crime under their circumstances, whereas [29] give as an example that many will steal from employers but convince themselves mentally that they will pay it back, that it is just a loan, which makes the theft noble. However, there are many excuses that the fraudster can make to commit the crime [39]. explain that to overcome this dissonance, fraud perpetrators often try to find a way to reconcile their unethical cognitions with their core values.

Opportunity is when fraudsters have the knowledge and the opportunity to commit the fraud [33]. According to Ref. [29], the fraudster will commit the fraud once they have a position of trust, know the weaknesses in internal controls, and gain enough knowledge on how to successfully commit the crime. Lastly, the opportunity is largely to realise the undetectable method for perpetrating the fraud [38]. It is also a starting point for designing fraud risk management strategies that address both the perpetrator and the environment where the fraud event occurs [40]. For [41] opportunity factors dealt with accounting and organizational complexity, internal control policies and procedures. Policies that emphasize accountability, transparency, and oversight increase citizens' trust in the government and its officials [42].

In this way, just as [1,43] states "fraud is big business", this statement, as the authors saw earlier, exposes the problem of fraud generating wealth when not detected and not declared, creating a devastating economic problem in society, harming the economy. financial and economic development of a country and consequently hamper the sustainable development of all stakeholders through conflicts of interest. The consequence of conflicts of interest originates problems between two parties, the principal, and the agent. According to Ref. [44] the agency theory identifies problems and solutions in contexts of conflicting interests between the parties. The theory explains the underlying and inevitable problem of conflict of interest in agreements between an agent and the principal [45].

Both parties seek to optimize their personal interests, both the principal and the agent [46]. The main one for being the shareholder and having all kinds of information for monitoring the activities carried out by the agent. The agent, in turn, does not act in accordance with the interests of the principal, but through various factors that have an impact on an individual's decision to commit fraud, as previously verified in the theory of the fraud triangle [47]. refer that both in agency theories and in stakeholder theory. There is great controversy in stakeholder theory [31,48]. states that: "if who the stakeholder is imprecise, it becomes difficult to formulate priorities and rules about which interests count and when they come into play". However, stakeholder theory refers to the fact that it addresses who and what really matters in the development of strategies, measures, and policies to combat fraud. However, to develop strategies and measures to detect and verify fraudulent practices, it is first important to know why fraud is committed.

Detecting, preventing, and deterring fraud requires different types of skills and professional experience, depending on the type of fraud being dealt with. According to Ref. [49], there are more common types of fraud that include tax fraud, forgery, investment fraud, and benefit fraud. Tax fraud refers to illegal tax evasion, from knowingly underreporting taxable income or overstating business deductions to sophisticated international VAT carousel fraud. Another component of tax fraud relates to excise taxes, evaded by smuggling or illegal importation, illegal manufacture, or detour of consumer products, such as alcohol, cigarettes, or fuel [16]. mention that the most popular determinant of tax evasion is the tax burden because the increased tax burden provides a strong incentive to work in the market in an undeclared manner.

The tax evasion is a significant socioeconomic problem in every society in the world, regardless of the type of tax system or the level

of economic development of the country [50] therefore, deception through tax incentives or tax evasion should be analysed in a broader context, as a fundamental spectre of the underground economy. However [51], state that fraud in public companies is greater than fraud in private companies, and the fact that fraud in public companies is greater may make it more likely to be detected by formal means rather than by accident. Auditing resources can be used to detect companies involved in fraud, as well as intermediaries who provide false documents [52].

Counterfeiting is the fraudulent imitation or copying of items with the intent to deceive, such as consumer products, food, pharmaceuticals, technical products like aircraft or automobile parts, artwork, money, or documents. Investment fraud is a result of luring investors into making buying or selling decisions based on false information, often in variations of boiler room schemes, Ponzi schemes, or pyramid schemes, resulting in large losses to victims. Finally, benefit fraud is illegally claiming benefits to which a person is not entitled, such as unemployment benefits, allowances, pensions, or compensation, by providing false information or failing to report changes in circumstances that determine eligibility to receive such benefits.

Regarding the relationship between the underground economy and corruption, according to Ref. [11], the shadow economy and corruption are two closely related and complementary phenomena because the higher the level of corruption, the larger the shadow economy. In this way, those who commit tax fraud become part of the shadow economy. According to Ref. [12], when there is a greater tax burden, the size of the shadow economy may not increase, meaning that there may even be a negative correlation between the size of the shadow economy and the tax burden. Corruption and fraud incorporate a spectrum of illegal payments and transactions, such as bribes, embezzlement, and money laundering, among others [53]. For [54] corruption is considered an international phenomenon, especially in emerging markets with an imperfect legal environment and severe government intervention.

Given the great influence of crimes on both society and the economy, fraud detection mechanisms must be very quick in identifying a fraud as soon as it is perpetrated so that it can be stopped [55]. Therefore, prevention and detection mechanisms are important in combating fraud, confirming the need to invest in fraud prevention and detection. However, according to. the risk of fraud can be mitigated through the implementation of effective detection mechanisms, through robust internal controls, promoting a culture of integrity and openness. In the case of investors, they give importance on fraud risk assessment make greater use of fraud warning signs to avoid fraudulent investments [56]. [57] states that academics and accounting professionals express concern that the current legal system in the United States, in cases of undetected fraud, may effectively penalise auditors for failing to identify and investigate fraud risks [58]. states that Japanese and American companies have been affected by massive corporate scandals involving accounting firms and certified accountants. The differences in frauds in both countries are cultural variations that play an important role in their detection. For [59], it is important to create a strong organizational culture that emphasizes ethical behavior among employees can help prevent fraud, promoting open communication and awareness of fraud, implementing robust organizational structures and guidelines.

In addition to fraud awareness and prevention, it is important to create warning signs for possible fraudulent practices, particularly in financial fraud where fraudulent schemes are incredibly difficult to detect. Fortunately, there are warning signs that analysts and auditors can use to determine the financial stability of a company [60]. [61] argue that real cases of financial fraud have always been detected by auditors through warning signs. However, these warning signs are often ignored by companies that are victims of such fraud. Internal auditors should consider carrying out an alert analysis tailored to the risks and circumstances according to their organization [62]. As [63] states, the availability of warning signs will alert auditors to the likelihood of fraud occurring. Consequently, the risk of fraud not being detected will decrease if auditors understand the warning signs and apply their skepticism in a professional manner.

In the EU, the body that carries out independent administrative investigations into fraud is the European Anti-Fraud Office (OLAF). This body seeks to ensure that EU taxpayers' money goes to projects that can help create jobs and promote growth in Europe. The results of investigations show that between 2010 and 2020 more than 2200 investigations were completed, with a recovery of more than €7.5 billion for the EU budget, and more than 3000 recommendations were issued for judicial, financial, disciplinary, and administrative measures to be taken by the competent authorities of the member states and the EU [64]. On the other hand, in 2020 the European Union Agency for Cooperation in Criminal Justice (Eurojust) registered about 1300 cases where swindle and fraud crimes and 286 corruption cases were involved [49]. The ACFE in its annual report recorded 2504 cases of fraud in 125 different countries. In Europe, 128 cases were identified in western Europe and 95 cases in the remaining countries belonging to Eastern Europe and western central Asia [24].

Several events in the EU over the years have shaped trends in fraudulent practices, influencing fraud patterns and their causes and effects. According to Ref. [65], after the COVID-19 pandemic, there has been an increase in fraud occurring digitally, mainly in cases of collusion, manipulation of procurement procedures, conflicts of interest, inflated invoices, evasion of customs duties, smuggling and counterfeiting. These new forms of fraud have led to new trends in criminal practices and created new challenges in matters of justice. The competent authorities of the member states and the EU, according to Ref. [64] in 2022 of the 256 fraud cases investigated and successfully closed, more than €624 million of EU taxpayers' money was involved, with €426.8 million recovered and a loss of €197.9 million from the EU budget being avoided. This situation highlights a global problem with a severe economic and social impacts.

Bearing in mind that this type of crime is more and more recurrent and that there has been no decrease, this factor is essentially because it is a fertile area for the opportunistic behavior of its perpetrators, as the authors have previously proven through of the fraud triangle. In this sense, based on the agency theory, the authors find that these authors will not act with the best interest and will probably cause problems for the organization [66]. states that the agency's theory stems from assumptions that the agent will behave opportunistically.

The combination of agency theory, stakeholder theory, and the fraud triangle provide a more holistic view of the causes and effects of fraud. The various theories attempt to explain the causes of fraud [67]. state that the theory that primarily concerns itself with the

causes that lead individuals to engage in deceptive and immoral behavior is Cressey's fraud triangle theory. Agency theory and stakeholder theory help identify the different pressures and incentives that managers face [68,69], increasing the understanding of the motivations for fraud. For [70], agency theory is the conflict of interests that can arise between the agent and the principals, as situations of failures in controls and supervision can allow fraud, while stakeholder theory shows how the lack of balance between interests can lead to less controlled environments [71]. states that stakeholder theory proposes that an organization exists not only to maximize shareholder value, but also needs to take into account the positive impact of its actions on other stakeholders in an organization. Thus, the integration of these three theories allows for a more complete understanding of the underlying causes of fraud, addressing both the incentives and pressures that lead to fraudulent behavior and the opportunities and rationalizations that facilitate its occurrence.

Economic variables have a combined effect on fraud [72]. According to Ref. [73], when there is an adverse economic environment, fraudulent activities and crime tend to increase, considering that if people have little money, some will commit a crime so that they can survive. For [12], the unemployment rate has a positive relationship to the shadow economy. Regarding fraud-influencing indicators, the literature showed different views of fraud indicators. For [74], there are five potential indicators of fraud, financial performance indices, financial health indices, management efficiency indices, accounting practices and corporate governance indices.

[72,75] argue that factors considered as influencing corruption and fraud are economic growth, economic freedom, wealth distribution, and inflation. Corruption and fraud, on the other hand, hinder the development of financial and banking markets and therefore influence economic growth [1]. However, according to Ref. [76], countries with a higher GDP are less corrupt than those with a lower GDP, but countries with an average GDP are identified as more corrupt than countries with a lower GDP. For [72], the higher the GDP contribution, the fewer the cases of fraud. Given the above, there are certain factors to be used in this type of analysis. For [77], inflation is a factor that increases the level of corruption and democracy, and political stability are the political factors that have a reducing effect on the level of corruption in these countries. A situation argued by Ref. [10] in which he states that people report higher levels of well-being when their governments perform well [78]. argue that the presence of corruption in the political system and government institutions may be a factor in increasing fraud in financial statements. They state that individuals who are in environments with some limitations on access to education and information may have weaker financial and ethical principles and are more likely to commit fraud, and that social injustice, poverty, financial needs and inequality in the distribution of wealth and resources may encourage individuals to engage in illegal actions and commit fraud [75]. explains that human behaviour is caused by sophisticated relationships between political, judicial, economic, social, and cultural structures. Crime is one of the factors that negatively affect the well-being and sense of security of individuals. Depending on the type of crime, victims may suffer fewer or greater financial, physical, emotional, and psychological consequences, which triggers different levels of emotional intensity [9].

3. Data and variables

In relation with the data, the authors collected key performance indicators (KPI) from 27 countries of the EU: Belgium, Bulgaria, Czechia, Denmark, Germany, Estonia, Ireland, Greece, France, Croatia, Italy, Spain, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, and Sweden. At the time of writing this paper, the population and sample of countries in the EU are the same, so the authors collected all available information. The period chosen for this research was from 2012 to 2020. The time frame began in 2012 due to unavailability of data for the each KPI in the preceding period. Similarly, the year 2020 was chosen due to the lack of more current data for each KPI. The selection of KPI for this research was guided by specific criteria of theoretical relevance, data availability, specificity to fraud specifications and identification of possible causes and effects. Thus, KPI were used to assess and monitor aspects that may indicate the presence of fraud, its causes and effects. This analysis was carried out through a literature review that allowed the selection of KPI that were widely recognized for their effectiveness in analyzing the impact of fraud.

During data collection, some limitations have been found inherent to the extended observation period were encountered. Temporal changes, such as: economic crises, political shifts and the COVID-19 pandemic, led to variations in data quality. Also, data availability issues arose due to incomplete records and were found due to recording failures throughout the period. To this end, imputation

Table 1
Variables and indicators used in the MIMIC model.

Variable	Definition	Source
Causes		
MAF	Measures taken by the Anti-Fraud Office	OLAF
IFUF	Inability to face unexpected financial expenses	Eurostat
IFRE	Investment freedom	Heritage Foundation
EDU	Education	Eurostat
EXP	Total general government expenditure Police service	Eurostat
Effects		
GDP	Real gross domestic product	Eurostat
GC	Gini coefficient	Eurostat
CI	Corruption index	Eurostat
PRR	Property rights	Heritage Foundation
HUM	Human development index	Alldatanow

techniques were employed, such as filling in missing values using the mean, in order to manage missing data and conduct sensitivity analyses to assess the impact of varying data quality. The data collection instruments were pre-tested and validated to ensure accuracy and consistency in the measurements. To identify the hypothesized variables relating to the causes and effects of fraud, an extensive literature review was conducted. It was found that several studies have been conducted using the MIMIC methodology. However, no research has used fraud as a latent variable. Studies have been conducted to estimate corruption and the shadow economy in various parts of the world, such as those by Refs. [11–22,79], and [23]. The variables and indicators used in this research are presented in Table 1.

To select the causal variables of fraud, the authors defined a reflexive measurement model to incorporate various potential indicators of each latent variable. Based on the literature review, the authors defined each variable of the model that refers to fraud (as well as causes and effects) that contributes to its existence and to combat it.

χ_1 *Measures Taken by the Anti-Fraud Office (MAF).* The measures that are being taken by anti-fraud organizations and the various police forces that investigate this type of crime are ways to mitigate possible situations that may lead to fraud crimes. For [51], fraud deterrence refers to the creation of strategies in which people are discouraged from committing fraud. According to Ref. [80], community-oriented policing strategies have positive effects on citizen satisfaction, perceptions of disorder, and police legitimacy. According to Ref. [81], the policy implemented to combat the crime of money laundering prevents criminals from attempting crime behaviours, reducing the crime rate [82]. states that there has been a significant intensification of anti-fraud policy in Europe, as fraud by its nature is difficult to identify [83]. advocate greater use of fraud risk measures and anti-fraud strategies to reduce financial losses. Thus, this causal variable will contribute to verify if the imposed measures influence fraud control in Europe and in which countries.

χ_2 *Inability to Face Unexpected Financial Expenses (IFUF).* IFUF, according to Ref. [84], relates to highly indebted households, which are financially fragile and more likely to default on their commitments. Households may risk an unsustainable level of debt relative to their income [51]. explain that sudden financial deficits can cause a given individual to fall into the temptation to commit fraud. Financial pressure, as verified earlier through the fraud triangle, is a motivation for committing fraud. Therefore, it is possible to verify that unexpected financial difficulties can be a cause to commit the crime of fraud.

χ_3 *Investment Freedom (IFRE).* IFRE is an indicator of the Index of Economic Freedom that an individual or company possesses. According to the Heritage Foundation and the Wall Street Journal, regulations, corruption, bureaucracy, weak infrastructure, and political and security conditions can also affect the freedom that investors have in each market. For [75], economic freedom is inherently linked to the level of government activity in each economy, and the higher the level of freedom, the lower the level of corruption in a country. According to Ref. [19], economic and financial imprecision and macroeconomic volatility lead to the deterioration of a country's fiscal health [14]. mention that governments often interfere in the economy in terms of the regulatory environment and the tax burden imposed on individuals and businesses, and this interference reduces economic and financial freedom. According to Ref. [1], in an economically free society, individuals are free to work, produce, consume, and invest in the way they choose. Thus, the greater the economic and financial freedom, the less fraud and corruption will occur because individuals face more choices in doing business and less bureaucracy.

χ_4 *Education (EDU).* Higher levels of EDU, according to Ref. [4], are beneficial in reducing corruption and fraud, which is justified by the fact that more educated citizens are better able to assess the negative effects of these crimes and have a greater awareness of the public interest. Giving [79], EDU increases society's ability to control government behaviour and judge its performance. For [85], economic development increases the spread of EDU, literacy, and depersonalised relationships, which increase the opportunity for abuse to be perceived and challenged. Thus, a higher percentage of EDU leads to a decrease in fraudulent practices.

χ_5 *Total General Government Expenditure Police Service (EXP).* There are several key aspects that influence the decision on the revenue allocated to police forces. According to Ref. [86], decision making about the types of budgets used by the government is largely derived from criminal justice through different patterns of government spending on services and levels of police force, pointing out that there are several important aspects that substantially depend on socioeconomic factors that make the decision on budgeting revenue given to police forces [87]. point out that the budget allocation that police receive from the government depends on several factors, such as demographic, social, and economic cost. On the other hand, the cost and benefit ratio of investing in highly effective but potentially underutilised methods is important in preventing or generally detecting crime [88]. Thus, the greater the investment in police services, the more likely it is to combat the various types of crime, as in fraud, so the mechanisms to combat fraud need to be intensified [89].

λ_1 *Real Gross Domestic Product (GDP).* GDP per capita is one of the most common factors affecting fraud and, according to Ref. [72], is the variable that should be incorporated into the framework [23]. GDP per capita is the GDP divided by the number of inhabitants of a country. GDP is the sum of all assets in a country, and the higher the GDP, the more it shows how developed that country is. Countries can be classified as poor, rich, or developing. Increased fraud will contribute to poor economic development. Moreover, fraudulent activities tend to increase in an adverse economic environment because in a recession people's incomes decrease, and companies and financial resources to detect and investigate fraud become scarcer due to a lack of revenue [1]. The lower the GDP is, the fewer the possibilities for people to earn money, and they are more likely to be driven to resort to fraud [13].

λ_2 *Gini Coefficient (GC).* The GC was developed to measure wage inequality [4,90]. [91] argues that a GC of zero represents perfect equality, where all citizens share identical income values. On the other hand, a coefficient of 100 indicates the maximum wage inequality, where only one individual receives 100 % of a nation's entire income. According to Ref. [20], most studies confirm the hypothesis that higher wage inequality, expressed as a GC, raises the level of the shadow economy, increasing cases of fraud and corruption in certain countries.

λ_3 *Corruption Index (CI).* This indicator was chosen since, as presented previously in the Fraud Tree, corruption is one of the three

main categories of fraud. In this way, the CI is an indicator that is generated by international transparency and identifies the level of corruption practiced in each country, measuring the perceptions of corruption in the public sector in different countries [92]. According to Ref. [93], this indicator is part of the set of indicators of the EU Sustainable Development Goals and is integrated in the Priorities of the European Commission under the European way of life and European democracy [94]. explain that this indicator has been successfully used by policy makers and academics, as it is often credited as an indicator of corruption levels within countries and closely related to economic growth, foreign direct investment, foreign aid, political accountability, democratic governance, sustainability, and well-being.

λ_4 *Property Rights (PRR).* PRR is an indicator that considers various aspects of the judicial system [5]. According to the Heritage Foundation and the Wall Street Journal, PRR assess the likelihood that private property will be expropriated and analyse the independence of the judiciary, the existence of corruption within the judiciary, and the ability of individuals and companies to enforce contracts [95]. note that there is evidence that intellectual property protection is a significant determinant of economic growth. For [96], evidence shows that PRR are consistently the most important source of corruption, suggesting that anti-corruption efforts should begin with reform of the legal system. Thus, the PRR index may be influenced by the level of fraud committed in different countries.

λ_5 *Human Development Index (HUM).* The HUM is an indicator that measures the levels of social and economic development of various countries [97]. [98] states that the HUM is composed of schooling, years of schooling, average life expectancy, and per capita GDP [99]. finds through his research that corruption reduces the level of human capital and the share of private investment. According to Ref. [100], the results of their research show a high correlation between the HUM and the level of corruption. Thus, the HUM can be influenced by the level of fraud committed in various countries.

The fraud indicators were suitable for this research and were chosen based on the information taken from the literature, where there are sufficient guidelines for the choice of indicators that will allow to estimate the MIMIC model and recover a measure of the latent variable [23].

4. Methodology

In this research, structural equation modelling (SEM) was employed, with the multiple indicators of multiple causes (MIMIC) approach [101]. MIMIC models are a specific type of multivariate regression model in which variables influence each other reciprocally, either directly or through other intermediary variables. These structural equations are designed to represent causal relationships between the variables in the model [102]. SEM provides a general framework that allows for the simultaneous resolution of systems of linear equations and encompasses other techniques such as regression, factor analysis, path analysis, and latent growth curve modeling [103]. This approach enables the analysis of complex research questions that involve multiple factor regression analyzes [104].

The application of this model allows specifying the relationships between observed causal variables and the latent variable [12,13, 23,79]. Thus, this model will confirm the influence of a set of causal variables in confirmatory factor analysis, which, according to Ref. [79], is a theory-based approach to identify the effects of causal variables on the latent variable, in this case fraud, as well as the effects of fraud indicators. For [105] it is an approach that facilitates a more comprehensive understanding of the complex relationships between the variables under investigation and helps to estimate path analyses with multifaceted constructs.

The period chosen for this analysis was from 2012 to 2020. The time started from the year 2012 due to unavailability of data for the variables in the previous period. In turn, 2020 is the last year with all the updated data of the variables used in this research. For the period under analysis, three distinct time groups were established. This serves to balance the presence of missing values with an unbalanced sample size for this research, as [5] used in his research. Thus, the groups are comprised of three time periods: the first group with the period between 2012 and 2015, the second group with the period between 2016 and 2019, and the third group with only the year 2020.

The division of the period was aligned with European political landscape. The years between 2012 and 2015 were years of recovery from the public debt crisis in Europe. Starting in 2016, the European Commission [106] proposed a new Investment Plan for Europe, boosting employment and economic growth. The year 2020 stands alone because it cannot be comparable to another, since it was an atypical year due to the appearance of the COVID-19 pandemic, which caused complications at both a health and economic, financial and social level in all countries of the world.

According to Ref. [64], during the COVID-19 pandemic, individuals changed their habits and began to perform many tasks in their lives digitally, from shopping to communication, and as the world became more digital, fraud also became more digital. Most of the increased fraudulent activities were carried out online and across jurisdictions influenced fraud patterns and their causes and effects.

Between 2012 and 2020, several economic events and regulatory changes impacted fraud levels. The EU faced some challenging economic events, from debt and banking crises to Brexit uncertainty and the COVID-19 pandemic. These events created an environment conducive to increased fraudulent activity. Financial uncertainty, coupled with economic pressures, contributed to an environment in which fraudulent activity could thrive. However, the EU implemented a number of regulatory changes to combat fraud and improve transparency and compliance through directives such as [106]. However, economic pressures and new opportunities for fraud have highlighted the continued need for vigilance and innovation in fraud detection and prevention.

The hypotheses to be analysed are presented through a set of relationships that link variables to causes and effects of fraud, such as.

H1.   Causal variables contribute as causes of fraud

H1.1.   The measures taken by anti-fraud agencies contribute as a cause of fraud

H1.2. The inability to cope with unexpected expenses contribute as a cause of fraud

H1.3. Investment freedom contributes as a cause of fraud

H1.4. Education contributes a cause of fraud

H1.5. Total general government spending on the police service contributes a cause of fraud

H2. Indicators measure the effects of fraud

H2.1. GDP per capita measures the effects of fraud

H2.2. Gini coefficient measures the effects of fraud

H2.3. The corruption index measures the effects of fraud

H2.4. Property rights measure the effects of fraud

H2.5. The human development index measures the effects of fraud

Following [12,13,79], and [16], the MIMIC model consists of two parts: the structural equation model and the measurement model. The structural equation model is represented as follows:

$$\eta = \alpha + \gamma_1 \ \chi_1 + \gamma_2 \ \chi_2 + \gamma_3 \ \chi_3 + \ldots + \varsigma \tag{1}$$

where χ_i is a vector of causal variables, γ_i are the indicators, η is the latent variable, and ς is a structural disturbance term. This assumption is crucial to ensure the quality of the results. In this way, the latent variable is determined by a set of various causes.

The measurement model represents the link between the latent variable and its indicators and is represented as follows:

$$\gamma_1 = \lambda_1\eta + \varepsilon_1, \gamma_2 = \lambda_2\eta + \varepsilon_2, \ldots \gamma_p = \lambda_p\eta + \varepsilon_p \tag{2}$$

where γ_i are indicator variables and λ are the loading factors that represent the magnitude of change expected for a unit change in the latent variable. The ε_i are the errors of the measurement variables.

According to Refs. [16,79], equations (1) and (2) can be summarised as follows:

$$\eta = \acute{\gamma}\varkappa + \varsigma \tag{3}$$

$$\gamma = \lambda_1 + \varepsilon$$

Considering equations (3) and (4), the authors assume that E $(\varsigma\varepsilon') = 0'$ and define E $(\varsigma) = \sigma\hat{~}2$ and E $(\varepsilon\varepsilon') = \Theta\hat{~}2$, where $\Theta(p \times p)$ is a diagonal matrix with the standard deviation of the ε's on its diagonal.

The authors solve the model by inserting equation (3) into (4) as follows:

$$\boldsymbol{\gamma} = \lambda(\acute{\gamma}\varkappa + \varsigma) + \varepsilon = \acute{\Pi}\varkappa + \varkappa \tag{5}$$

where the reduced-form coefficient matrix $\Pi = \gamma\lambda'$ and the reduced-form perturbation vector are v $= \lambda\varsigma + \varepsilon$ with the following covariance matrix:

$$\Sigma = \text{E}\ (\varkappa\acute{\varkappa}) = \text{E}[(\lambda\varsigma + \varepsilon)(\lambda\varsigma + \varepsilon)]\acute{~} = \boldsymbol{\lambda\lambda}\sigma\acute{~}2 + \Theta^2 \tag{6}$$

where $\sigma\hat{~}2$ is the variance of the perturbation of ε. Given that Π in equation (5) is 1 and the error covariance matrix is also constrained, the authors cannot obtain values for all parameters. This situation requires normalising one of the elements of the λ vector to a pre-
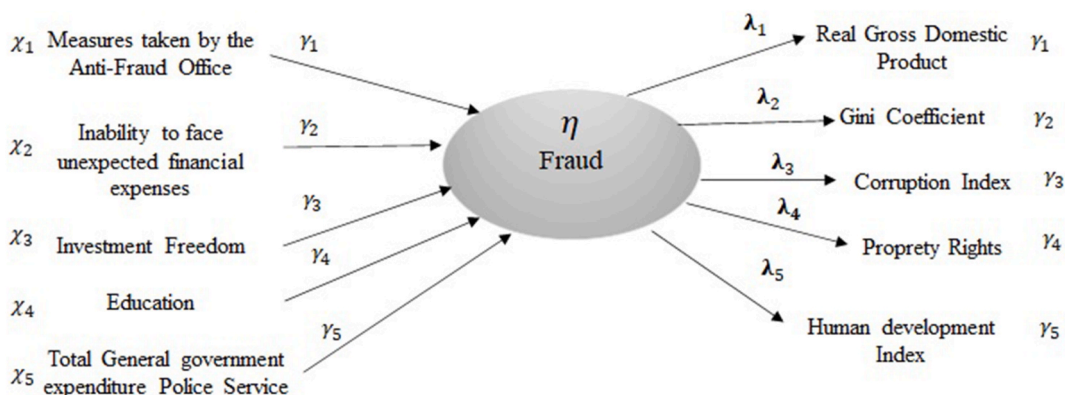

Fig. 1. Structure of the MIMIC model. Source: adaptation from [13:8].

specified value before estimating the reduced form.

Finally, according to Refs. [16,79], assuming normality of equation (6), the model parameters are estimated using the following function:

$$F = \ln|\Sigma(\delta)| + \text{tr}\left\{s\Sigma^{-1}(\delta)\right\} - \ln|S| - \rho \tag{7}$$

Considering equation (7), where S is the sample covariance matrix of observable variables, $\Sigma^{\wedge}(-1)$ is the estimated population covariance matrix, and ρ is the number of measured variables. Fig. 1 shows the general structure of the MIMIC model.

Following the model of [16,79], the first step is to confirm the hypothesized relationships between the latent variables and their causes. After identifying and estimating these relationships and parameters, results of this model are used to calculate the latent variable scores to estimate the value of fraud.

5. Results and discussion

Following the validation of the exploratory factor analysis model, which, as outlined by Ref. [107], enables the determination of underlying dimensions within a dataset, the collected data underwent structural equation modelling to estimate the previously identified impacts and consequences. The model depicted in Fig. 2 was tailored to the variables under scrutiny, employing structural equation analysis via AMOS 26.0 software.

As a research hypothesis, it was assumed that the proposed model explains the existing relationships between the impacts of fraud, C1 and C2, as shown in Fig. 2. The variables C1 and C2 are the fraud impacts, called "effects of fraud" and "causes of fraud", and correspond to the latent variable fraud with a causal dependency between them that corresponds to the fraud impacts, reviewed by the fraud triangle through its characteristics. The variable C1 "Effects of fraud" is determined by the weighted sum of the variables arising from fraud: "Real gross domestic product (GDP)", "Gini coefficient (GC)", "Corruption index (CI)", "Property rights (PRR)", and "Human development index (HUM)". The variable C2 "Causes of fraud" is determined by the weighted sum of the variables estimating fraud: "Measures taken by the Anti-Fraud Office (MAF)", "Inability to face unexpected financial expenses (IFUF)", "Investment freedom (IFRE)", "Education (EDU)", and "Total general government expenditure police service (EXP)".

The empirical results of this research provided sustainable evidence to simultaneously consider acceptable the effects of fraud (C1) and the causes of fraud (C2). Furthermore, the effects of fraud are influenced by the causes of fraud, leading to a causal dependence between them. The criteria used in the definition of the final model were based on the establishment and elimination of relationships between variables that would lead to a better quality of the adjustment. In accordance with the theoretical foundations studied, this adjustment must be made by the analysis of the goodness of fit measures and the modification indices.

Table 2 presents the maximum likelihood estimates related to the structural coefficients for the adjusted model with information regarding the standardised and non-standardised factor loadings, the standard error associated with each coefficient, and the critical ratio (ratio between the factor loading and its standard error, its value being considered significant when greater than 1.96 or less than −1.96) for the adjusted model [108].

The results of the maximum likelihood estimates related to the structural coefficients for the adjusted model show the existence of
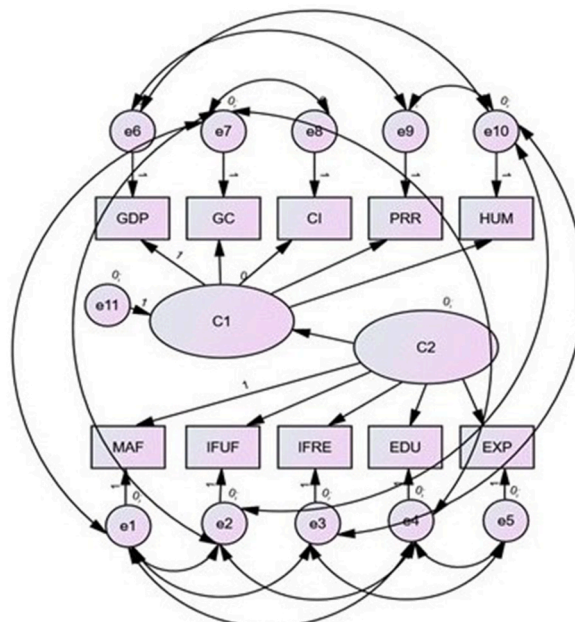

Fig. 2. Conceptual model of the relationships between causes and effects of fraud.

Table 2

Maximum likelihood estimates related to the structural coefficients for the adjusted model.

	Estimate	Standardised Estimates	SE	CR	P-value
C1 <— C2	−5.740	−1.002	1.111	−5.165	***
GDP < — C1	1.000	.760			
GC < — C1	−.041	−.308	.009	−4.732	***
CI < — C1	.370	.851	.027	13.650	***
PRR < — C1	.434	.916	.034	12.890	***
HUM < — C1	.001	.788	.000	11.514	***
MAF < — C2	1.000	.339			
IFUF < — C2	1.621	.686	.325	4.983	***
IFRE < — C2	−1.104	−.721	.220	−5.012	***
EDU < — C2	−.952	−.648	.167	−5.697	***
EXP < — C2	.034	.704	.007	5.177	***

statistically significant relationships between all the variables under research. Thus, the p-value or probability of rejecting the null hypothesis is lower than the significance level of .05 (5 %) previously set [109]. When the authors analysed the magnitude of structural coefficients, the following relationships stood out.

- Effects of fraud and corruption index (C1CI) - Corruption is one of the predominant categories of fraud and is directly related to the sustainable development of each country;
- Effects of fraud and property rights (C1PRR) - PRR were consistently the most important source of corruption and a significant determinant of economic growth;
- Effects of fraud and human development index (C1HUM) - The HUM can be influenced by the level of fraud committed in various countries across levels of social and economic development;
- Causes of fraud and inability to cope with unexpected financial expenses (C2IFUF) - Financial pressure is one of the characteristics of committing fraud and is implicit in its origin through the fraud triangle. It is considered a motivation for committing fraud. However, unexpected financial hardship is considered one of the possible causes for committing fraud.
- Causes of fraud and total general government expenditure police service (C2EXP) - The greater the investment in police services, the more likely it is to combat the various types of crimes and thus reduce and combat the commission of fraud.

The results of the adjusted estimates as verified in Table 2 reveal that five research hypotheses have been confirmed. The estimated hypotheses of the relationships between the impacts of fraud reveal that the inability to cope with unexpected expenses contributes as an impact of fraud (H1.2), and the total expenditure of the general government on the police service (H1.5) also contributes as a fraud impact. Regarding the hypotheses of certain indicators causing fraud effects, it is found that CI measures fraud effects (H2.3), PRR measure fraud effects (H2.4), and the HUM measures fraud effects (H2.5).

Thus, the remaining hypotheses — measures taken by anti-fraud agencies contribute as an impact of fraud (H1.1), freedom of investment contributes as an impact of fraud (H1.3), EDU contributes as an impact of fraud (H1.4), GDP per capita measures the effects of fraud (H2.1), and GC measures the effects of fraud — do not justify the relationship of the variables under research. Table 3 presents the information regarding the adjustment quality indices obtained, indicating a quite satisfactory adjustment quality.

According to Ref. [110], the root means square error of approximation (RMSEA), comparative fit index (CFI), and Tucker–Lewis index (TLI) measure values are based on a specific fit function for a chosen estimation method. According to Ref. [111], when the value is smaller than .05, it is considered that the model fits adequately. Thus, the RMSEA measurement value is .067, which indicates a very good fit. The value of the CFI is .984, and being a value greater than .95, it is considered that the model fits adequately. Regarding the TLI [110], explain that this indicator should be greater than .90 for an acceptable adjustment. In this case, given that the TLI is .963, the model is acceptable and fits adequately. The value of the chi-square statistic, which also measures the overall goodness of fit of the model, obtained the value of 39.925 for 19 degrees of freedom, which also allows us to conclude that the fit is adequate.

Regarding the analysis of fraud and its impacts in the EU, a descriptive statistical analysis was performed. This analysis reduces the data into a smaller number, allowing to make sense of the results obtained by providing a useful strategy to summarise data and provide a description of the sample [112].

The significance between the period under analysis and according to variables of the impact of fraud showed the following.

Table 3

Quality of adjustment indices.

N	243
Qui-squared	39.925; gl = 19
Comparative fit index	.984
Root mean square error of approximation	.067
Tucker–Lewis index	.963

- The variable "Investment freedom (IFRE)" showed a significant value of .936, with a temporal space that shows a lower value in the period from 2016 to 2019, followed by the year 2020 and the period from 2012 to 2015. This demonstrates that from 2016 to 2019, there was less IFRE, causing a possible increase in fraudulent practices in this period;
- The variable "Total general government expenditure police service (EXP)" showed a significant value of .972. However, the temporal space with a lower value is in the period from 2012 to 2015, followed by 2016–2019 and 2020. Thus, it can be seen that from 2016 onwards there was a greater EXP, meaning that the fight against fraud intensified from that period onwards;
- The variable "Real gross domestic product (GDP)" showed a significant value of .874. However, the temporal space with a lower value is in the period from 2012 to 2015, followed by 2020 and 2016 to 2019. As we saw earlier, the lower the GDP is, the fewer possibilities people must earn money, and they are more likely to be led to resort to fraud. In this sense, the period from 2012 to 2015 was the period in which this situation occurred;
- The variable "Gini coefficient (GC)" presented a significant value of .713. The temporal space that presents a lower value is in the period from 2012 to 2015, followed by 2016–2019 and 2020. This demonstrates that between 2012 and 2015 there was higher wage inequality, expressed as the GC raising the level of the shadow economy, increasing the cases of fraud in this period;
- The variable "Corruption index (CI)" presented a significant value of .990. The temporal space that presents a lower value is the period from 2016 to 2019, followed by 2020 and 2012 to 2015. Thus, since this is a corruption level index, it can be seen that 2012 to 2015 were the years in which there was a higher percentage of corruption and, in turn, fraud;
- The variable "Property rights index (PRR)" presented a significant value of .185. However, the time frame with the lowest value is the year 2020, followed by 2016–2019 and 2012 to 2015. Thus, the PRR index can be influenced by the level of fraud committed in the various countries. It was also found that 2012 to 2015 were the years in which there was a higher percentage of fraud.

Based on the data collection and the literature review, it was possible to state that the causal variables contribute as causes of fraud through the following.

- **The measures taken by anti-fraud agencies are a cause of fraud** (H1.1) that negatively influences the fraudulent practices. These measures, strategies and policies applied by anti-fraud agencies are aimed at preventing the non-occurrence of situations that may give rise to fraud crimes as well as punishing those who commit them;
- **The inability to cope with unexpected expenses contribute as a cause of fraud** (H1.2) that positively influences the fraudulent practices. It is possible to determine the inability to deal with unexpected expenses creates financial pressure, which is a common characteristic of the fraudulent behavior;
- **Investment freedom contributes as a cause of fraud** (H1.3) that negatively influences the fraudulent practices. In this sense, the greater economic and financial freedom reduces the likelihood of less fraud and corruption, as citizens have more legitimate choices available when conducting business;
- **Education contributes as a cause of fraud** (H1.4), which may be either a contributing or non-contributing cause of fraud. On one hand, citizens in environments with limited access to education and information may have weaker financial and ethical principles, making them more likely to commit fraud. On the other hand, citizens with a higher level of education are able to assess the negative effects of such crimes and have a greater awareness of the public interest;
- **Total general government spending on the police service contributes as a cause of fraud** (H1.5) that negatively influences the occurrence of fraud, in which the greater the investment in police services, the greater the likelihood of combating various types of crimes, such as fraud.

Regarding the indicators that measure the effects of fraud, the following findings were obtained through the data collection and the literature review.

- **GDP per capita measures the effects of fraud** (H2.1) by reflecting the influence that exists on the economic and financial development of each country. As previously discussed, countries with a higher GDP tend to have fewer cases of fraud compared to countries with a lower GDP, where there is less investment in the economy and, consequently, increase level of financial pressure, and a higher likelihood of fraudulent activities.
- **Gini coefficient measures the effects of fraud** (H2.2) by assessing wage inequality within each country. In situations where there is greater wage inequality is associated with a higher likelihood of an expanding level of the shadow economy and consequently an increase in the number of cases of fraud;
- **The corruption index measures the effects of fraud** (H2.3), by serving as an indicator generated by the International Transparency that identifies the level of corruption practiced in each country;
- **Property rights measure the effects of fraud** (H2.4) because they consistently represent a significant source of corruption. So, it is possible to identify the influence of fraud committed in different countries through the status of property rights;
- **The human development index measures the effects of fraud** (H2.5) as it is an indicator that assesses the levels of social and economic development across various countries. In turn, there is a relationship between countries with a low social and economic level and the high incidence of the number of cases of fraud and corruption.

This research demonstrates through the causes and effects of fraud that it is essential to create measures, strategies and policies applied by anti-fraud agencies with the aim of influencing the non-occurrence of situations that may give rise to fraud crimes as well as punishing those who commit them, as well as ensuring greater investment in police services and anti-fraud organizations and

implementing educational training creating greater awareness of the public interest and awareness of the impacts of fraud on society. As well as developing measures that provide an increase in economic and financial development contributing to a greater balance in the population's salary inequality and in turn contributing to the reduction of corruption and fraud levels.

According to previous research [15], demonstrate that tax efficiency is becoming a growing necessity and is considered a very important factor in terms of the shadow economy, bringing significant consequences for the economic order [22]. states that the activities of the shadow economy affect the activities of the formal economy and that the main causes of the shadow economy are the unemployment rate and subsidies granted to companies [4]. emphasize that education and public investment are key factors in reducing corruption.

According to Ref. [5], in a global context, the most relevant global determinants of corruption include the Quality of the Judiciary System, Quality of Regulation, Freedom of the Media, Quality of Democracy, Education and "Fractionation of society". In turn, the important causes of corruption are identified as colonial heritage, religious affiliation, Size of the public sector, Natural resources and Oil revenue. It is therefore possible to state that this investigation is in line with existing research and that the problems of the dangers of fraud, corruption and the underground economy are persistent and visible worldwide.

In this line and to analyse the impact of fraud throughout the EU, between 2012 and 2020, there was a need to demonstrate, through Table 4, the descriptive statistics of each variable of the model for each EU country.

Table 4 presents the descriptive statistics related with several variables across 27 European Union countries comparing them under the period under analysis, with focus to explain the fraud impact. From the statistical analysis perspective, some variables present a homogeneous dispersion, but others show greater dispersion of data, such as: Measures taken by the Anti-Fraud Office, Corruption index, Inability to face unexpected financial expenses, Real gross domestic product, and Property rights and the other variables. The countries that present these results are Belgium, Bulgaria, Germany, Ireland, Croatia, Italy, Latvia, Hungary, Austria, Poland, Portugal, Romania, and Slovenia.

It was found that the variable Corruption Index (CI) has the lowest impact in Finland. This situation is because the corruption index is a composite index, and the results are a combination of corruption analysis sources developed by other independent organizations. It is ranked from 0 (perceived as very corrupt) to 100 (very transparent), showing that Finland has highest transparent level with less corruption. As for the Measures taken by the Anti-Fraud Office (MAF) variable, the country with the highest value of anti-fraud measures is Romania, reflecting its position in the EU due to the economic indicators lower than the median values of EU. The country with the largest value of Inability to face unexpected financial expenses (IFUF) is Hungary. As previously seen, financial fragility is a source of financial instability that can lead to fraudulent practices. Bulgaria is the country with the highest Gini coefficient (GC) index. Therefore, it has a higher level of wage inequality. The country with the highest real gross domestic product (GDP) is Luxembourg and it presents the greatest investment, as we saw previously, countries with a higher GDP are less corrupt. The country that stands out in the Human development index (HUM) is Ireland, means that it presents a higher level of a long and healthy life and has access to resources for a standard of well-living and cultural enrichment. The highest value of the Investment freedom (IFRE) is Luxembourg, because it has the greatest economic freedom and the quality of life. As the authors have previously verified, the educational level is an important indicator to classify people and reflects the lifestyles and cultural values of socioeconomic groups, the analysis carried out verifies that the country with the highest level of Education (EDU) is Finland. The country with the greatest impact on the Property rights (PRR) variable is Denmark, this indicator is important to evaluate the effects on economic inequality and economic results. Finally, the country with the highest Total general government expenditure Police service (EXP) is Greece, which means they invest more in police forces and have better police performance. This statistical analysis applied to each country listed in Table 4 provide a detailed perspective across different variables.

6. Conclusion

The impact of fraud on society enables us to analyse causes and effects of fraud across 27 EU countries, during 2012 and 2020, using a conceptual model, estimating two latent constructs with causal interdependence between them. The significance of identifying the causes and effects of fraud facilitates, on the one hand, the enhancement of social and economic stability for both society and citizens. On the other hand, it aids in promoting sustainable development for all stakeholders by implementing effective public policy measures of transparency, integrity, justice, and security to mitigate fraud and enhance the safety and well-being of citizens.

The methodology employed, utilizing structural equation modelling, demonstrated potential as tool for modelling and integrating variables, as highlighted by Collier (1995) in his research. Consequently, the empirical findings of this research offer sustainable evidence regarding the types of fraud, facilitating the simultaneous consideration of both its effects and causes. Through this research, the authors discovered that the effects of fraud are influenced by its causes, establishing a causal dependence between them, as identified in the MIMIC model.

The results of the MIMIC model indicate that five research hypotheses have been confirmed. The significant correlation observed between variables and indicators enables the assessment of both the causes and effects of fraud in the EU. On one hand, variables IFUF and EXP contribute to the occurrence of fraud, while on the other hand, variables PRR and HUM gauge the effects of fraud. Obtaining these results confirms the existing literature. The findings suggest that financial difficulties elevate both the probability and frequency of fraudulent activities. Additionally, the absence of mechanisms to combat fraud, stemming from diminished investments in police forces, contributes to the proliferation of fraudulent practices. Regarding the effects of fraud, the results highlight that safeguarding intellectual property is considered an outcome of fraud, given its significant role in fostering economic growth. Moreover, the Human Development Index is also identified as an effect of fraud; an increase in fraudulent activities diminishes the level of human capital and private investment, thereby impacting the social and economic development of a country.

Table 4
Descriptive statistics on the impact of fraud in 27 EU countries.

		CI	MAF	IFUF	GC	GDP	HUM	IFRE	EDU	PRR	EXP			CI	MAF	IFUF	GC	GDP	HUM	IFRE	EDU	PRR	EXP
Belgium	MEDIAN	75	23	25,2	25,9	120	0,92	85	37,5	80	1	Lithuania	MEDIAN	59	6	53,2	35,4	76	0,867	80	40	65	0,5
	MIN	75	7	23,3	25,1	118	0,91	80	35,3	80	1		MIN	54	0	41,8	32	71	0,841	70	34	60	0,5
	MAX	77	45	26	26,5	121	0,93	85	42,4	84,5	1,1		MAX	60	9	60,4	37,9	87	0,891	80	44	77,9	0,6
	ST DEV.	0,87	14,7	0,9	0,44	1,41	0,01	2,2	2,57	1,68	0,05		ST DEV.	1,76	2,62	5,25	1,75	4,82	0,02	3,14	3,26	7,03	0,03
Bulgaria	MEDIAN	42	22	53,2	37,7	49	0,92	65	27,7	30	1,3	Luxembourg	MEDIAN	81	5	22,5	29,6	277	0,908	95	43	90	0,5
	MIN	41	4	32,1	33,6	46	0,8	55	24	30	1,1		MIN	80	0	16,7	28	254	0,9	95	39	82,7	0,4
	MAX	44	45	64,1	40,8	55	0,93	70	29,2	64,2	1,4		MAX	85	10	24,8	32,3	283	0,916	95	47	90	0,5
	ST DEV.	1,05	13,1	8,25	1,85	2,66	0,04	5,15	0,64	16,44	0,11		ST DEV.	1,55	3,10	2,39	1,38	9,69	0,01	0,00	2,91	2,96	0,03
Czechia	MEDIAN	55	7	32,1	24,6	89	0,89	80	23	73	0,9	Hungary	MEDIAN	48	15	50,8	28,2	69	0,843	75	24	60,1	1,3
	MIN	48	0	19,6	24	84	0,87	70	19,3	70	0,8		MIN	44	4	31,5	27,2	67	0,831	75	22	45	1,1
	MAX	59	9	42,4	25,1	93	0,9	80	24,9	76,8	1		MAX	55	22	75,9	28,7	74	0,854	80	27	65	1,4
	ST DEV.	3,54	2,67	8,41	0,43	3,09	0,01	4,16	1,8	2,57	0,07		ST DEV.	4,29	5,55	####	0,41	2,16	0,01	2,36	1,52	6,01	0,12
Denmark	MEDIAN	90	3	25,2	25,9	129	0,94	90	37,8	90	0,5	Malta	MEDIAN	55	5	20,8	28,1	97	0,883	85	22	70,5	0,7
	MIN	87	0	22,7	26,5	127	0,93	85	34,6	84,8	0,5		MIN	53	0	13,9	27,1	87	0,86	80	18	67,7	0,6
	MAX	92	5	28,5	27,8	135	0,94	90	40,6	95	0,6		MAX	60	6	25	30,3	103	0,895	85	31	75	0,8
	ST DEV.	1,64	1,66	1,87	0,42	2,21	0,00	2,08	2,14	3,53	0,04		ST DEV.	1,95	2,18	4,08	0,84	5,36	0,01	2,08	4,08	2,99	0,07
Germany	MEDIAN	80	19	30,4	29,7	124	0,94	85	28,3	90	0,7	Netherlands	MEDIAN	83	10	22	26,8	131	0,935	90	36	90	0,8
	MIN	78	9	26	28,3	121	0,93	80	0	79,9	0,7		MIN	82	4	19,1	25,1	128	0,928	90	33	87,4	0,8
	MAX	81	76	37,9	34,4	127	0,95	90	29,9	90	0,8		MAX	84	16	23,7	28,2	137	0,944	90	43	90	0,8
	ST DEV.	0,99	18,70	3,28	1,65	1,52	0,00	4,37	8,97	4,50	0,05		ST DEV.	0,79	4,40	1,34	0,91	3,06	0,01	0,00	2,99	1,06	0,05
Estonia	MEDIAN	70	2	36,3	32,5	78	0,88	90	38,9	85	1	Austria	MEDIAN	58	5	22,2	29,7	91	0,916	90	31	90	0,7
	MIN	64	0	30,5	30,5	74	0,87	90	37,4	80,4	0,9		MIN	46	2	17,6	28,5	65	0,905	85	20	83,5	0,7
	MAX	75	3	44,7	35,6	84	0,89	90	42,3	90	1,1		MAX	81	23	23,9	36,9	262	0,922	90	34	90	0,7
	ST DEV.	3,17	0,94	4,62	1,75	3,06	0,01	0,00	1,77	3,60	0,07		ST DEV.	####	7,36	2,05	3,04	57,30	0,01	2,08	5,14	2,56	0,00
Ireland	MEDIAN	73	2	45,2	29,7	181	0,94	90	45,1	87,7	0,6	Poland	MEDIAN	64	8	37,9	27	87	0,866	75	29	60,8	1,1
	MIN	69	0	35,6	28,3	133	0,91	90	40,8	85	0,5		MIN	47	1	25,7	20,9	66	0,842	65	25	60	1,1
	MAX	75	3	56,4	31	209	0,96	90	49,9	90	0,8		MAX	85	84	54,1	35,1	129	0,88	80	33	65	1,3
	ST DEV.	1,66	1,17	7,83	0,92	####	0,01	0,00	2,61	2,02	0,12		ST DEV.	####	24,64	9,46	3,98	24,76	0,01	5,33	2,68	1,67	0,08
Greece	MEDIAN	45	12	50,4	34,2	68	0,88	90	30,2	40	1,4	Portugal	MEDIAN	63	7	36,9	33,5	77	0,855	70	24	70	1
	MIN	36	9	40,5	31	62	0,87	55	26,1	40	1,2		MIN	61	4	30,8	25,1	76	0,836	70	19	69,2	0,9
	MAX	50	23	53,6	34,5	72	0,89	65	32,7	57	1,5		MAX	75	10	43,2	34,5	118	0,864	70	28	75,4	1,2
	ST DEV.	4,11	5,59	3,92	1,36	3,15	0,01	3,69	2,13	6,86	0,10		ST DEV.	4,01	2,10	4,26	2,80	12,84	0,01	0,00	2,95	1,92	0,10
Spain	MEDIAN	59	19	38,7	34,1	91	0,9	85	35,7	70	1,2	Romania	MEDIAN	44	74	52,5	34,7	60	0,818	75	17	40	1,1
	MIN	57	4	33,9	32,1	84	0,88	80	32,6	70	1,1		MIN	43	14	44,3	33,1	54	0,803	70	15	35	0,9
	MAX	65	33	42,7	34,7	93	0,91	85	39,7	74,9	1,3		MAX	48	100		37,4	72	0,828	80	19	72,5	1,2
	ST DEV.	2,47	9,40	3,10	0,82	2,40	0,01	2,36	2,15	1,74	0,09		ST DEV.	1,93	28,99	3,55	1,13	6,27	0,01	3,93	1,16	13,80	0,09
France	MEDIAN	70	8	31,8	29,2	106	0,89	70	34,6	80	0,9	Slovenia	MEDIAN	60	1	41,7	23,9	84	0,897	70	31	60	0,8
	MIN	69	3	29,6	28,5	104	0,84	65	30,7	80	0,9		MIN	57	0	29,6	23,4	83	0,884	70	26	40	0,7
	MAX	72	24	34	30,5	110	0,9	75	39,7	85,9	0,9		MAX	61	9	45,8	25	89	0,917	70	36	76,6	0,9
	ST DEV.	1,05	7,56	1,42	0,58	2,00	0,02	3,69	2,71	2,32	0,05		ST DEV.	1,31	2,67	5,97	0,51	2,28	0,01	0,00	2,81	13,23	0,05
Croatia	MEDIAN	48	1	57,7	29,9	62	0,84	75	23	40	1,2	Slovakia	MEDIAN	50	10	36,1	23,7	73	0,853	75	22	60	1
	MIN	46	0	48,9	28,3	60	0,83	75	18,5	35	1,2		MIN	46	4	26,1	20,9	69	0,843	75	19	50	0,9
	MAX	51	26	67,4	30,9	66	0,88	80	25,4	69,9	1,4		MAX	51	17	39,5	26,1	78	0,86	80	27	73,1	1,1
	ST DEV.	1,37	7,90	6,02	0,78	2,00	0,02	2,08	2,34	13,96	0,07		ST DEV.	1,63	3,59	4,26	1,68	3,69	0,01	2,08	2,58	8,71	0,06
Italy	MEDIAN	47	33	38,8	32,7	98	0,88	85	17,7	55	1,1	Finland	MEDIAN	89	1	27,5	25,6	111	0,934	85	43	90	0,5
	MIN	42	13	0		94	0,87	85	15,8	50	1,1		MIN	85	0	25,4	25,2	109	0,921	85	40	89	0,5
	MAX	53	71	42,1	33,4	104	0,89	85	20,1	75,4	1,2		MAX	90	4	29,4	26,5	117	0,938	90	48	92,3	0,6
	ST DEV.	4,35	20,86	12,37	10,30	2,74	0,01	2,36	1,41	11,21	0,03		ST DEV.	2,11	1,40	1,12	0,42	2,31	0,00	2,48	2,36	0,85	0,04
Cyprus	MEDIAN	59	3	50,5	31,1	88	0,87	75	41,9	70	1,3	Sweden	MEDIAN	87	2	20,4	26,9	124	0,939	85	41	90	0,6

Table 4 (*continued*)

		CI	MAF	IFUF	GC	GDP	HUM	IFRE	EDU	PRR	EXP		CI	MAF	IFUF	GC	GDP	HUM	IFRE	EDU	PRR	EXP
	MIN	55	0	44,6	29,1	81	0,85	65	39,3	70	1,3	MIN	84	0	19,7	26	119	0,914	85	36	88,6	0,6
	MAX	66	4	60,5	34,8	92	0,89	75	44,9	77,4	1,7	MAX	89	4	21	28	130	0,945	90	45	92,6	0,6
	ST DEV.	3,38	1,69	5,20	1,76	3,74	0,01	3,33	2,11	2,63	0,13	ST DEV.	1,83	1,45	0,44	0,65	3,65	0,01	2,48	2,93	1,07	0,00
Latvia	MEDIAN	56	2	60	35,2	66	0,85	85	33,4	50	1,2											
	MIN	49	0	45,6	34,5	61	0,83	75	29,2	50	1											
	MAX	58	5	73,6	35,7	70	0,86	85	37,8	72,6	1,3											
	ST DEV.	2,71	1,64	8,59	0,47	2,87	0,01	3,42	2,59	10,12	0,12											

According to the analysis of causes and effects of fraud, from 2012 to 2020, the model reveals the following trends.

- From 2012 to 2015: Lower GDP, reduced earning opportunities for individuals, increased wage inequality, higher corruption levels, leading to an escalation in the shadow economy and a rise in fraud cases during this period.
- From 2016 to 2019: Decreased investment freedom, potentially contributing to a surge in fraudulent activities during this timeframe.
- In 2020: Increased investment in police services, indicating heightened efforts to combat fraud during this year.

Overall, all three periods analysed present factors conducive to fraudulent practices, such as wage inequality and restricted investment freedom, leading to an upsurge in fraudulent activities and an expansion of the parallel economy. These trends have negative repercussions on society, the economy, and individuals, thereby impeding social, economic, and sustainable development.

This research presents some significant contributions to the existing literature and its practical applications. Firstly, it addresses an important gap in the research of the effects of fraud and its impact on the society, the economy and sustainable development. This standardization of fraud causes and effects facilitates future comparative research and provides a robust foundation for subsequent analyses.

Furthermore, the research offers new insights through the framework of the agency theory, the stakeholder theory and the fraud triangle, providing valuable information on the dynamics of fraudulent behaviour and its consequences. This analysis contributes to the theoretical debate by providing empirical evidence that highlights the importance of these contextual variables.

Our research highlights the importance of combating poverty, increasing infrastructure resilience, promoting safe cities and facilitating access to essential knowledge and skills through public policy strategies aimed at promoting social well-being. Furthermore, effective and efficient measures to combat fraud, ensuring an equitable distribution of wealth and imposing sanctions on individuals convicted of fraudulent practices are crucial.

The results of this research have several practical applications. Firstly, they provide a basis for developing more effective public policies. Insights into the influence of legal systems can help policymakers develop anti-fraud strategies tailored to the specific legal contexts of each country.

Additionally, the findings can be used to improve existing fraud prevention and detection mechanisms. Identifying effective practices in different cultural and legal contexts can inform the development of more effective strategies across the EU.

Decisively, the standardized set of fraud indicators developed in the research can be adopted by international and national organizations to more accurately monitor and to compare the prevalence of fraud, considering its causes and effects. This standardization facilitates the implementation of evidence-based policies and practices.

Consequently, the practical implications of this research contribute to a nuanced view of the types of procedures used and the ways in which they can be carried out in fraud detection. These findings have important implications for combating fraud in organizations and the European Union economy and require effective measures for stakeholders to mitigate fraud. The findings have practical implications for stakeholders and for the implementation of several nuanced policies, such as the creation of specialized units to combat fraud and improve ongoing training of staff in modern fraud detection techniques; strengthening regulatory agencies with more resources and training in modern fraud detection technologies; and encouraging the adoption of codes of conduct and governance practices that promote transparency and ethics within organizations.

These findings serve as a guide for professionals and researchers to critically approach the development of measures to mitigate fraud and enhance citizen safety and well-being. While the causes and effects of fraud in the EU have been identified, there remains a need to further explore its impact on the economy and sustainable development, particularly considering ongoing technological advancements. Moreover, our research contributes to fostering critical discussions on how understanding the causes and effects of fraud can promote social and economic stability for both society and individuals. By identifying various types of fraudulent behavior through theories such as the fraud triangle theory, agency theory, and stakeholder analysis, our findings pave the way for enhancing social growth and the sustainable development of countries.

The combination of the agency theory, the stakeholder theory, and the fraud triangle provides a more comprehensive and robust multidisciplinary view than any of these theories identified individually. This integration can uncover complex interactions between incentives, pressures, and rationalizations that might not be apparent when examining a single theory in isolation. This approach can identify new patterns of rationalisation and broaden the understanding of the psychological and social factors involved in fraud, as well as highlight new risk factors that are not typically considered. For example, the interaction between stakeholder expectations and the opportunities created by internal control failures can be considered as a new angle for future analysis. By emphasizing these points, this research not only deepens the understanding of the causes and effects of fraud, but also establishes a solid foundation for future research, thereby promoting both theoretical and practical advances in the field of fraud prevention and detection.

The implications of this research extend to the prevention of fraud within organizations and the European economy, elucidating the causes and effects of fraudulent practices. Consequently, this research highlights the global impact of fraud on societies and economies, underscoring its detrimental effects on economic and financial resources. The authors advocate for the establishment of effective public policy measures to address issues stemming from fraudulent practices. This includes recognizing that the allure of fraud persists due to opportunistic behaviors and various societal inequalities. Additionally, addressing factors such as inadequate investment in police services is imperative for enhancing mechanisms to combat fraud and promoting citizen security and well-being.

7. Limitations and further research

The limitations of this research primarily concern the comparability analysis of fraud across EU countries. The prevalence of fraud varies between countries, as highlighted by the authors, due to several indicators. Additionally, cultural, and legal factors unique to each country influence not only how fraud is addressed but also the effectiveness of mechanisms for identifying and mitigating fraud in Europe. Through this research, the authors identified a scarcity of researchers and case studies focusing on fraud, particularly regarding its causes and effects. Furthermore, there is a pressing need for more evidence-based research to gain a comprehensive understanding of the true impact of fraud across all sectors—society, the economy, public and private organizations, and citizen well-being. This would enable the identification of effective and efficient measures to combat fraud.

This research identified some limitations that open up promising avenues for future research. First, the creation and validation of standardized indicators for comparing fraud prevalence across EU countries is essential to overcome the difficulty of direct comparison caused by the variation in indicators used. Collaborative studies and harmonization efforts across countries could significantly contribute to this area.

This research identifies some limitations that open up promising avenues for future research. First, the creation and the validation of standardized indicators for comparing fraud prevalence across EU countries is essential to overcome the difficulty of direct comparison caused by the variation in indicators used. Collaborative studies and harmonization efforts across countries could significantly contribute to this area.

In addition, the influence of cultural factors on the perception, approach and mitigation of fraud needs further investigation. Studies that correlate specific cultural values with the prevalence and treatment of fraud could provide valuable insights and guide cultural and educational policies. Another critical area is the analysis of the impact of different legal systems on the effectiveness of anti-fraud mechanisms. Comparative studies across different legal systems can reveal which practices and policies are most effective in different contexts.

Decisively, there is an urgent need for detailed case studies on fraud in specific sectors, in the public and private organizations, in the society, in the economy and in the well-being of citizens themselves. Such studies could provide a more granular understanding of the causes and effects of fraud, as well as the impacts caused by them.

Finally, conducting evidence-based research to quantify the impact of fraud across all sectors is crucial. Statistical and econometric analyses that quantify the direct and indirect costs of fraud are needed to inform more effective policies and mitigation strategies. These areas of future research will not only address the limitations identified in this research but will also contribute to a more comprehensive and detailed understanding of the fraud phenomenon in the European Union.

As further research and based on results obtained through the MIMIC model, this research shows opportunities for further development regarding a more detailed analysis of each country of the EU. Therefore, conducting a detailed analysis of each EU country using the MIMIC model can provide valuable insights into the causes and effects of complex fraud and corruption phenomena. Given that EU countries vary widely in terms of economic development, tax systems, corruption levels, and business cultures, the diversity of legal and administrative systems across countries can influence the indicators and causes modeled. However, it is crucial to be aware of the associated differentiated challenges and data requirements. Addressing these challenges in a strategic and systematic manner will allow the research to contribute significantly to the existing body of knowledge and open new avenues for future investigation. Thus, it would be interesting to expand the analysis of these results to estimate the latent variable for each country and each year under analysis (2012–2020).

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