
An international analysis of fraud detection in European structural and investment funds

Thomas Baumgärtler and Philipp Eudelle

Offenburg University,
Offenburg, Germany
Email: thomas.baumgaertler@hs-offenburg.de
Email: eudelle@hs-offenburg.de

Jorge Gallud Cano*

Universidad de Valladolid,
Valladolid, Spain
Email: jorge.gallud@uva.es
*Corresponding author

Abstract: The aim of this paper is to identify indicators at country level that could prove useful in improving the effectiveness of fraud detection in European Structural and Investment Funds. We analyse data for 454 funds, belonging to the period 2014–2020, from the 28 countries that were members of the European Union in 2014. Explanatory results suggest the convenience of tracking funds, especially in countries with higher GDP and higher transparency levels, and the lesser relevance of the number of irregularities for countries with higher GDP and those receiving larger funds. Fraud and fraud detection rates in individual funds vary significantly across states. Federal states, such as the Federal Republic of Germany, are comparatively successful in detecting fraud in EU funds.

Keywords: fraud; fraud detection; fraud offences; corruption; transparency; European Union; European structural and investment funds; anti-fraud-strategy; Germany.

Reference to this paper should be made as follows: Baumgärtler, T., Eudelle, P. and Gallud Cano, J. (xxxx) ‘An international analysis of fraud detection in European structural and investment funds’, *European J. International Management*, Vol. X, No. Y, pp.xxx–xxx.

Biographical notes: Thomas Baumgärtler, PhD in Financial Economics, is Professor of the Faculty of Business Administration and Industrial Engineering at Offenburg University. He is key member of EUMODFRAUD European Project. As a researcher, he is expert in terms of fraud and tools to detect and prevent the fraud in Germany and all over Europe.

Philipp Eudelle, PhD in Financial Economics, is Dean of the Faculty of Business Administration and Industrial Engineering at Offenburg University. He is key member of EUMODFRAUD European Project. As a researcher, he is expert in terms of fraud and tools to detect and prevent the fraud in Germany and all over Europe.

T. Baumgärtler, P. Eudelle and J. Gallud Cano

Jorge Gallud Cano, PhD in Business Economics, is Professor of accounting at Universidad de Valladolid. He is key member of EUMODFRAUD European Project. As a researcher, he writes on corporate governance and disclosure policies.

1 Introduction

The European Commission and the Member States share responsibility for combating fraud and other illegal activities affecting the financial interests of the European Union (EU). Fraud or fraudulent irregularities are also a major problem in the European Structural and Investment Funds (ESIF). In the area of EU cohesion policy, for example, where the level of reported fraud is significant compared to other areas of expenditure, the Member States' authorities responsible for managing EU programmes have a key role to play in the fight against fraud and corruption. In addition, Member States also have to deal with various forms of fraud against their financial interests. The European Court of Auditors noted in a 2019 special report that while managing authorities have improved the assessment of fraud risks and the development of preventive measures, there is still a need to improve the detection of fraud, the response to it and the coordination between the different bodies of the Member States (European Court of Auditors, 2019a). This study addresses this issue area on a country- and fund-specific basis.

The motivation of this study firstly relies on the great relevance of the fight against fraud in EU funding. In fact, European Commission affirms that fraud affects approximately 0.2% of the total EU budget (European Commission, 2020f). Nowadays, these improvements can significantly affect the funds granted to mitigate the consequences of the COVID pandemic. Secondly, transparency and good governance are outstanding issues in recent years (Goh et al., 2020). In August 2018, the EU simplified the financial regulation applied to those receiving and managing funds; one of the main goals of this change is the greater transparency. On the other hand, European Commission, in the seventh report on economic, social and territorial cohesion, highlights the main role of the quality of governance for the convergence of economic growth. Therefore, both the increasing interest on corruption problems, and the relevance of good governance in order to foster economic growth, lead us to the analysis of fraud in European funds.

The aim of this paper is to identify country-level indicators that can help improve the effectiveness of fraud detection in ESI Funds used by EU Member States. We analyse data for 454 funds, belonging to the period 2014–2020, from the 28 countries that were members of the European Union in 2014. Results show significant relationships between the fraud detection rate and the indicators of the use and monitoring of funds, the number of fraudulent irregularities, the level of economic development and the transparency of an EU country. These results suggest the convenience of tracking funds, especially in countries with higher GDP and higher transparency levels, and the lesser relevance of the number of irregularities for countries with higher GDP and those receiving larger funds.

Following this introduction, Section 2 compiles the theoretical framework and hypotheses derived from it. The empirical design is described in Section 3. Section 4 includes the descriptive analysis and Section 5 describes the explanatory analysis with the results regarding the stated hypotheses. The work is concluded in Section 6 with the main contributions of the paper, limitations and lines for future research.

2 Theoretical framework

2.1 European structural and investment funds

Five major funds are working together to support economic development in all EU countries. This is in line with the objectives of the ‘Europe 2020 strategy’¹: European Regional Development Fund (ERDF), European Social Fund (ESF), Cohesion Fund (CF), European Agricultural Fund for Rural Development (EAFRD) and European Maritime and Fisheries Fund (EMFF). Every European region can receive funding from the ERDF and the ESF. But only the less developed regions can receive funding from the Cohesion Fund.

The EU's Structural Funds, which are managed by the European Commission, finance structural assistance. The aim is to strengthen economic and social cohesion in the EU so that the requirements of the European Single Market can be met throughout the EU. An important principle in the allocation of funds is partnership, i.e., EU measures are only intended to contribute to or complement structural policy activities at regional and national level (European Commission, 2015).

The task of the European Regional Development Fund (ERDF) is to reduce the main regional disparities within the EU. The aim is to build on the economic strengths and potential of regions. To this end, the ERDF supports regions lagging behind in their development and facing structural problems. The fund also supports industrial regions with declining development in their structural transformation.

The European Social Fund (ESF) invests in people. It focuses on improving employment and education opportunities in the EU. It also aims to improve the situation of vulnerable people at risk of poverty. The ESF invests in all EU regions. Over EUR 80 billion was earmarked between 2014 and 2020 to invest in the skills and abilities of people in member states, plus at least EUR 3.2 billion for the Youth Employment Initiative (YEI).

The Cohesion Fund (CF) was established for EU countries with a gross national income per inhabitant below 90% of the EU average. Its aim is to redress economic and social disparities and promote sustainable development. Through the General Regulation, this fund is subject to the same programming, management, and monitoring rules as the ERDF and ESF. For the 2014–2020 programming period, the CF will support Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia. Financial assistance from the CF can be suspended by a decision of the Council (taken by a qualified majority) if a member state is excessively indebted and has not resolved this situation or taken appropriate measures to resolve it (European Commission, 2015).

The European Agricultural Fund for Rural Development (EAFRD) supports rural development policies and projects under the Common Agricultural Policy. The EAFRD budget for the period 2014–2020 is around EUR 100 billion. The funds will be spent during this period for the implementation of rural development programmes which will run until the end of 2023.

The European Maritime and Fisheries Fund (EMFF) is the fund for the EU's maritime and fisheries policy.

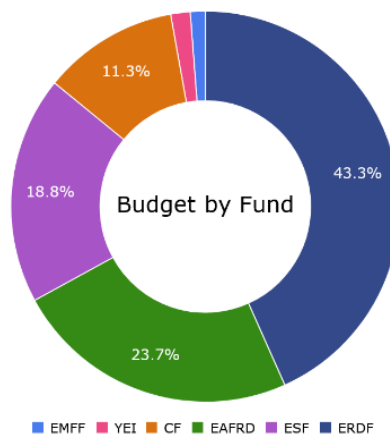
In terms of the total ESI Funds budget of EUR 644.4 billion, the ERDF accounts for around 43% of the 2014–2020 programming period, followed by EAFRD and ESF as shown in Figure 1. Figure 2 represents how the member states benefit differently from the ESI funds: Measured in terms of country-specific budget shares, Poland, Italy and Spain in particular, but also France and Germany, each with well over EUR 40 billion, are among the main beneficiaries from the ESIF. Germany receives structural and investment funds from the ERDF (EUR 17.7 billion), the EAFRD (EUR 14.8 billion), the ESF (EUR 12.5 billion) and marginally from the EMFF (EUR 290.3 million). Because Germany does not meet the requirements for funds from CF and YEI due to its comparatively high GDP per capita (above the EU average), neither the federal government nor the federal states can draw money from these funds.

2.2 Fundamentals of fraud prevention

Both companies and public institutions are exposed to corruption risks to a greater or lesser extent, depending on the countries and sectors in which they operate and the business partners with whom they work. In order to find out to what extent business processes may be affected by corrupt practices, risk assessment plays a central role.

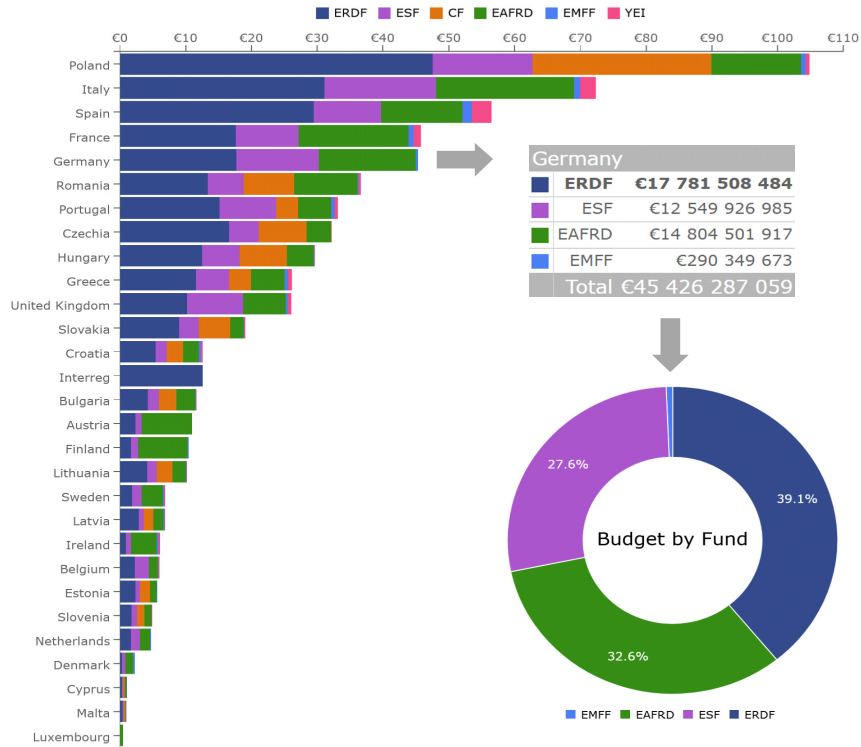
Risk assessment is exclusively concerned with specific fraud risks and not with irregularities. However, the effective conduct of risk assessment can have an indirect impact on the prevention and detection of irregularities in general, which are understood as a higher-level category of fraud. It is the aspect of intent that distinguishes fraud from irregularity.

Figure 1 ESIF 2014–2020: total budget by Fund, EUR billion



Source: European Commission (2021), daily update – Refresh Date: 22/04/2021.

Figure 2 ESIF 2014–2020: total budget by member states, EUR billion



Source: Own representation based on European Commission (2021), daily update – Refresh Date: 20/04/2021.

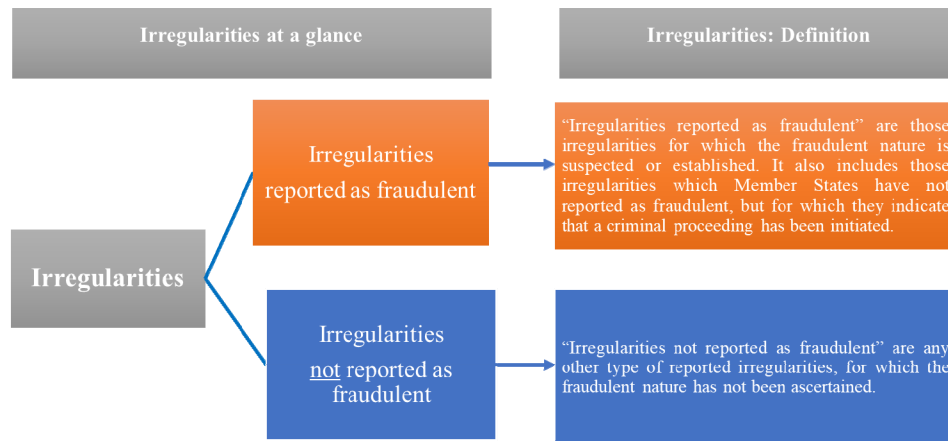
The Convention drawn up on the basis of Article K.3 of the Treaty on European Union, on the protection of the European Communities’ financial interests, defines ‘fraud’ in relation to expenditure as any intentional act or omission concerning ‘the use or presentation of false, incorrect or incomplete 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’; concealment of information in breach of a specific duty with the same consequence; ‘the misuse of such funds for purposes other than those for which they were originally granted’ (European Commission, 2014).

The term ‘corruption’ is a common expression in itself, and so it is surprising that no universally comprehensive definition of corruption exists. The word corruption has a Latin root and means ‘to bribe’, ‘to falsify’, and ‘to seduce’ (Wolf, 2014). Consequently, corruption can be understood as ‘the abuse of a position of trust in an administrative, economic or political function in order to obtain an advantage to which there is no legally justified entitlement’ (Polizei NRW, 2020).²

Effective fraud prevention requires in-depth knowledge of fraud indicators and conflicts of interest. In the context of approval or audit processes, red flags can reveal fraudulent behaviour or potential conflicts of interest. Depending on the ESI Funds area, different red flags exist, such as falsification of documents to be submitted, irregularities

in procurement or public procurement (BMAS, 2019a). Irregularities can generally be divided into fraudulent and non-fraudulent offences, which can be seen in the chart in Figure 3.

Figure 3 Delimitation and definition of irregularities



Source: Own presentation based on OLAF (2021); European Commission (2020c) and European Commission (2020a).

The concept of irregularity³ in the preceding definition includes both intentional and non-intentional acts which can be committed by economic operators. An irregularity committed intentionally, i.e., deliberately, is considered fraud and is defined in the present context as a ‘fraudulent (reported) irregularity’. This is to be distinguished from ‘non-fraudulent (reported) irregularity’, i.e., actions or operations which, although not compliant with applicable EU law, are mostly the result of erroneous actions which occurred (unintentionally) in the application, approval, or delivery process of ESI Funds and which can also lead to significant financial damage (OLAF, 2021). Member states are required to report fraudulent and non-fraudulent irregularities above a threshold of EUR 10,000.

Various factors can be considered for both fraudulent and non-fraudulent irregularities. The European Commission lists twelve main categories, which in turn are subdivided into further subcategories. Causes of irregularities are, e.g., false or falsified application documents, ineligible applications, false identity of the beneficiary, incomplete or falsified evidence, but also artificially created framework conditions for obtaining financial resources. The table in the Annex 1 provides an overview of the individual types and characteristics of irregularities.

Fraud and corruption undoubtedly pose a threat to the EU’s financial interests. Fraud and corruption against the EU budget lead to EU funds not being able to fulfil their intended purpose, which consequently requires an effective fight against fraud on the part of the EU. When fraudsters succeed, the integrity of EU action is called into question and citizens’ trust in EU anti-fraud policy is damaged. Article 317 AEUV (Dejure, 2021) and Article 36 of the Financial Regulation require the Commission to apply the EU budget in accordance with the principles of sound financial management and thus to carry out internal controls covering the prevention, detection, correction and follow-up of fraud

An international analysis of fraud detection in European structural

and other irregularities. In doing so, the Commission cooperates with the member states, which claim and spend 80% of the EU budget. As a result, the EU as well as the member states have an obligation under Article 325 AEUV to fight fraud and other acts affecting the EU's financial interests. Thus, on 24 June 2011, the Commission adopted its Current Anti-Fraud Strategy (CAFS). This includes, on the one hand, the Commission's communication to the other institutions describing the strategic and operational objectives and the steps to be taken to achieve them. A detailed internal action plan must also be inherent in the communication. Three priorities were identified in the CAFS 2011: The inclusion of anti-fraud provisions in the Commission's proposals under the MFF for spending programmes for 2014–2020, the implementation of anti-fraud strategies at service level, and the revision of the procurement directives (European Commission, 2019b).

Every year, the Commission produces a report on the protection of the EU's financial interests, the so-called 'PIF report'.⁴ It provides an overview of the extent to which the EU budget is affected by fraud and other irregularities detected. The PIF report uses, e.g., the information collected in the IMS. Since 2013, the Commission has thus been reporting on the implementation of the 2011 CAFS. In this context, it should also be noted that instead of a sufficiently accurate measurement, only an approximation of the corruption score is possible. The PIF report is examined and commented on by the European Parliament every year. Most recently, the European Court of Auditors published a special report on the fight against fraud in 2019, which refers to the Commission's institutional framework and working methods in the fight against fraud in relation to EU spending (European Court of Auditors, 2019a). This report highlights the importance of the issue and has recommended further action in this regard.

Commission services also published an analytical report to evaluate the relevance, efficiency, effectiveness and coherence of the CAFS 2011 and its implementation. With CAFS 2011, an effective anti-fraud strategy already exists. However, due to the preparations of the MFF 2021-2027, the opportunity to adapt and improve the anti-fraud strategy was taken and consequently CAFS 2019 was created. In doing so, the CAFS 2019 facilitates the fight against fraud affecting the EU revenue side, for example by combating smuggling and preventing tax evasion. This will improve the Commission's analytical capabilities and increase the coherence and efficiency of the fight against fraud through optimised coordination. Member states, although not directly addressed, will be required by the Commission to fulfil their obligations under Article 325 AEUV to prevent and detect fraud and corruption affecting the EU's financial interests (European Commission, 2019b).

The CAFS 2019 not only strengthens the fight against fraud – which burdens the EU budget, especially on the revenue side – but includes adjustments to the additions to EU legislation adopted in 2017. This concerns, on the one hand, Directive (EU) 2017/1371 on the protection of the EU's financial interests (Official Journal of the European Union, 2017a), which determines stricter common standards for the criminal law of the member states and Regulation (EU) 2017/1939 establishing the European Public Prosecutor's Office (EUPPO), which provides for enhanced cooperation between the member states (Official Journal of the European Union, 2017b). The aim is to enable more effective prosecution of criminal offences affecting the EU's financial interests. The proposed amendments will allow OLAF to work closely with EUPPO and conduct its own investigations in a more efficient manner (European Commission, 2019b). In April 2019, the European Parliament voted on the Commission's proposal, allowing the amended

OLAF Regulation to enter into force at the end of 2020, before EUSa has finally become operational (European Commission, 2020c). Close cooperation between EUSa, OLAF, EUROJUST, EUROPOL and the member states is of particular importance in comprehensive investigations and for the effectiveness of the new institutional approach (European Commission, 2019b).

In order to outperform the CAFS 2011 with the CAFS 2019 on a qualitative level, a strengths and weaknesses analysis and a fraud risk assessment were conducted. The fraud risk assessment analysed fraud patterns and systematic weaknesses. One of the most common fraud patterns was the claiming of overstated costs through misrepresentation and falsification of supporting documents. Owing a planned programme in the MFF 2021–2027 to increase the share of EU funds – i.e. funds which are not linked to costs – the elimination of this fraud pattern is aimed at. This new form of funding creates potential new risks, which is why the CAFS 2019 includes optimised control strategies. A deeper analysis of the issues of Germany, which is the largest in European economy, is developed in annex 5.

2.3 Hypotheses

Corruption is considered by many authors as one of the main problems for European funds being effective. Ederveen et al. (2006) described how trust, corruption and bureaucratic quality underlies contractual incompleteness and inefficient market transactions. European funds, which are expected to foster economy through investments, are usually required to be invested in specific projects that sometimes are not the more profit activities, in terms of economic growth (i.e., environmental and cultural projects), and might demand an attention that could be to the detriment of economic growth. In addition, when institutions are careless about accountability, or their quality does not reach a minimum level, funds could appear as an attractive opportunity for public officials to obtain private gains. In this vein, public procurements, which are a principal mean for improving the quality of investments and public services, constitute an important potential path for corruption given the possibility of generating closed networks where allocating contracts (Fazekas et al., 2016). Therefore, they are required to comply with severe disclosure requisites. On the other hand, Beugelsdijk and Eijffinger (2005) do not found a significant result for the relationship between corruption and economic growth from structural funds.

The Fraud Detection Rate (FDR) reported by the European Commission in the annual PIF reports is used as an important indicator for the detection of fraud and suspected fraud. The ratio is defined as the total financial amount affected by suspected and established fraud over total expenditure (European Commission, 2016). It constitutes a relevant tool against corruption for receiving countries in the management of European Structural and Investment Funds. The aim of our empirical analysis is to shed light on country-level indicators that may result useful for improving the effectiveness when using the FDR.

Firstly, we propose a positive relationship between the static management of funds ‘amounts and fraud. Funds’ amounts are planned with margins that could be adjusted in the future. This decrease in the finally decided amounts also shows a proper use of funds by receiving countries, that try to fit the money to what is really needed. As European Funds cover a large period of time, following subsequent steps in the allocation and spending of the money may lead to a better use of these funds, while a less detailed

An international analysis of fraud detection in European structural

tracking could bring on irregularities or fraudulent behaviour. Therefore, we state our first hypothesis as follows:

H1: There is a negative relationship between fund tracking and fraud detection.

Secondly, we expect a positive relationship between the number of irregularities reported as fraudulent and the fraud detection ratio. While the amount involved in corruption cases is considered as the relevant measure for indicating its heaviness, the number of cases in a country should also be an interesting indicator for detecting fraud. Thus, we posit the following hypotheses:

H2: There is a positive relationship between the number of irregularities and fraud detection.

These two country-level indicators should vary between countries. Given the aim of this paper in analysing corruption detection, we have selected two characteristics that determine the situation of the country in this way: the first one is the economic level of the country. Whether the member state has a higher or lower development of its economy may be considered in order to pay attention to different corruption practices. As richer countries have to deal with bigger structures when managing funds, it should be relevant observing if funds' managers are adapting the amounts of projects in each step and also if corruption cases in these countries are few but large amounts of money are taken or vice versa. Therefore, we expect the following:

H3: The wealth of the country positively moderates the relationship between fund tracking and fraud detection.

H4: The wealth of the country negatively moderates the relationship between the number of irregularities and fraud detection.

The second indicator is the Corruption Perceptions Index (CPI) given by Transparency International. It is a generally used index that summarises transparency perceptions. The control of corruption is one of the most effective points for a country enhancing its development (Cuervo-Cazurra, 2016). Disclosure policies arise in the last decades as an essential tool (Leuz and Wysocki, 2016). Thus, we expect that countries that are more transparent may be prone to pay more attention to the allocation of funds in the different moments while countries in the opposite situation may give less value to this tracking. Moreover, the number of irregularities may be lower in more transparent countries since the control mechanisms that allow such transparency will be greater. Consequently, we propose the following:

H5: The transparency of the country positively moderates the relationship between fund tracking and fraud detection.

H6: The transparency of the country positively moderates the relationship between the number of irregularities and fraud detection.

Finally, we want to take into consideration –as a third indicator – the size of the funds. In the last years, we can observe how aid fragmentation is leading to smaller projects, that is associated to more administrative work (Kilby, 2011). In this vein, the tracking of smaller funds, despite the increase of work for the public administrations, might be easier. Thus, monitoring larger funds can be more difficult and therefore needs to be more closely watched. Moreover, countries with larger funds could involve a fewer

number of irregularities but higher amounts, which should be the ones to be concerned about. As a result, we posit the following hypotheses:

H7: The size of funds positively moderates the relationship between fund tracking and fraud detection.

H8: The size of funds negatively moderates the relationship between the number of irregularities and fraud detection.

3 Empirical design

In this analysis, we study a sample of 454 funds from the 28 countries that were members of the European Union in 2014. These funds belong to the period 2014–2020. Data were obtained mainly from the European Commission website; we also include measures from Transparency International and International Monetary Fund. Given that Slovak Republic represents a clear outlier because of its high values for the dependent variables, it has been removed from the sample. Therefore, it consists of 446 funds from 27 countries as shown in Tables 1(a) and 1(b). The empirical analysis includes a descriptive analysis of the main characteristics of the sample. We then check our hypotheses with the subsequent explanatory analysis through linear regression models.

Table 1 (a) Distribution of the sample by country (b) Distribution of the sample by fund

(a)			
<i>Country</i>	<i>Freq</i>	<i>Country</i>	<i>Freq</i>
Austria	4	Italy	75
Belgium	10	Latvia	3
Bulgaria	10	Lithuania	3
Croatia	4	Luxembourg	3
Cyprus	4	Malta	5
Czech Republic	10	Netherlands	7
Denmark	4	Poland	24
Estonia	3	Portugal	16
Finland	6	Romania	8
France	70	Slovenia	3
Germany	47	Spain	63
Greece	20	Sweden	13
Hungary	9	UK	17
Ireland	5	Total	446

Table 1 (a) Distribution of the sample by country (b) Distribution of the sample by fund (continued)

<i>(b)</i>	
<i>Fund</i>	<i>Freq</i>
CF	12
EAFRD	114
EMFF	26
ERDF	165
ESF	129
Total	446

Our dependent variable is the Fraud Detection Rate (FDR): the percentage that the total established and estimated amounts related to fraudulent cases represent on the total traditional own resources collected by Member States; it is scaled by 100. As independent variables we include the ratio between decided and planned amounts for ESI funds (f_fit), that measures inversely if there is any tracking of the amount of the funds in the period for their use, i.e., the higher f_fit , the lower the tracking; and the number of irregularities reported as fraudulent in the period 2014-2020 ($Irreg_n$). We also control for the logarithm of GDP per capita as a variable for the economic level of the country, the size of the fund measured as the logarithm of planned amount ($fsize$) and the Corruption Perceptions Index (CPI), given by Transparency International, which scores each country transparency level. The definition of all the variables is summarised in the table of Annex 2.

The main empirical model is presented in the following equation:

$$FDR_i = \beta_0 + \beta_1 \cdot GDP_i + \beta_2 \cdot fsize_i + \beta_3 \cdot CPI_i + \beta_4 \cdot f_fit_i + \beta_5 \cdot Irreg_n_i + \varepsilon_{i,t}$$

4 Descriptive analysis

Table 2 reports the mean value, the standard deviation and quartiles (Q25, Q50 and Q75) of the main variables of our whole sample. Descriptive statistics are homogeneous. Table 3 shows the correlation matrix. Values are adequate so multicollinearity should not be a problem.

We also provide in Table 4 a test of equality of means for the moderating variables. Results support differences for GDP and CPI dummies while do not show significant results for the dummy created from funds' size.

Table 2 Descriptive statistics

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Q25</i>	<i>Q50</i>	<i>Q75</i>
FDR	446	7.2018	9.1862	0.0000	57.0000	0.0000	4.0000	14.0000
GDP	446	10.6103	0.9881	9.5700	15.2500	10.1400	10.4350	10.5700
fsize	446	20.1764	1.3964	15.9400	24.2000	19.3175	20.2750	21.1000
CPI	446	63.9552	11.8216	43.0000	87.0000	53.0000	62.0000	74.2500
f_fit	446	0.9687	0.2510	0.3608	2.1015	0.8138	0.9712	1.0959
Irreg_n	446	11.7220	21.6635	0	89.0000	0	4.0000	7.0000

Note: This table presents the mean, standard deviation and quartiles (Q25, Q50 and Q75) of all the variables used. FDR is the fraud detection rate scaled by 100; GDP is the logarithm of gross domestic product per capita; fsize measures the size of the funds; CPI is the corruption perceptions index; f_fit measures the tracking of fund; Irreg_n is the number of irregularities reported as fraudulent.

Table 3 Correlation matrix

	<i>FDR</i>	<i>GDP</i>	<i>fsize</i>	<i>f_fit</i>	<i>CPI</i>
GDP	0.1779				
	0.0002				
fsize	0.0947	0.0975			
	0.0457	0.0395			
f_fit	0.1564	0.0023	0.0689		
	0.0009	0.9617	0.1461		
CPI	0.0179	0.1173	-0.1940	0.0531	
	0.7062	0.0132	0.0000	0.2633	
Irreg_n	0.3121	0.3862	0.3274	0.0212	-0.0734
	0.0000	0.0000	0.0000	0.6545	0.1217

Note: This table shows correlation ratios and corresponding p-values. FDR is the fraud detection rate scaled by 100; GDP is the logarithm of gross domestic product per capita; fsize measures the size of the funds; CPI is the corruption perceptions index; f_fit measures the tracking of funds; Irreg_n is the number of irregularities reported as fraudulent.

Table 4 Test of equality of means

		<i>Obs</i>	<i>Mean</i>	<i>p-value</i>
FDR	High GDP	223	3.2556	0.0000
	Low GDP	223	11.1480	
	High CPI	257	5.0817	0.0000
	Low CPI	189	10.0847	
	High fsize	223	7.0404	0.7110
	Low fsize	223	7.3632	

5 Explanatory analysis

In Table 5, we show the results of the regression with the model. Columns (2) and (4) show a positive and significant relationship between f_fit and FDR, supporting the first hypothesis. The less the attention paid to the funds in order to adequate amounts to the real situation, the more corruption indicated by the FDR. Regarding the second hypothesis, results also support the positive and significant relationship between $Irreg_n$ and FDR, as can be observed in columns (3) and (4). This initial result suggests a proportional distribution of the amounts involved in fraudulent situations.

Table 5 Results of the model estimation

	(1)	(2)	(3)	(4)
<i>VARIABLES</i>	<i>FDR</i>	<i>FDR</i>	<i>FDR</i>	<i>FDR</i>
GDP	1.565***	1.585***	0.576	0.599
	0.440	0.435	0.461	0.455
fsize	0.532*	0.449	-0.002	-0.083
	0.315	0.313	0.319	0.317
CPI	0.011	0.002	0.025	0.016
	0.037	0.037	0.036	0.036
f_fit		5.531***		5.483***
		1.697		1.640
$Irreg_n$			0.123***	0.123***
			0.022	0.022
Constant	-20.839***	-24.188***	-1.898	-5.276
	8.001	7.982	8.439	8.404
Observations	446	446	446	446
R^2 -squared	0.038	0.060	0.102	0.124
<i>F</i> -test	5.798***	7.098***	12.56***	12.51***

Note: This table shows the estimated coefficients (standard errors) from the regression model. FDR is the fraud detection rate scaled by 100; GDP is the logarithm of gross domestic product per capita; fsize measures the size of the funds; CPI is the corruption perceptions index; f_fit measures the tracking of funds; $Irreg_n$ is the number of irregularities reported as fraudulent.

In order to test hypotheses 3 to 8, three dummies have been created from GDP, CPI and fsize. Using the median of each variable, the new dummies equal 1 if the observation is over the median, and 0 otherwise. These three dummies allow us to generate interacted measures with f_fit and $Irreg_n$, respectively, in order to contrast their relevance when GDP, CPI and fsize are high (i.e., over the median).

Results in columns (1) and (3) of Table 6 show a positive and significant relationship between f_fit_1 and FDR while the coefficient for f_fit is negative and smaller. This supports hypothesis 3 as we obtain positive results for countries with higher levels of GDP, while using the whole sample does not show the same. It suggests that tracking funds is a more important task in richer countries. Regarding the number of irregularities,

results of columns (2) and (3) support hypothesis 4. The mutual cancellation of the coefficients suggests that the number of irregularities is almost irrelevant for countries with high economic level while in the ones with low GDP it represents an interesting indicator.

Table 6 Results of the model estimation with GDP dummy

	(1)	(2)	(3)
VARIABLES	FDR	FDR	FDR
GDP	-0.603	1.492***	-0.280
	0.463	0.445	0.386
fsize	0.046	-0.287	-0.580**
	0.290	0.301	0.248
CPI	-0.198***	0.040	-0.277***
	0.040	0.034	0.035
f_fit	0.573		-5.582***
	1.642		1.440
f_fit_1	9.899***		15.230***
	1.064		1.064
Irreg_n		1.776***	2.713***
		0.206	0.186
Irreg_n_1		-1.646***	-2.702***
		0.204	0.188
Constant	19.908**	-8.232	35.159***
	8.709	7.925	7.278
Observations	446	446	446
R ² -squared	0.215	0.218	0.473
F-test	24.08***	24.52***	56.14***

Note: This table shows the estimated coefficients (standard errors) from the regression model. FDR is the fraud detection rate scaled by 100; GDP is the logarithm of gross domestic product per capita; fsize measures the size of the funds; CPI is the corruption perceptions index; f_fit measures the tracking of funds; f_fit_1 is the interacted variable between f_fit and a dummy that equals 1 if GDP is over the median of the sample and 0 otherwise; Irreg_n is the number of irregularities reported as fraudulent; Irreg_n_1 is the interacted variable between Irreg_n and a dummy that equals 1 if GDP is over the median of the sample and 0 otherwise.

Results in columns (1) and (3) of Table 7 show a positive and significant relationship between f_fit_2 and FDR while there is no significance for the coefficient for f_fit. This supports hypothesis 5 since we obtain a positive result for the countries that are more transparent (i.e., those with higher levels of CPI), while coefficients for the whole sample are not significant. This result suggests the relevance of tracking funds in countries that are more transparent. On the other hand, results in columns (2) and (3) for Irreg_n_2 are not significant, so we have to reject hypothesis 6. However, coefficients for Irreg_n_2 are

An international analysis of fraud detection in European structural

positive and significant suggesting the positive influence of the number of irregularities regardless the transparency of the country.

Table 7 Results of the model estimation with CPI dummy

	(1)	(2)	(3)
<i>VARIABLES</i>	<i>FDR</i>	<i>FDR</i>	<i>FDR</i>
GDP	1.373***	0.716	0.133
	0.402	0.472	0.428
fsize	0.558*	-0.021	0.004
	0.289	0.319	0.288
CPI	-0.458***	-0.018	-0.441***
	0.062	0.048	0.061
f_fit	-0.928		-1.526
	1.724		1.652
f_fit_2	13.104***		14.272***
	1.472		1.465
Irreg_n		0.114***	0.143***
		0.023	0.021
Irreg_n_2		0.102	-0.104
		0.076	0.071
Constant	6.057	-0.586	28.080***
	8.102	8.488	8.351
Observations	446	446	446
R ² -squared	0.204	0.106	0.283
F-test	22.55***	10.42***	24.71***

Note: This table shows the estimated coefficients (standard errors) from the regression model. FDR is the fraud detection rate scaled by 100; GDP is the logarithm of gross domestic product per capita; fsize measures the size of the funds; CPI is the corruption perceptions index; f_fit measures the tracking of funds; f_fit_2 is the interacted variable between f_fit and a dummy that equals 1 if CPI is over the median of the sample and 0 otherwise; Irreg_n is the number of irregularities reported as fraudulent; Irreg_n_2 is the interacted variable between Irreg_n and a dummy that equals 1 if CPI is over the median of the sample and 0 otherwise.

Table 8 shows the estimated coefficients including dummies for the size of the funds. In columns (1) and (3) we obtain a positive and significant relationship between f_fit and FDR, but the coefficients for f_fit_3 are not significant. This rejects hypothesis 7, suggesting the importance of reviewing planned amounts of funds, regardless the size of the fund.

Table 8 Results of the model estimation with fsize dummy

	(1)	(2)	(3)
<i>VARIABLES</i>	<i>FDR</i>	<i>FDR</i>	<i>FDR</i>
GDP	1.588***	0.519	0.550
	0.435	0.457	0.453
fsize	1.062**	0.314	0.538
	0.488	0.336	0.478
CPI	0.002	0.004	-0.001
	0.037	0.037	0.036
f_fit	6.242***		5.730***
	1.749		1.697
f_fit_3	-2.197		-1.281
	1.345		1.378
Irreg_n		0.299***	0.269***
		0.066	0.069
Irreg_n_3		-0.191***	-0.158**
		0.067	0.071
Constant	-36.178***	-6-740	-16.123
	10.833	8.547	10.920
Observations	446	446	446
R ² -squared	0.066	0.118	0.141
F-test	6.233***	11.80***	10.24***

Note: This table shows the estimated coefficients (standard errors) from the regression model. FDR is the fraud detection rate scaled by 100; GDP is the logarithm of gross domestic product per capita; fsize measures the size of the funds; CPI is the corruption perceptions index; f_fit measures the tracking of funds; f_fit_3 is the interacted variable between f_fit and a dummy that equals 1 if fsize is over the median of the sample and 0 otherwise; Irreg_n is the number of irregularities reported as fraudulent; Irreg_n_3 is the interacted variable between Irreg_n and a dummy that equals 1 if fsize is over the median of the sample and 0 otherwise.

Considering the number of irregularities, results of columns (2) and (3) support hypothesis 8 as we obtain positive and significant coefficients for Irreg_n and negative and significant coefficients for Irreg_n_3 and the latter are smaller. This suggests that, although the number of irregularities is relevant for every country, this importance is less in countries that receive larger funds.

Regarding the explanation of the models, we can observe through the R² of the column (4) of Table 5 and columns (3) of Tables 6, 7 and 8 that including the dummy obtained from the GDP considerably increases the explicability from 12.40 to 47.30%. When using the dummies for CPI and fsize, explicability also increases but not so much.

6 Conclusions

The fight against fraud and other illegal activities detrimental to the EU's financial interests, such as corruption, is a joint task of the EU and the Member States. This means a multi-eye principle in control which is conducive to the detection of fraud and corruption with the aim of a 'zero tolerance policy'. In addition to the consistent implementation of EU directives on combating fraud and corruption, national regulations in criminal, subsidy, civil service and labour law make a significant contribution to combating fraud and corruption. Neither the European Commission's anti-corruption reports, which are predominantly oriented towards descriptive statistics, nor the audit reports of the European Court of Auditors or OLAF can provide a sound explanation for the causes of the significant differences in fraud detection between the individual countries.

The present study attempted to identify indicators for the differences in fraud detection rates and thus to make a further contribution to explaining them. For this purpose, an original database has been built, with data for 454 funds, belonging to the period 2014–2020, from the 28 countries that were members of the European Union in 2014. The regression analyses carried out at the level of the EU member states revealed significant correlations between the fraud detection rate and the indicators of the use and monitoring of funds, the number of fraudulent irregularities, the level of economic development and the transparency of an EU country. These results suggest the convenience of tracking funds, especially in countries with higher GDP and higher transparency levels, and the lesser relevance of the number of irregularities for countries with higher GDP and those receiving larger funds.

The results obtained in this paper contribute to the literature on fraud and the influence of institutional factors by providing effective indicators for improving fraud detection by receiving countries. These variables may also prove useful for European Commission when controlling Member States' management of funds. Among the limitations, the Fraud Detection Rate has been interpreted throughout the paper as an indicator that there are many cases of fraud, however, it could also be considered as a high control over the funds. Moreover, a wider timespan, covering more waves of funds would provide more conclusive results; also considering regional data could shed light in a deeper way. Future research could address this topic, from the starting point of the results of this study. Finally, the scarce literature on fraud in European funds represents both a limitation and an opportunity to contribute with new articles.

Acknowledgements

The authors are grateful to EUMODFRAUD International Research Project (EU proposal 878513) and the Spanish Ministry of Economy and Competitiveness (PID2020-114797GB-I00) for financial support. Any remaining errors are solely the authors' responsibility.

References

- Beugelsdijk, M. and Eijffinger, S.C.W. (2005) 'The effectiveness of structural policy in the European Union: an empirical analysis for the EU-15 in 1995–2001*', *Journal of Common Market Studies*, Vol. 43, No. 1, pp.37–51. Doi: 10.1111/j.0021-9886.2005.00545.x.
- BMAS (2019a) *Federal ministry of labour and social affairs: guidelines on the treatment of irregularities and the assessment of fraud and corruption risks for the European Social Fund in the Federal Republic of Germany funding period 2014–2020 (version 2.3)*. Available online at: https://www.esf.de/portal/SharedDocs/PDFs/DE/Recht_VO/Leitfaden-Unregelmäßigkeiten.pdf?__blob=publicationFile&v=11
- BMAS (2019b) *Federal Ministry of Labour and Social Affairs: Self-assessment and the Strategic Approach of the Administrative Authority to Prevent and Combat Fraud and Corruption*, Internal, Unpublished Guide of the Federal Ministry of Labour and Social Affairs, Berlin.
- Cuervo-Cazurra, A. (2016) 'Corruption in international business', *Journal of World Business*, Vol. 51, No. 1, pp.35–49. Doi: 10.1016/j.jwb.2015.08.015.
- Dejure (2021) *Treaty on the Functioning of the European Union*, Article Art. 317 (274 TEC). Available online at: <https://dejure.org/gesetze/AEUV/317.html>
- Ederveen, S., De Groot, H.L.F. and Nahuis, R. (2006) 'Fertile soil for structural funds? A Panel data analysis of the conditional effectiveness of European cohesion policy', *Kyklos*, Vol. 59, No. 1, pp.17–42. Doi: 10.1111/j.1467-6435.2006.00318.x.
- EFRE – Administrative Authority Bremen (2019) *Risk management in the Operational Programme Bremen 2014–2020 for the European Regional Development Fund (OP ERDF Bremen) – Description of Measures to Combat and Prevent Fraud and Corruption Pursuant to Art. 125(4) c) Regulation (EU) 1303/2013*, Bremen. https://www.efre-bremen.de/sixcms/media.php/13/GRBK_01_V6_BeschreibungRisikomanagement.pdf
- European Commission (2014) *Fraud Risk Assessment and Effective and Proportionate Anti-Fraud Measures*, Programming period 2014–2020. Available online at: https://ec.europa.eu/regional_policy/de/information/publications/guidelines/2014/fraud-risk-assessment-and-effective-and-proportionate-anti-fraud-measures
- European Commission (n.d.) *ARACHNE Charter v1.5, Charter for the Implementation and Use of the ARACHNE Risk Assessment Tool in Administrative Reviews*, Brussels.
- European Court of Auditors (2019a) *Tackling Fraud in EU Cohesion Spending: Managing Authorities Need to Strengthen Detection, Response and Coordination*, Special report No 06/2019, Brussels. Available online at: <https://www.eca.europa.eu/de/Pages/DocItem.aspx?did=49940>
- European Court of Auditors (2019b) *Fighting fraud in EU spending: action needed*, Special report No 01/2019, Brussels. Available online at: <https://www.eca.europa.eu/de/Pages/DocItem.aspx?did=48858>
- European Commission (2015) *European Structural and Investment Funds 2014-2020: Official texts and commentaries*, Brussels. Available online at: https://ec.europa.eu/regional_policy/sources/docgener/guides/blue_book/blueguide_en.pdf
- European Commission (2016) *Commission Staff Working Document: Methodology regarding the statistical evaluation of reported irregularities for 2015. Accompanying the document REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL, Protection of the European Union's financial interests – Fight against Fraud 2015 Annual Report*, Brussels. Available online at: https://ec.europa.eu/anti-fraud/sites/default/files/methodology_statistical_evaluation_2015_en.pdf
- European Commission (2018) *Arachne Risk Scoring Tool, HU-Budapest-Interreg Arachne & Irregularities*, (non-published presentation of European Commission – DG EMPL). Available online at: <http://www.interact-eu.net/download/file/fid/15129>

An international analysis of fraud detection in European structural

- European Commission (2019a) *Preventing Fraud and Corruption in the European Structural and Investment Funds – Taking Stock of Practices in the EU Member States*, Study on the Implementation of Article 125(4)(c) of the Regulation (EU) No 1303/2013 Laying Down the Common Provisions on the European Structural and Investment Fund in Member States, Luxembourg.
- European Commission (2019b) *Commission Anti-Fraud Strategy: Enhanced Action to Protect the EU Budget*, Brussels. Available online at: https://ec.europa.eu/anti_fraud/sites/antifraud/files/2019_commission_anti_fraud_strategy_en.pdf
- European Commission (2020a) *Commission Staff Working Document: Statistical Evaluation of Irregularities Reported for 2019: Own Resources, Agriculture, Cohesion and Fisheries Policies, Pre-accession and Direct Expenditure*, Accompanying the Document 31st Annual Report on the Protection of the European Union's Financial Interests – Fight Against Fraud – 2019, COM(2020) 363 final, Brussels.
- European Commission (2020b) *Commission Staff Working Document: Statistical evaluation of Irregularities Reported for 2019: Own Resources, Agriculture, Cohesion and Fisheries Policies, Pre-accession and Direct Expenditure*, Accompanying the document 31st Annual Report on the protection of the European Union's financial interests – Fight against fraud – 2019, COM(2020) 363 final (Annexes 1 to 2), Annex 1, Brussels.
- European Commission (2020c) *Commission Staff Working Document: Statistical Evaluation of Irregularities Reported for 2019: Own Resources, Agriculture, Cohesion and Fisheries Policies, Pre-accession and Direct Expenditure*, Accompanying the document 31st Annual Report on the protection of the European Union's financial interests. Fight against fraud – 2019, SWD (2020) 160 final, part 1/3, Brussels.
- European Commission (2020d) *Commission Staff Working Document: Statistical Evaluation of Irregularities Reported for 2019: Own Resources, Agriculture, Cohesion and Fisheries Policies, Pre-accession and Direct Expenditure*, Accompanying the document Report from the European Parliament and the Council, 31st Annual Report on the protection of the European Union's financial interests – Fight against fraud – 2019, SWD (2020) 160 final, part 2/3, Brussels.
- European Commission (2020e) *Commission Staff Working Document: Statistical Evaluation of Irregularities Reported for 2019: Own Resources, Agriculture, Cohesion and Fisheries Policies, Pre-accession and Direct Expenditure*, Accompanying the document: Report from the Commission to the European Parliament and the Council, 31st Annual Report on the protection of the European Union's financial interests Fight against fraud – 2019, SWD (2020) 160 final, part 3/3, Brussels.
- European Commission (2020f) *Fact Check on the EU Budget*. Doi: 10.2761/25800.
- European Commission (2021) *European Structural and Investment Funds*. Available online at: Available online at: <https://cohesiondata.ec.europa.eu/overview#>
- Fazekas, M., Tóth, I.J. and King, L.P. (2016) 'An objective corruption risk index using public procurement data', *European Journal on Criminal Policy and Research*, Vol. 22, No. 3, pp.369–397. Doi: 10.1007/s10610-016-9308-z.
- Goh, L., Liu, X. and Tsang, A. (2020) 'Voluntary disclosure of corporate political spending', *Journal of Corporate Finance*, Vol. 61. Doi: 10.1016/j.jcorpfin.2018.08.014.
- Kilby, C. (2011) 'What determines the size of aid projects?', *World Development*, Vol. 39, Vol. 11, pp.1981–1994. Doi: 10.1016/j.worlddev.2011.07.023.
- Leuz, C. and Wysocki, P.D. (2016) 'The economics of disclosure and financial reporting regulation: evidence and suggestions for future research', *Journal of Accounting Research*, Vol. 54, pp.525–622. Doi: 10.1111/1475-679X.12115.
- Official Journal of the European Union (2017a) *No L 198/29, 28.7.2017: DIRECTIVE (EU) 2017/1371 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 July 2017 on the fight against fraud to the Union's financial interests by means of criminal law*. Available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017L1371&from=DE>

T. Baumgärtler, P. Eudelle and J. Gallud Cano

- Official Journal of the European Union (2017b) *Nr. L 283/1, 31.10.2017: COUNCIL REGULATION (EU) 2017/1939 of 12 October 2017 implementing enhanced cooperation on the establishment of the European Public Prosecutor's Office ('the EPPO')*. Available online at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R1939&from=DE>
- OLAF (2021) *European Anti-Fraud Office: Report fraud*. Available online at: https://ec.europa.eu/anti-fraud/olaf-and-you/report-fraud_de
- Polizei NRW (2020) *Police North Rhine-Westphalia – Corruption*. Available online at: <https://polizei.nrw/artikel/korruption>
- Rechnungsh of Baden-Württemberg (2015) *Advisory Opinions/Special Reports on 'Control System and Administrative Costs in EU Funding Procedures in the Areas of EFGl and EAFRD'*. Available online at: <https://www.rechnungshof.baden-wuerttemberg.de/de/veroeffentlichungen/beratende-aeusserungen/317652.html>
- Wolf, S. (2014) *Corruption, Anti-Corruption Policy and Public Administration: Introduction and European Policy References*, Wiesbaden.

An international analysis of fraud detection in European structural

Annexes 1: Categorisation and typification of irregularities as defined by the European Commission

<i>Category of irregularity</i>	<i>Type (examples)</i>
Request	<ul style="list-style-type: none"> • Incorrect or incomplete request for aid • False or falsified request for aid • Several requests for the same product, species, project, and/or activity
Beneficiary	<ul style="list-style-type: none"> • Incorrect identity operator/beneficiary • Non-existent operator/beneficiary • Operator/beneficiary not having the required quality
Accounts and records	<ul style="list-style-type: none"> • Incomplete accounts, falsified accounts • Calculation errors • Revenues not declared
Documentary proof	<ul style="list-style-type: none"> • Documents missing and/or not provided • Documents provided too late • Documents false and/or falsified
Product, species, and/or land	<ul style="list-style-type: none"> • Inexact composition, inexact origin, inaccurate value • Falsification of the product • Fictitious use or processing
(Non-)Action	<ul style="list-style-type: none"> • Action not implemented or not completed • Control, audit, scrutiny, etc. not carried out in accordance with regulations, rules, plan, etc. • Infringement of rules concerned with public procurement
Movement	<ul style="list-style-type: none"> • Irregularities in connection with final destination (change of, non-arrival at, etc.) • Fictitious movement
Bankruptcy	<ul style="list-style-type: none"> • Legal persons – liquidation • Legal persons – reorganisation to structure debt • Natural persons – repayment plan not possible
Ethics and integrity	<ul style="list-style-type: none"> • Conflict of interest • Bribery – passive or active • Corruption – passive or active
Public procurement	<ul style="list-style-type: none"> • Artificial splitting of works/services/supplies contracts • Insufficient definition of the subject-matter of the contract • Rejection of abnormally low tenders
State aid	<ul style="list-style-type: none"> • Wrong aid scheme applied • Monitoring requirements not fulfilled • Reference investment not taken into account in the applicable aid scheme
Other	<ul style="list-style-type: none"> • Other irregularities

Source: Adapted from (European Commission 2020e).

1.2 Variables' definition

<i>Variable</i>	<i>Definition</i>
FDR	Fraud Detection Rate: The percentage that the total established and estimated amounts related to fraudulent cases represent on the total TOR (Traditional own resources) collected by Member States. It is scaled by 100.
f_fit	Measures the tracking of funds through the ratio between decided and planned amounts.
Irreg_n	Number of irregularities reported as fraudulent 2014–2020.
GDP	Logarithm of gross domestic product per capita in constant national currency per person. Data are derived by dividing constant price GDP by total population.
fsize	Logarithm of the amount planned for each programme
CPI	Corruption perceptions index (Transparency International)
f_fit_1	The interacted variable between f_fit and a dummy that equals 1 if GDP is over the median of the sample and 0 otherwise
Irreg_n_1	The interacted variable between Irreg_n and a dummy that equals 1 if GDP is over the median of the sample and 0 otherwise
f_fit_2	The interacted variable between f_fit and a dummy that equals 1 if CPI is over the median of the sample and 0 otherwise
Irreg_n_2	The interacted variable between Irreg_n and a dummy that equals 1 if CPI is over the median of the sample and 0 otherwise
f_fit_3	The interacted variable between f_fit and a dummy that equals 1 if fsize is over the median of the sample and 0 otherwise
Irreg_n_3	The interacted variable between Irreg_n and a dummy that equals 1 if fsize is over the median of the sample and 0 otherwise

1.3 List of abbreviations

AEUV	Vertrag über die Arbeitsweise der Europäischen Union (Treaty on the Functioning of the European Union, TFEU)
AFCOS	Anti-Fraud Coordination Service
AFIS	Anti-Fraud Information System
BMAS	Bundesministerium für Arbeit und Soziales (Federal Ministry of Labour and Social Affairs)
BMEL	Bundesministerium für Ernährung und Landwirtschaft (Federal Ministry of Food and Agriculture)
BMF	Bundesministerium der Finanzen (Federal Ministry of Finance)
CAFS	Current Anti-Fraud Strategy
CAP	Common Agricultural Policy
CF	Cohesion Fund
CPI	Corruption Perceptions Index
EAFRD	European Agricultural Fund for Rural Development
EAGF	Agricultural Guarantee Fund
EDES	Early Detection and Exclusion System

An international analysis of fraud detection in European structural

EFGL	Europäischen Garantiefonds für die Landwirtschaft (European Agricultural Guarantee Fund)
EFRE	Europäischer Fonds für Regionale Entwicklung (European Regional Development Fund)
EG	Europäische Gemeinschaft (European Community)
ELER	Europäische Landwirtschaftsfonds für die Entwicklung des ländlichen Raums (European Agricultural Fund for Rural Development)
EMFF	European Maritime Fisheries Fund
ERDF	European Regional Development Fund
ESF	European Social Fund
ESIF	European Structural and Investment Funds
EUROJUST	European Union Agency for Judicial Cooperation in Criminal Matters
EUROPOL	European Union Agency for Law Enforcement Cooperation
EUStA	Europäische Staatsanwaltschaft (European Public Prosecutor's Office)
FEAD	European Aid Fund for the Most Disadvantaged
GDP	Gross Domestic Product
IMS	Irregularity Management System (reporting system for irregularities)
ISB	Investitions- und Strukturbank (Investment and Structural Bank)
MFF	Multiannual Financial Framework
OECD	Organisation for Economic Cooperation and Development
OLAF	European Anti-Fraud Office
OPs	Operational Programmes
OP ESF Bund	Operational Programme ESF of the federal Government of Germany
OWNRES	Database relating to traditional own resources
PIF	Protection of the financial interests of the European Union ('protection des interest financiers de l'Union européenne')
VKS	Verwaltungs- und Kontroll-System (Management and control system)
YEI	Youth Employment Initiative

1.4 EU country codes

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czechia
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain

FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom

1.5 Germany's National Anti-Fraud Strategy and testing system

In Germany, the federal states are responsible and accountable for regional funds: they administer, coordinate and audit.⁵ Unit EA 6 (Protection of the EU's financial interests; EU financial control and anti-fraud; EU regulatory and executive agencies) of the Federal Ministry of Finance (BMF) does not carry out audits itself but coordinates between the federal states and the EU.⁶

The administrative authorities of the federal states – like the administrative and audit authority – are located as units within the state ministries. They implement the funding programmes according to the OP and pay particular attention to sound financial management. The delegated managing authority provides information on the programme, selects projects and monitors implementation (first-level check).⁷ The certifying authority prepares the payment applications to the European Commission. It certifies that the data come from reliable accounting systems based on verifiable and audited supporting documents. The audit authority ensures that the management and control systems of the OP are functioning. To this end, it audits the management and the projects on the basis of representative samples of declared expenditure. The audit authority operates independently and strictly separate from the other authorities. The operational audit authorities are formally attached as units to the federal states' ministries, but these sometimes make use of subordinate administration⁸ or other third parties.⁹ In some federal states there is also the set-up where the management of the audit authority sits in the ministry and the operational audit activity is carried out by state banks (with experience in audits and audit standards).

An international analysis of fraud detection in European structural

However, these differences in the individual federal state lie only in the organisation. The operational implementation of the audit is consistently carried out according to the existing EU requirements, with regard to normative law and lived administrative law (Commission guidelines, oral communications of the Commission).

Within the member states of the European Union there are three federalist countries: Belgium, Germany, and Austria. All three countries are found in the fraud prevention statistics in the group with the fewest fraud offences. Could a federal structure thus mean an impact on the quality of state control systems?

Within the OPs of the ESI Funds, the procedure for organising the distribution of competences for federally constituted states initially means additional work and costs. If a member state such as Germany has a federal structure, the funding and thus the administration of the funds is handled by the federal states under their own sovereignty. Here, the administration of each federal state forms a payment agency. In this case, the EU requires – irrespective of the size of the member state – that a so-called coordinating office also be appointed.¹⁰ This serves as the European Commission's sole point of contact for all questions concerning administration and control. The Federal Ministry of Finance (BMF), together with the Federal Ministry of Food and Agriculture (BMEL), acts as the coordinating body for the 16 German paying agencies. The federal states are responsible for ensuring compliance with EU regulations. However, the federal government remains responsible to the EU. It represents Germany, with the participation of the federal states, in dealings with the European Commission, e.g. in proceedings for charges. The EU relies on an administrative system characterised by constant control cycles and 'controls of controls'. The Commission also assesses it an error to deviate from the guidelines on administrative procedure and organisation even if the individual cases are correctly decided to a reasonable extent and do not show any errors above the materiality threshold.

The EU regulations provide for different control intensities depending on the extent of the error. However, the Court of Auditors of the federal state of Baden-Württemberg sees a disproportionate increase in administrative expenditure in relation to the control result, i.e., the correction of erroneous expenditure (Rechnungsh of Baden-Württemberg, 2015). Nevertheless, intensive controls also have a preventive effect.

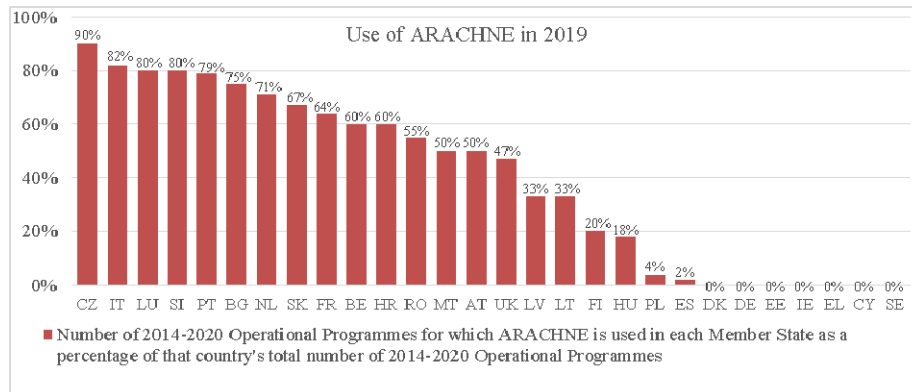
Owing the federal structure of the Federal Republic of Germany, both the federal government and the federal states are involved in the management of EU Funds. In this regard, their respective audit offices independently perform external financial control tasks for this area. Irrespective of the development and assessment of the cost-benefit ratio, Germany with its federal structure has a higher control effort than centralised states because of its additional level (the federal government as a 'coupling' between the federal states and the EU).

Funding projects co-financed with EU Funds are subject to a large number of controls by the intermediate bodies (organisational units set up in the ministries involved), the managing authority, the certifying authority and the audit authority, which are laid down in the management and control system. This high number of controls by different organisational units increases the risk of detection of irregularities and minimises risks of fraud and corruption (EFRE –Administrative Authority Bremen, 2019). To be able to identify these risks, assess them and if necessary, initiate countermeasures, the responsible bodies have at their disposal the two tools: ARACHNE and a Self-Assessment Tool.

ARACHNE is a risk assessment tool developed by the European Commission (European Court of Auditors, 2019b). Designed as an IT tool, ARACHNE is intended to detect irregularities through data mining and data enrichment and thus plays a central role in the EU's fraud prevention and fight (European Commission, n.d.). Managing authorities of the member states responsible for the implementation of OPs from the ESI Funds should identify high-risk projects and contracts as well as economic operators (contractors and beneficiaries) during their administrative audits and thus help to avoid potential irregularities in the context of preventing and combating fraud (European Commission, n.d.). An important prerequisite for this is that the competent administrative authorities enter as much data as possible into ARACHNE and systematically use the tool to detect fraud (European Court of Auditors, 2019b). Currently, the tool is available for ERDF, ESF, CF and the European Aid Fund for the Most Disadvantaged (FEAD).

ARACHNE can be used by member states free of charge, but is not mandatory to use the tool (European Commission, n.d.; European Court of Auditors, 2019b). Where and with what intensity the risk assessment tool is applied is shown in the chart in Figure 4. 21 EU countries use ARACHNE, some of them very actively, while in seven EU countries – including Germany – ARACHNE is not used at all in the context of the OP (European Court of Auditors, 2019b). This, as well as the currently still relatively small amount of data, is clearly criticised by the European Court of Auditors in its special report 2019 (European Court of Auditors, 2019b). The tool can only effectively fulfil its function in the fight against fraud if all EU member states use ARACHNE and continuously enter the most comprehensive possible data sets on suspected fraud cases into the system.¹¹

Figure 4 Use of ARACHNE in the EU member states as of 2019



Source: Own representation, data basis: European Court of Auditors 2019b).

Germany takes its own approach to risk assessment. To combat fraud and corruption, the responsible federal ESF managing authorities use a self-assessment tool (Excel tool) as part of the management and control systems (VKS), which is also provided by the European Commission. The tool is used in Germany for the ‘Operational Programme ESF Bund 2014–2020’ (BMAS, 2019b). Furthermore, individual federal states use the self-assessment tool within the framework of the ERDF programmes to develop and implement an anti-fraud strategy, such as the ERDF managing authority of the federal state of Bremen.

An international analysis of fraud detection in European structural

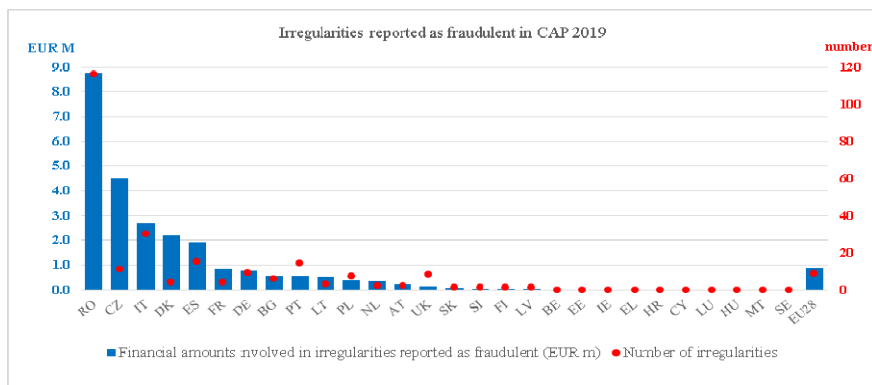
The risks and control mechanisms with regard to fraud and corruption are described in detail in the self-assessment tool. The self-assessment tool also includes an evaluation of these risks and an assessment of the effectiveness of the controls by the relevant administrative authorities. However, no company-specific data is entered into the tool and there is no IT networking or integration for data exchange between the EU member states. In this respect, the application of the self-assessment tool can currently (still) be considered an isolated solution, which effectively prevents or detects fraud and corruption from a German perspective, but does not systematically record transnational information and extended findings on combating fraud and corruption. Ultimately, this also does not allow for cross-national and thus networked data mining in the field of risk assessment. Despite intensive research and enquiries in German ministries and the EU, no information can be obtained about which EU countries still use the self-assessment tool intensively in addition to Germany.

We develop a country-, fund-, and thus also sector-specific analysis of irregularities on the expenditure side in the context of the ESI Funds. The following analysis focuses on *fraudulent* irregularities in the 2014-2020 programming period in selected ESI Funds.¹² Germany draws exclusively on funds for the Common Agricultural Policy and Fisheries (EAFRD and EMFF), at the state level on the Regional Development Fund (ERDF) and at the federal level on the Fund for predominantly labour market policy measures (ESF). In the following, these funds are analysed sector- and country-specifically with regard to identified irregularities, with a special focus on Germany.¹³

The Common Agricultural Policy (CAP) is financed by two EU Funds: the European Agricultural Fund for Rural Development (EAFRD) and the Agricultural Guarantee Fund (EAGF). The resources from these two funds reach a share of around 40% of the EU budget (European Commission 2020c).

A first country comparison of fraudulent irregularities reported in the agricultural sector is shown in Figure 5. The detected fraud cases with a loss volume of more than EUR 1 million are concentrated in a few countries, namely Romania, the Czech Republic, Italy, Denmark and Spain. Germany (DE), with a total of 9 reported cases and an amount of EUR 0.76 million, is roughly in line with the EU average. The total volume of claims from the 235 cases reported as fraudulent in the CAP amounts to EUR 24.6 million in 2019.

Figure 5 Irregularities reported as fraudulent in CAP by member states 2019

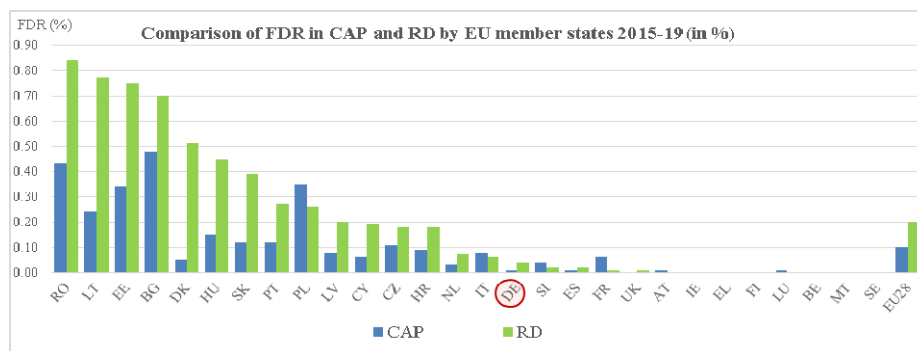


Source: Own representation, data basis: European Commission (2020b).

Various factors can account for the concentration of fraud cases in a few states. The probability of success in detecting fraud is likely to depend, among other things, on the effectiveness and thus the quality of the country-specific fraud and detection instruments. This also raises the question of the extent to which the range of instruments has been applied and to which fraud prevention measures have been consistently introduced in the EU countries. In the member states, the application of criminal law necessary to protect the EU budget also varies, which could further explain the differences between countries (European Commission, 2020a).

If we first compare the fraud detection rate for fraudulent irregularities for the CAP as a whole, the highest number of fraud cases during the period 2015–2019 can be found above all in the market support measures (intervention in agricultural markets), with an average of 0.87%, followed by fraud offences in the area of rural development (RD), with 0.2% (see Figure 6). For CAP, the average fraud detection rate is 0.1% (EU-28, European Commission, 2020c). The fraud detection rate for RD is thus higher than for CAP as a whole. This finding is also confirmed by a country comparison.

Figure 6 Comparison of fraud detection rates (FDR) in CAP and RD from 2015–2019 by member state



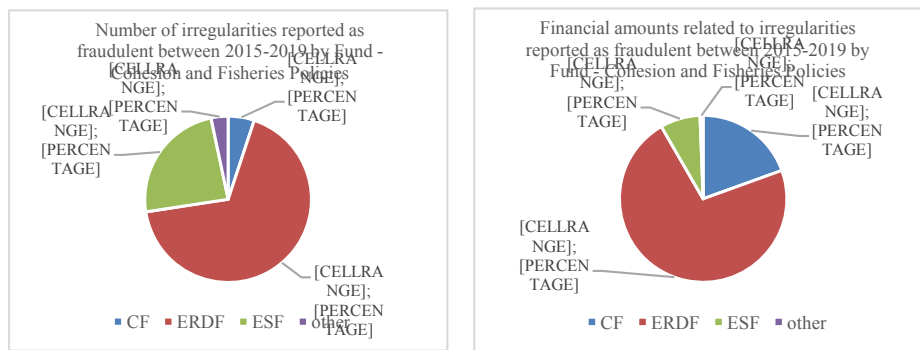
Source: Own representation, data basis: European Commission 2020c).

The fraud detection rates in CAP and RD in the period 2015–2019 show a certain correlation in the individual member states: Countries which show a high FDR in RD also show a comparatively high FDR in CAP. These countries include Romania, Lithuania, Bulgaria and Poland. For the group of countries around Denmark, Hungary, Slovakia and Portugal, the fraud detection rates in CAP are below or at the EU average, but the FDR in RD produces values significantly above the EU average. In contrast, groups of countries with little (e.g., Slovenia, Spain or Austria) or no fraud (e.g., Ireland, Finland, Belgium or Sweden) can also be identified. The validity of this finding is supported above all by the values also obtained in the CPI 2019, according to which, e.g., there is a generally low propensity for fraud and corruption in Finland or Sweden.¹⁴ Nevertheless, among the countries with FDR values of zero, it cannot be ruled out that – despite perceived cases of fraud or suspected fraud – no data was reported to the European Commission or OLAF.¹² Germany, which has FDR scores well below the EU average in both RD and CAP, provides a satisfactory result and can be considered a successful member country in fraud detection in the context of receiving agricultural funds (for the time being).

An international analysis of fraud detection in European structural

A comparison (see Figure 7) between the individual ESI Funds with regard to fraudulent irregularities proves the priority of combating fraud and corruption in the European Regional Development Fund (ERDF). Measured by the number and the financial volumes involved in fraudulent irregularities, the ERDF is the focus: 67.5% of all cases and 72.2% of the EU funds granted are attributable to fraud offences in the ERDF. Around a quarter of the cases relate to the ESF, but only 7.7% of the funding involved. Since Germany does not currently receive any funding from the CF, this fund will not be considered in the further course of the analysis.

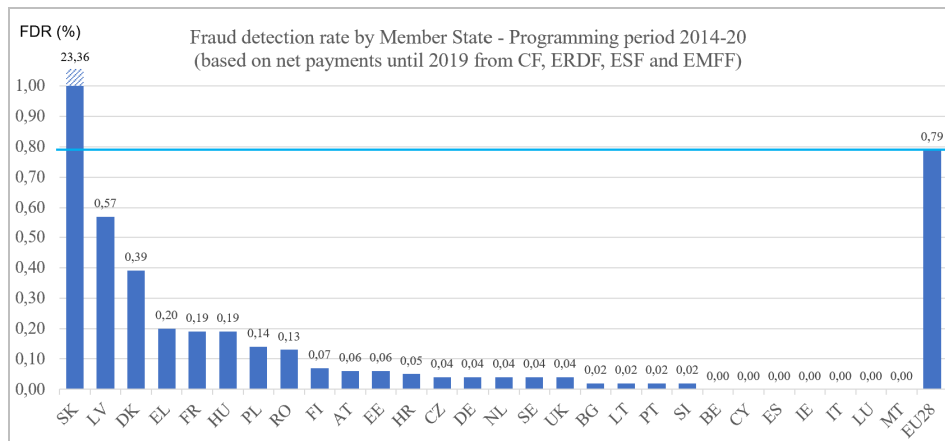
Figure 7 Number of irregularities reported as fraudulent and financial amounts related to irregularities reported as fraudulent by fund 2015–2019



Source: Own illustration based on European Commission 2020d).

If we now analyse the fraud detection rate across all four funds, i.e., CF, ERDF, ESF and EMFF, it is striking that with an FDR of 0.79% a comparatively high average value is shown for the EU-28 (see Figure 8).

Figure 8 Fraud detection rate by member state, programming period 2014–2020, based on net payments until 2019 from CF, ERDF, ESF and EMFF



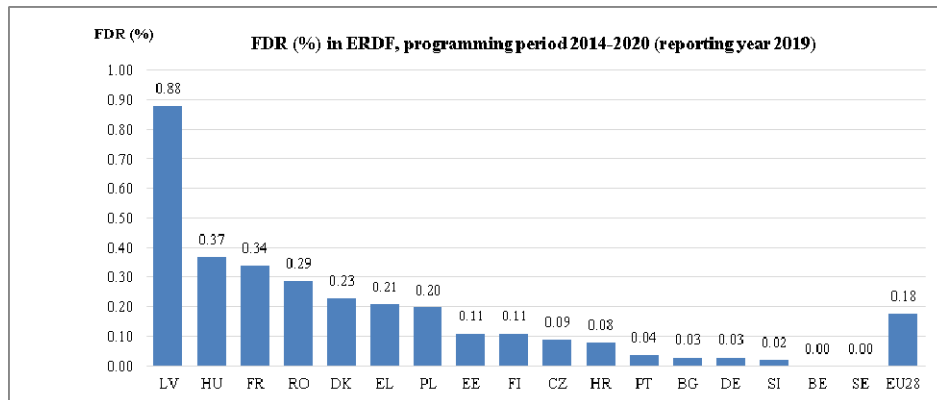
Source: Own representation, data basis: European Commission 2020d).

Across all ESI Funds, Slovakia provides a significant deviation, as the country reports an FDR of 23.36%, meaning that around 23% of the expenditure received is classified as fraudulent irregularities, which is a very high proportion and could thus be interpreted as a very poor performance in the fight against fraud. However, this is due to only three cases in Slovakia, which cause a loss of EUR 850 million – Slovakia can thus be classified as a significant outlier. Deviating from this, but still with high-FDR values, are Latvia and Denmark, followed by Greece, France and Hungary. It is astonishing that Denmark, which is generally little affected by fraud and corruption, has a significantly high value of 0.39%.

In the further categorisation of FDR below 0.15 to 0.05% are the countries Poland, Romania, Finland, Austria, Estonia, Croatia and the Czech Republic. The category of countries with a very low FDR below 0.05 to 0.02% also includes Germany, with 0.04%, which suggests that the existing measures to combat fraud and corruption are having an effect. Finally, member states with an FDR of 0% (e.g., Belgium, Cyprus, Spain) are supposedly without fraud. However, the criticism of the European Court of Auditors is likely to apply here as well, by which administrative authorities of the member states examined by the Court make no or only insufficient reports on cases of fraud or suspected fraud.

If we look further only at the fraud detection rates for ERDF in particular, the data basis at country level becomes narrower: of 28 possible EU states, only 17 countries reported their specific FDR in 2019 (see Figure 9).

Figure 9 Fraud detection rate in ERDF by member state 2014–2020. Reporting year 2019, without outlier Slovakia with an FDR value of 47.46% – no data from remaining EU countries



Source: Own representation, data basis: European Commission 2020e).

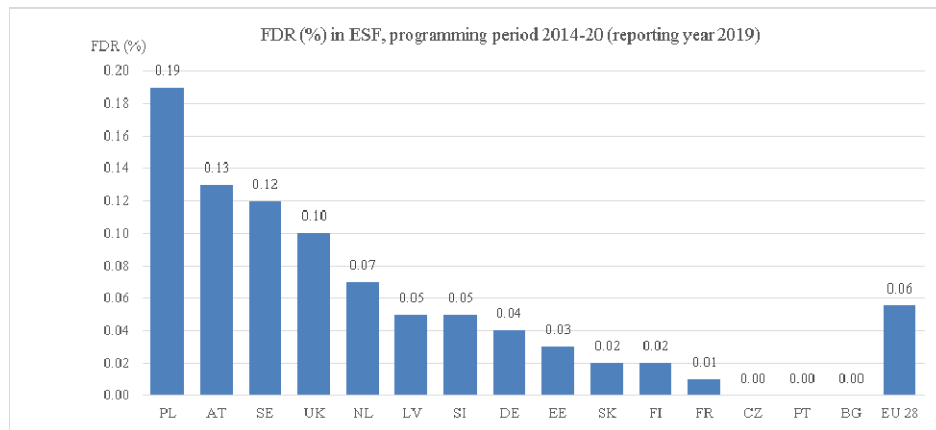
The EU-28 average FDR is a relatively low 0.18%, with Latvia, Hungary, France, Romania, Denmark, Greece and Poland above. Below average values are recorded by 10 countries which can demonstrate a positive fraud detection rate, including Germany with a very low value of only 0.03%. Here, too, it seems reasonable to assume that Germany successfully prevents or detects fraud and corruption at an early stage with the established management and control systems in the ERDF Operational Programmes (OPs). This is also confirmed, e.g., by the risk management report of the Federal State of Bremen in the ‘ERDF Bremen Operational Programme’ prepared in 2019, which

An international analysis of fraud detection in European structural

highlights Germany's positive performance with regard to the prevention and punishment of legal violations in cases of fraud and corruption (EFRE – Administrative Authority Bremen, 2019). Comparable, confirming statements are also made by other German states participating in OPs.

The last fund area to be examined in more detail is the fraud detection rate in the European Social Fund (ESF). Figure 10 shows the country-specific FDR values in ESF for the 2014–2020 programming period in the reporting year 2019.

Figure 10 Fraud detection rate in ESF by member state 2014–2020. Reporting year 2019, no data from remaining EU countries



Source: Own representation, data basis: European Commission 2020e).

First of all, in the area of ESF it is striking to find countries with relatively high FDRs which are otherwise considered less susceptible to fraud as measured by the CPI for 2019, including Austria (CPI 77), Sweden (CPI 85), the UK (CPI 77) and the Netherlands (CPI 82), but also Germany (CPI 80). With an FDR of 0.04%, Germany still has an acceptable value, but this is only slightly below the EU average of 0.06%. Even Finland, which is considered to be low in fraud and corruption, still has a value of 0.02%. One reason for this could be that countries with a higher gross domestic product (GDP) also benefit from EU spending from the ESF and may also cause higher loss volumes if fraud is detected. Atypical, on the other hand, are the data from the Czech Republic, Portugal and Bulgaria, which each report FDR values of 0%. This finding does not correlate with the consistently high CPI values in these countries¹⁶ and suggests that potential fraud and corruption cases may not be detected in the ESF or are not, or only incompletely, entered into IMS for administrative reasons.

As with the previously analysed ESI Funds, the reasons for the significant differences at country level remain hidden in the case of the ESF, and no firm statements can be made due to the lack of background information. With its descriptive methodology and the existing data gaps, the analysis only provides a rough assessment of fraud detection in individual EU member states. Previous studies (e.g., European Commission, 2019a) or reports (especially audit reports, for example the findings of European Court of Auditors, 2019a) cannot explain, or can only begin to explain, why the fraud detection rates vary so widely. In a study prepared by Price Waterhouse Coopers (PWC) on behalf of the European Commission to take stock of fraud and corruption prevention in the ESI Funds,

T. Baumgärtler, P. Eudelle and J. Gallud Cano

fraud prevention measures in a sample of 50 OPs for the planning period 2014–2020 are examined on a country-specific basis (European Commission, 2019a). However, questions remain unanswered, such as the causes of the country-specific differences, the way in which the fraud assessment is carried out or how effective the measures taken actually are. Against this background, a more in-depth investigation of the specifics of individual EU member states would be helpful in order to explain the different performance in fraud detection and, based on this, to be able to derive recommendations for action – also in the sense of a best practice for other EU states.