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EU' Battlefront on Corruption: A panel study on the effect of anti-corruption strategies in the EU

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Abstract:

This study investigates the effects that anti-corruption strategies implemented by the European Union (EU) had in reducing corruption levels within its member states, which are measured using the V-Dem Project Database. Utilizing a panel data set encompassing 27 EU countries from 1999 to 2022, the analysis employs a country fixed effects model. EU initiatives, namely the European Public Prosecutor's Office (EPPO), the European Anti-Fraud Office (OLAF), the Protection of the Union's Financial Interests (PIF) Directive, and the EU Whistleblower Protection Directive, are examined for their impact on corruption levels. The results indicate that the activities of EPPO and OLAF have a significant negative effect on corruption, particularly with a time lag, highlighting the delayed but substantial impact of these measures. The PIF Directive and the Whistleblower Protection Directive did not show a significant immediate impact. Interestingly, government size was found to have a negative effect on corruption. The study reinforces existing literature on the importance of economic prosperity, democracy, and good governance in reducing corruption. It also provides new insights into the role of EU-specific anti-corruption agencies and directives. This study provided a robust methodology but still faces limitations such as potential reverse causality, data quality, and the relatively short time frame for some measures are acknowledged, suggesting avenues for future research.

Keywords: Anti-corruption, European Union, Panel Data, Country Fixed effects, EPPO, OLAF

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1. Introduction

The formation of the EU as a trading and political block has been one of the most impactful things to happen to the European continent and was a result of a long-standing idea of European federalism which materialized in the ashes of World War 2. Beginning in 1952, as the European Coal and Steel Community, it has grown and evolved through multiple stages such as the European Community and today encapsulates 28 member states, with more waiting to join. These aspiring countries, as well as those that already joined, believe that the European single market and community are crucial for achieving economic prosperity. As the European Union grew, so did the complexity of its bureaucracy, which has led to opportunities in enhanced cooperation between nations but has also opened the doors to new challenges such as corruption, which manifests itself more and more these days. Notable cases such as Qatargate in 2022 (Braun et al., 2023) or the Pfizer controversy (Stavis-Gridneff, 2021) concerning the president of the EU, Ursula von der Leyen, are just the most prominent cases of grand corruption in the EU. Occurrences such as these, but also smaller scale embezzlement and corruption have been an enduring challenge for the EU and its governing bodies.

Political corruption, which is defined generally as the abuse of public office for private gain and can take multiple shapes, from bribery and embezzlement of public funds to the capture of independent institutions (Transparency International, 2022). The harmful effect of corruption is that it undermines democratic institutions and hampers economic development (Rose-Ackerman & Palifka, 2016).

Now, when discussing corruption in the case of the European Union, in any supranational body it is very hard to stifle problems such as corruption, due to the legal challenge diverse legal and administrative frameworks across member states present. In the European Union, this is a particular issue as countries have different governmental and legislative structures. This is seen in practice by the distinct schools of legal systems that are found in the EU, such as Germanic, French or Scandinavian schools of law, which all have different ways of legal proceedings. Another big obstacle to rooting out corruption is the amount of money coming out of the European Union's funds. For example, the *NextGenerationEU*, a program designed to help the Union recover from the pandemic will provide 712 billion € by 2026 to the member states (European Commission, 2022). Due to all

of this mentioned the EU, albeit from all sources, not only ones concerning EU funds, faces a staggering number of almost 905 billion € of damages due to corruption annually across its member states (Carrera et. al., 2016). This has all led to the European Commission recognizing corruption as a problem that “seriously harms the economy and society as a whole” (European Commission, 2020) and has made the fight against in one of the key issues of the EU.

In the wake of the EU’s first major scandal, which was the allegations of corruption of the EU Commission led by then President Jacques Santer, the result of which was an *en masse* resignation of the Commission, the first manifestation of the solution to the problem of corruption appeared in 1999. This was the creation of the European Anti-Fraud Office or OLAF (*Office Européen de la Lutte Antifraude*) which was designed to be an independent body that worked under the European Commission that would investigate all matters related to corruption but also fraud, smuggling and drug trafficking. While OLAF in its 25 years of service has seen many successes, it has not been without faults. Most notably, OLAF is not a sanctioning body and does not have the legal framework to itself prosecute the parties it finds suspicious. Rather, OLAF can only recommend the national bodies of a country to prosecute offenders which can often lead to cases where national bodies refuse to cooperate with OLAF and take their recommendations, which was often the case in more generally corrupt countries in the EU block.

Due to these shortcomings, the EU bodies have decided to take another approach, which has radically changed the way corruption is combatted. It started in 2017, when the EU first introduced the PIF Directive with the EU Directive 2017/1371 (EUR-Lex, 2017). The Directive states: “The PIF Directive aims to strengthen the protection of the Union’s financial interests through criminal law, ensuring that offenses such as fraud and corruption are uniformly defined and effectively prosecuted across the EU” (European Commission, 2019). This was the directive which established the legal framework and precedent for the formation of the EPPO and thus these two structures are intertwined. (EUR-Lex, 2017).

After this, a step was taken to protect whistleblowers who uncover corruption inside the EU. The Whistleblower Protection Act of 2019 was adopted to ensure robust legal safeguards for whistleblowers across all member states, which ensures that people who report breaches of the law and presence of corruption cannot get demoted, fired or prosecuted due

to their acts. The directive requires member states to implement national laws that will be in line with the writing in the directive. It was planned by the Commission that by December 2021, all member states write the directive into their national legislature.

The final step in this new chapter of the EU was their crown jewel of anti-corruption called the European Public Prosecutor's Office. Founded in 2019 with a delayed start in operational activities due to the COVID-19 pandemic, this office, headed by the former Romanian prosecutor Laura Kövesi is a centralized office with the legal authority to prosecute all financial crimes related to the funds of the EU budget in the signing member states. According to the European Commission, "The EPPO is a crucial step towards a more integrated and robust enforcement of EU financial interests, enabling a more efficient and coordinated fight against crimes that damage the Union's budget" (European Commission, 2022). The EPPO, in its limited existence has already shown great promise, as in 2023, it had 1927 active investigations with over 19.2 billion € in damages (EPPO, 2024).

As mentioned before, the EU has had a long-standing problem with corruption and misappropriation. On the one hand, the EU poses strict restrictions and conditions on prospecting member states and makes them revise their legal framework in order to be considered for entry, which in theory lowers corruption. On the other hand, countries, once they join the EU, join a system with extensive bureaucracy and with a massive number of regulations which indirectly creates new opportunities for corruption. This dual impact of EU membership is a phenomenon which was researched by a paper titled "EU accession: A boon or bane for corruption?" by Alfano et al. in 2020. This paper will serve as a basis for this research, which will expand upon its findings by adding an additional layer of complexity in the form of examining the effects that the EU's internal mechanisms have on the levels of corruption.

By looking at insights from existing literature and implementing new observations, this research comes to the results that some of the measures taken by the EU have a significant negative effect on the levels of corruption observed, while some did not. These findings were robust and consistent throughout several iterations of the model. The rest of the paper's structure will consist of a comprehensive review of existing literature and methodology followed by the data, results, conclusion and limitations sections.

2. Literature review

The ideas behind this study are based on what drives corruption and on the mechanisms that stop it. Literature has so far quite extensively discussed and analyzed the determinants of corruption in general (Dimant & Tosato 2018, Lambsdorff 2006). On the other hand, in spite of considerable public interest in the topic, there is little work which discusses anti-corruption measures and their effectiveness, especially the ones inside the European Union.

Dimant & Tosato (2018), as mentioned above, provide an extensive analysis of a number of determinants of corruption, the relevant ones being economic and legislative variables such as government size and structure, GDP per capita, press freedom etc. This paper is used as a starting point for any research into this topic and is an invaluable resource when trying to isolate a specific determinant on corruption by including controls.

When discussing governmental determinants, studies have analyzed the relationship between regulation and legislative complexity and corruption. The first papers that deal with this phenomenon are Rose-Ackerman (1999) and Goel & Nelson (1998). Goel & Nelson (1998) find in their paper a significant positive relationship between public spending and the perception of corruption. This is explained by the authors by saying that more public spending provides more opportunity for rent-seeking behavior, which will then lead to corruption. Following these papers, a paper by Goel (2012) finds that procedural complexity and the inefficiency of bureaucracy have positive effects on levels of corruption. This is relevant as EU membership acts as an additional layer of red tape and regulations and might provide an environment in which corruption will be more present.

Existing literature also discusses more nuanced measures of government quality by investigating the relationship between indicators of governance and corruption (Goel 2012; Treisman 2000). The findings generally show a negative relationship between the two, i.e. better governance leads to lower levels of corruption.

Alfano et Al. (2020) is a paper that analyses the specific issue of corruption in the realm of the EU and researches the effects of EU membership on levels of corruption inside a member state, while controlling for the previously mentioned variables. They find that countries present a decrease in corruption levels pre-accession, but then experience an

increase post-accession. This paper was the inspiration for the design of this research paper and provide a basis for the setup of the analysis's base design.

When it comes to literature that provides insight into the effects of specific EU anti-corruption measures, only qualitative research is available. Bellacosa & De Bellis (2023) examine the EU's anti-corruption strategy and the synergy between OLAF and EPPO. They conclude that EPPO and OLAF combined with the legal instruments of the 2017 Directive on the protection of the EU's financial interests (EURLex, 2017) can only prove effective if concise legislature is introduced for the cooperation between offices.

The general findings of many of the papers analyzing corruption is that countries which have higher levels of transparency and a culture of integrity and individual accountability tend to have lower levels of corruption. This is something that was addressed in a paper by de Sousa (2009), which finds mixed results when it comes to the effectiveness of anti-corruption agencies (ACAs). This paper finds that the effectiveness of ACAs is highly contingent on their design and operational autonomy from the political context. These are all papers which provide evidence in favor of European agencies that deal with corruption.

To sum up, while there is a big pool of literature, both theoretical and empirical from which this research will draw inspiration and findings from, it seems that the isolated effects of anti-corruption measures by the EU have not been properly tested from a quantitative perspective. In addition to expanding the academic discourse, this paper's findings provide policy implications to the space of European legislative discussion.

3. Methodology

The EU, since its inception in 1952, when the six original countries first formed the European Coal and Steel Community, has steadily grown into the premier supranational body in the world, second only to the United Nations. The EU today consists of 28 countries with multiple waves of expansion. The latest and biggest of these was the 2004 wave when 10 new countries, all of them being from Eastern Europe, joined. Table 1 below summarizes all the dates associated with the countries used in the sample.

On the other hand, the EU that is known today, was envisioned and executed in the treaty of Maastricht in 1992 which laid the groundwork and the legal framework for all the projects and initiatives this paper will be discussing. The dataset in this paper will have a panel structure and will comprise of 27 countries from 1999 until 2022. This timeframe was chosen to coincide with the start of activities of the oldest anti-corruption strategy, OLAF. All countries included have become member states of the European union at some point during this time interval (for details, see Table 1).

Since the analysis itself is about examining the effects of specific anti-corruption measures in countries, this research will do within-country comparisons over time and will use country fixed effects. This model will help control unobserved time-invariant characteristics within each country. What needs to be noted is that while this approach will help identify correlation between anti-corruption strategies and corruption levels, it does not clearly establish causation. There are multiple problems, the biggest one being reverse causality which would be the idea that levels of corruption influence the adoption and activity levels of anti-corruption measures. This will be considered in the analysis and addressed in the results section. The absence of time-fixed effects in the methodology is mainly down to the underlying design of the research. The goal is to provide an analysis which is not confounded by endogenous factors that are country specific, as noted before. Time-fixed effects, while it could provide useful to detect trends across time, lacks the ability to discern between country specific factors which might be drivers of corruption and due to this, country-fixed effects is chosen.

Based on the above discussion and literature review and to best focus on the questions posed in the Introduction, a hypothesis was formulated:

H1: *The implementation of EU anti-corruption strategies is associated with a decrease in corruption levels in EU member states, controlling for other relevant factors. ceteris paribus*

Table 1: EU joining process

Country	Application	Start of negotiations	End of negotiations	Member of the EU
Cyprus	3/7/1990	31/3/1998	12/2002	1/5/2004
Czech Republic	17/1/1996	31/3/1998	12/2002	1/5/2004
Estonia	24/11/1995	31/3/1998	12/2002	1/5/2004
Hungary	31/3/1994	31/3/1998	12/2002	1/5/2004
Latvia	22/6/1995	13/10/1999	12/2002	1/5/2004
Lithuania	8/12/1995	13/10/1999	12/2002	1/5/2004
Malta	16/7/1990	13/10/1999	12/2002	1/5/2004
Poland	5/4/1994	31/3/1998	12/2002	1/5/2004
Slovakia	22/6/1995	13/10/1999	12/2002	1/5/2004
Slovenia	10/6/1996	31/3/1998	12/2002	1/5/2004
Bulgaria	14/12/1995	13/10/1999	14/12/2004	1/1/2007
Romania	27/6/1995	13/10/1999	14/12/2004	1/1/2007
Croatia	21/2/2003	20/10/2005	30/6/2011	1/7/2013

To formally test this hypothesis, the following empirical model was designed:

$$CORR_{it} = \beta_0 + \beta_1 X_{it} + \beta_2 Y_{it} + \beta_3 CORR_{i(t-1)} + \beta_4 Y_{i(t-1)} + \beta_5 Y_{i(t-2)} + \varepsilon_{it}$$

In this model β_0 represents the constant and X_{it} is the matrix of the country specific control variables (for more details, see Table 2). Y_{it} will be the matrix of independent variables which signify the anti-corruption strategies in question. $CORR_{i(t-1)}$, $Y_{i(t-1)}$ and $Y_{i(t-2)}$ represent the lagged values of the dependent variable (corruption index) and the lagged values of the anti-corruption measures, respectively. This is used to address issues such as reverse causality and the presence of autocorrelation. The number of lags that was chosen was contingent on data availability. If the number of lags was increased, due to the limited data sample, it would not provide any further variation. This is a possible limitation mentioned later in the paper. Lastly, ε_{it} will represent the clustered robust error estimates which will address the potential issues of heterogeneity among countries.

The dependent variable will measure the spread of corruption in a country, based on the index of corruption provided by the V-Dem Institute from their Democracy report. (Details about methodology and scaling are found in Table 2). This index has a better methodology as it takes into account more objective values of corruption and does not suffer from the same issues the widespread but often criticized Corruptions Perceptions Index from Transparency International has, such as a change in methodology around 2011 which makes the index unusable for empirical research. (Alfano et al. 2020)

As presented before, following preexisting literature close to this topic, a general model that describes corruption as a function of multiple regressors, while controlling for country fixed effects, was chosen. The control variables chosen were drawn from existing literature as proven determinants of corruption. (Aidt 2003; Dimant & Tosato 2018). The ones that were chosen separated into different categories. These are economic prosperity with GDP per capita (*GDPperCapita*), legal prosperity (*RuleOfLaw* and *GovtEff*), democracy (*DemIndex*) and government structure (*GovtSize*, *Decentralization*).

In order to better see the effect the government has on corruption; different dimensions were considered. As mentioned before, government size and government structure are used. Evidence from Fisman & Gatti (2002) shows that more decentralized countries show lower levels of corruption, which is why *Decentralization* was chosen. Next, research suggests that with a bigger GDP of a country, the costs of corruption go up, which is seen in lower levels of corruption in wealthier countries (Serra, 2006). Finally, the size of government (*GovtSize*) is observed as more red tape and bureaucracy was shown to lead to more corruption, ceteris paribus (Guriev, 2004) and the government quality (*GovtEff*) is presumed to lead to less corruption.

In the legal prosperity arena, two variables are included as regressors, with the first one being the degree of democracy (*DemIndex*). This index is based on the amount of due and fair legal processes and freedom of press which are both indicators of a working legal system, which should in theory stifle corruption, but empirically this is debated (Dimant & Tosato 2018). The second variable that is included is Rule of Law (*RuleOfLaw*), which indicates the level of fairness and efficiency of a justice system in this task of punishing illegal activities, one of which is corruption.

When discussing the independent variables that this research will be focusing on, the focus is on four key elements in the European Union's (EU) anti-corruption framework: the European Public Prosecutor's Office (EPPO), the European Anti-Fraud Office (OLAF), the Protection of the Union's Financial Interests (PIF) Directive and the EU Whistleblower Protection Directive. The measures of PIF and the EU Whistleblower Effect have been implemented at different times over member states, but this is due to the speed of national legislative bodies and the bureaucratic processes that take place when implementing laws and it is the presumption of this research that this is an exogenous effect which should not present a threat to the internal validity of the research. When talking about EPPO on the other hand, this office was signed into effect simultaneously by all participating countries, but some countries did not adopt EPPO at all, potentially due to issues about national sovereignty or to avoid detection of corruption by bodies governments have no control over and this phenomenon will be discussed in the discussion part of the research. All these policies are implemented across the entirety of the EU and do not vary over member states in their legislative power, so there is no danger of discriminatory legislation which would confound the effects.

EPPO, which was established by Council Regulation (EU) 2017/1939 (EUR-Lex, 2017) is a new judicial body of the EU and represents a significant switch in the EU's judicial framework and paradigm in the addressing of corruption and financial crimes. By definition, EPPO is an independent and decentralized prosecution office of the EU, tasked with investigating, prosecuting, and bringing to judgment crimes against the EU budget, such as fraud, corruption, and cross-border VAT fraud. (European Commission, 2021). This research will construct an index measuring the intensity of EPPO activities and observe its effectiveness (See Table 2 for details on construction). The same methodology will be used to construct an index that will describe the levels of activity for the OLAF office.

The PIF Directive, which was adopted in 2017 with the EU Directive 2017/1371 (EUR-Lex, 2017) has the goal of strengthening the legal framework for protecting the EU's financial interests by harmonizing definitions, penalties, and sanctions for fraud and related criminal activities across member states. It helps the judicial bodies of the EU in prosecution by providing a legal basis for fraud and corruption. The European Commission highlights the PIF Directive as *"a crucial tool for reinforcing the fight against fraud affecting the EU's*

budget" (European Commission, 2017). In the analysis, it is designated as a dummy variable, which indicates the adoption by a specific member state.

Lastly the EU Whistleblower Protection Directive, which was established with the EU Directive 2019/1937 (EUR-Lex 2019) provides the minimum standards for member states regarding the protection of whistleblowers who report on general breaches of EU law and more specifically, corruption. It is represented as a dummy variable indicating implementation from a specific member state.

4. Data

To empirically test the aforementioned equation, data was gathered from a multitude of sources spanning from 1995 to 2022. Table 2 summarizes all variables, their data sources and methodology. It also shows the means and standard deviations in the parentheses in the last column of the table.

As mentioned before, data from the V-Dem project was used for our dependent variable, which is a normalized continuous variable with a range [0,1], where a higher value denotes a higher level of corruption. This database is also used for the index that measures democracy levels. The rest of the control variables regarding economic and governance indicators were sourced from the World Bank. The independent variables indicating either the presence or activity levels of specific anti-corruption strategies were sourced from internal reports by the EPPO and OLAF and EUR-Lex respectively. The only one that could not be sourced from internal documents was the implementation of the Whistleblower Act, as the actual date of implementation was needed to provide accurate information and this was sourced from OneTrust Data Guidance.

Table 2: Variable definitions, sources and summary statistics

Variable	Description	Source	Statistics
GDPperCapita	Gross Domestic Product per capita (in constant dollars)	World Bank (2022)	29027.525 (11483.082)
RuleofLaw	Measures the rule of law, based on the perception that individuals abide by the law. Index scaled from -2.5 to 2.5"	World Bank (2022)	1.060 (0.622)
GovtSize	General government final consumption as a percentage of GDP	World Bank (2022)	0.199 (0.030)
DemIndex	Index that measures democracy as an aggregate index which goes from 0 to 10, where the higher numbers signify higher levels of democracy	V-Dem Database (2022)	0.757 (0.113)
PoliticalCorruption	Index that measures corruption and gives an overview of corruption in a country. Normalized index that goes from 0 to 1 with higher numbers signifying higher corruption	V-Dem Database (2022)	0.155 (0.156)
Decentralization	Measures decentralization as a percentage of public expenditure for sub-national governments.	World Bank (2022)	9.876 (6.832)
PIFDirective	Measures the presence of implementation of the PIF directive by member states. Dummy variable equals 1 when the law went into effect	EUR-Lex(2022)	0.214 (0.411)
EPPO	Normalised index (from 0 to 1) which takes the average of seized assets and opened investigations in a member state. Index is equal to zero if a member state is not participating in EPPO	European Public Prosecutor's Office (2022)	0.013 (0.078)
OLAF	Normalised index (from 0 to 1) based on the cases per capita for a specific year in a member state. All member states participating.	European Anti-Fraud Office (2022)	0.0807 (0.000)
WhistleblowerAct	Dummy variable indicating the implementation of the Whistleblower Act mandated by the European Commission	OneTrust Data Guidance (2022)	0.019 (0.135)
EU	Dummy variable indicating when a country has formally joined the European Union	EUR-Lex (2022)	0.825 (0.380)
GovtEff	Measures government effectiveness. Captures the perceptions of the quality of public and civil service in member state	World Bank (2022)	1.077 (0.620)

5. Results

In order to test the main hypothesis, which was the effect of various anti-corruption strategies, a decision was made to employ a country fixed effects model with lagged values with robust standard errors clustered by country. This approach controls for country-specific unobserved time-invariant factors, which will help to isolate the effects of anti-corruption measures. This was decided after running primary analysis on the dataset after cleaning it. Three separate tests were run; A Variance Inflation Factor test, which showed limited multicollinearity of 3.52, which was found to be an acceptable level. Next a Woolridge test for autocorrelation was run which showed a F-test value of 83.1, which shows a significant level of autocorrelation between the error terms. Finally, a Modified Wald test was run, which again showed a Chi-Square value of 20436.73 which shows an almost certain presence of heteroskedasticity.

As mentioned before, there is a potential for delayed effects of anti-corruption effects but also for corruption itself to be autocorrelated. Due to this, the research will progressively build the models. The results section starts with a baseline model and introduces lagged independent and dependent variables to assess the delayed impact of anti-corruption policies and corruption itself.

Model 3.1, which is the baseline model with no lags and shows the immediate relationship between anti-corruption measures, controls and corruption levels within the countries. The results show that, of the control variables, the ones for GDP per Capita, Rule of Law, Government size and Democracy are all significant at a 5% significance level. The coefficient of the variable EPPO was found to be significant at a 5% significance level, while the rest of the anti-corruption measures were not found to be significant.

In Model 3.2, a lagged corruption value was added into the analysis which accounts for the persistence of corruption across time. This is done, as mentioned before, to try and solve the issue of autocorrelation. The results in this model now show a 5 % significance level for controls GDP per Capita, Democracy and the lagged values of Corruption. All of the anti-corruption variables are insignificant under a 5 % significance level in this model, although EPPO remains significant under a 10 % significance level.

Next, Model 3.3 is introduced, and it adds the lagged values of the anti-corruption strategies in addition to the lagged corruption values. The results that now GDP per Capita and Democracy are significant from the control variables and also Government Efficiency is significant for the first time, all at a 5 % significance level. None of the introduced lagged anti-corruption variables are significant at a 5 % significance level, while the lagged corruption variable remains significant as was previously seen in model 3.2.

Finally, Model 3.4, which will include all previous variables and will add an additional layer of auto correlation and will add second lags for all key variables. This represents the most comprehensive analysis of the factors included in this research. The results show that GDP per capita, Rule of Law, Democracy are the only controls significant at a 5 % significance level. Out of the anti-corruption variables, the first and second lag of the OLAF and the second lag of the EPPO are significant at a 5 % significance level. Lastly, the first lag of corruption remains significant at a 5 % significance level, while the second lag is not significant.

5.1. Summary of results

After obtaining all the models, the analysis offers us insights. Almost all control variables that were found to be significant affirm their pre-existing effects from literature. The exception was *GovtSize*, which was found to have a consistent negative effect on corruption, which is contrary to existing research and is an interesting find. This could be associated with the fact that larger governments that have larger budget have more resources to invest in building better institutions with higher oversight levels. Another possible explanation could be that the finding is contextual. As this research is based only on EU countries, which has one of the strongest and most robust legal frameworks in the world, larger government means more resources to combat corruption levels, whilst in other countries in the world, which existing literature such as Guriev (2004) has explored, larger government size could lead to higher bureaucratic inefficiencies or rent-seeking behaviors.

Regarding the variables of interest, the variable *EPPO* had a significant negative effect on the level of corruption found in member states only in model 1. What was also found was a significant effect of its second lag in model 4, which further strengthens the idea that anti-corruption measures have a time delayed effect. The variable *OLAF* was not found significant in any of the models, but its first and second lag was found to be significant in the

last model, which would again point to the idea that anti-corruption measures most strongly affect corruption levels with a time lag. On the other hand, the magnitude of this effect was found to be very small, namely $1.38E-11$ for the first lag and $-2.75E-11$. This could enforce the initial assumption about the OLAF office made in the introduction, which is that its impact on corruption, although existent, is quite small. The two following anti-corruption measures, namely *PIFDirective* and *WhistleblowerAct* and their lags were not found to be significant in any of the models throughout the research.

Table 2: Country Fixed Effects Regression Results

Model	3.1		3.2		3.3		3.4	
	Coefficient	St. error	Coefficient	St. error	Coefficient	St. error	Coefficient	St. error
GDPperCapita	-5.57E-06***	1.24E-06	-4.09E-06***	1.43E-06	-5.07E-06***	1.48E-06	-3.05E-06***	1.29E-06
RuleofLaw	-0.0390277**	0.019368	-0.0233791	0.0215243	-0.0355635*	0.0209753	-0.0744924***	0.0272112
GovtSize	-0.3651836**	0.1840473	-0.4286336*	0.242391	-0.3743709*	0.1988128	-0.5015466*	0.2896983
DemIndex	-0.3917137***	0.0421441	-0.2796355**	0.1034527	-0.4865062***	0.0504574	-0.6565699***	0.0728591
Decentralization	-0.0023863	0.003773	0.0013651	0.0033261	-0.0011576	0.0042485	0.000282	0.004273
PIFdirective	0.007918	0.0051233	0.0056822	0.0033584	0.0018606	0.0054663	-0.0020093	0.003328
EPO	-0.0382979**	0.0152541	-0.0211742*	0.0113529	-0.0170445	0.0153222	0.0112498	0.0158917
WhistleblowerAct	0.0055811	0.0080839	0.0086438	0.0062186	0.0050986	0.0077743	0.0014885	0.0052738
PartoftheEU	0.0237085	0.0277224	0.0049486	0.0059908	0.0355632	0.0027261	0.0040019	0.0212354
GovtEff	0.0281742*	0.0160998	0.0299091	0.0179821	-0.0396466***	0.0172426	0.0374605*	0.0191835
OLAF	-6.18E-12	1.64E-11	-5.00E-12	4.87E-12	-5.53E-12	1.44E-11	-1.07E-11	7.53E-12
EPO_L					-0.0275834*	0.016322	-0.016226	0.038604
WhistleblowerAct_L					-0.0000234	0.0137102	-0.0053921	0.0063435
PIFdirective_L					0.0035714	0.0053786	0.002307	0.0030401
OLAF_L					-7.07E-12	1.43E-11	-1.38E-11**	5.98E-12
PoliticalCorruption_L			0.5330761***	0.0685156	0.2699445***	0.0722023	0.1669392**	0.0731993
EPO_L2							-0.1105201**	0.0533034
WhistleblowerAct_L2							0	(omitted)
PIFdirective_L2							-0.0011509	0.0054408
OLAF_L2							-2.75E-11**	1.01E-11
PoliticalCorruption_L2							-0.026034	0.0400314
_cons	0.7033446	0.0839231	0.4701399	0.1350333	0.7180161	0.0995915	0.8522701	0.1030406
Observations	648		648		594		567	
R-Squared (Overall)	0.6956		0.9210		0.8384		0.8108	
R-Squared (Within)	0.3654		0.5364		0.5394		0.6998	
R-Squared (Between)	0.7106		0.9384		0.8508		0.8160	

t-statistics based on robust standard errors clustered at the country level. Asterisks denote significance at the following levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

6. Conclusion:

The European union and its formation have been a major structural change in the European landscape, for both the countries in the EU but for those outside of it. A big part of the creation of the EU and the opportunities that it has provided to member states was the creation of a whole new area of corruption which is the misappropriation of EU funds. As discussed in the introduction and methodology parts of this paper, the ways EU membership can impact levels of corruption are many and can go both ways. The EU liberalizes trade which increases economic development, increases bureaucracy by adding laws and regulations previously unknown to countries, but also introduces a new legal framework in which new anti-corruption policies are introduced. Until this paper, literature has scarcely dealt with the aggregate effects of these changes introduced by the EU, especially the anti-corruption strategies, which this paper puts in focus by providing a quantifiable measure of the activities taken by said strategies.

The empirical analysis has shown that the specific strategies the EU has implemented to combat corruption are significantly related to the decrease in corruption. The levels of activities of OLAF and EPPO have both been shown to correlate with the decrease in corruption, which is a key step in proving their mission which is to stifle corruption and misappropriation of public funds.

Contrary, the analysis failed to find any relationship between the presence of the Whistleblower Act and PIF Directive with corruption. As was already mentioned in the text above, this could be due to the very small number of periods in which these laws were passed as countries have only recently started to implement the acts. (2021. /2022.), which made the sample of lagged values even smaller or that the effects of this directive were already presented in some other variable in the research (e.g.Rule of Law). If the assumption that the effects of these directives would follow the same patterns as the effects of anti-corruption offices, like EPPO and OLAF, these variables should be revisited by further research once more data is available to see if there are potential effects.

When talking about the control variables, this research has mostly reiterated and reinforced preexisting findings. GDP per capita, Rule of law and Democracy, all were found to be negatively correlated with corruption levels which is in line with Dimant and Tosato

(2018) who presented these indicators as being crucial in lowering corruption. Wealthier nations have more resources to invest into better governance and anti-corruption tools, which will lead to lower levels of corruption. This again proves the idea that economic prosperity must be looked at as an irreplaceable tool to combat corruption.

There were interesting findings such as the negative relationship with government size and corruption found in model 1, but once the model deviated from the baseline structure into more valid designs with autocorrelation, this relationship became insignificant. Government efficiency gave constant negative results, which was in line with existing literature, but the effect was not significant enough within our research, which could be the result of variables such as Rule of Law already encapsulating most of the effect. Nonetheless, this finding combined with the significant results from the indicator for Rule of Law affirms the expectations from theory that a more transparent and accountable governmental structure will reduce the opportunities for corruptive practices and thus lower corruption levels.

This research has reiterated existing findings but has also presented some in a new way. OLAF, or the European Anti-Fraud Office, which has been the topic of many papers, and has once again been shown to be correlated with corruption levels. On the other hand, to the best of the writer's knowledge, this is the first research which has tried to analyze the effects of the European Public Prosecutor's Office and this paper provides a crucial insight into the work that is being done by this young legislative body which has revolutionized the way the EU approaches corruption and the things that might impact the effects this office might have on corruption. This paper also provided a way to quantify the levels of activity for offices such OLAF and EPPO for future research.

This research contributes to the existing literature and helps understand the effects that European laws and structures have on corruption levels. By using a robust econometric approach in the form of a country fixed effects model, this research provides evidence on the effects that European offices like EPPO and OLAF have in practice. It also confirms existing insights for policymakers and shows what is the correct way forward in terms of laws. For example, a major part of the series of laws that brought the creation of both EPPO and the PIF directive was the demand that all member states make their public project financing decisions transparent and make their legislative laws around misappropriation uniform throughout the

Union. This research shows that this is a good way of thinking going forward as it has a multivariate effect on the determinants of corruption.

Additional to everything new that this research brought to the table, it has reiterated existing conclusions from literature by providing empirical evidence on governance, economic and social indicators. It was shown that a continued investment in the betterment of the rule of law and democracy will provide a lower level of corruption. The EU should keep focusing on trying to boost civic engagement and forcing member states to enact meaningful reforms of their judicial systems.

7. Limitations and potential challenges:

Despite the approach in this research being robust and comprehensive with regards to the methodology, there are several limitations that must be considered. Firstly, while the country fixed effects method can address the problems associated with unobserved heterogeneity across countries, it does not resolve the issue of potential multicollinearity. This research has shown that the levels of multicollinearity are at an acceptable level, by means of implementing a Variance Inflation Factor test, but they could still impact the estimates of certain variables, especially those that are quite close together, such as *RuleofLaw* and *Democracy*.

Secondly, a major potential limitation of this research is reverse causality. The idea that corruption levels influence the levels of activity of anti-corruption agencies and not the other way around would complicate the interpretation of the results. This research addressed this and mitigated the threat partially by introducing lagged variables in the model. By including past levels of corruption and previous values of the anti-corruption strategies, the analysis can better isolate the effect of anti-corruption measures by considering the temporal sequence of events, thereby reducing the likelihood that the observed relationships are driven by reverse causality. While this helps mitigate the threat partially, it does not eliminate the problem. Even with lagged variables, there might still be a possibility that past values of anti-corruption activities and corruption levels influence each other in ways that are not described in this model.

An additional limitation that could occur is the data availability and quality across the multiple datasets used. This research uses many variables, each from its own source with an

added level of complexity where 27 countries are considered. For instance, some countries might have different reporting mechanisms of corruption which might artificially inflate the values of the dependent variable in some countries, and this could introduce unwanted bias into the analysis. An example of this is the corruption index that was used in this research. Due to the lack of resources, the author did not have access to the best database, which the *International Country Risk Guide*, which most of the literature on corruption (such as Alfano et al. (2020)) uses to measure corruption, but rather the V-Dem Project database was used. If this database has a flawed methodology or inaccurate measurements, it threatens the internal validity of the findings of the research.

Another limitation of this research is the limited nature of the dataset in trying to measure an evolving effect such as anti-corruption. The idea is that the moment in time in which the research is taking place is crucial for the success of the research as initiatives such as the EPPO, PIF Directive and Whistleblower Act, which are all young initiatives, may take multiple years or even longer to fully materialize their full potential effect. The panel data of this research, although extensive, does not have the time frame to capture the long-term effects properly, which might lead to the underestimation of the true effects of these initiatives. This is also a problem that defines the next limitation which is the choice of lags of the variables. It was not possible to examine the relationship of corruption and anti-corruption strategies past the second lag for the most important variables such as EPPO and PIF, due to the lack of data. This might be a problem if there is a relationship beyond the second lag implemented in this research. Potential research in the future would benefit greatly from expanding the timeframe of the panel dataset, allowing it to expand the lags of the independent variables, but also will capture more effects of the newer strategies that were introduced.

Next, this study focuses on a specific set of generally replicable variables across all countries, with limited cultural variables included, thus potentially overlooking significant factors which might influence corruption. For example, historical conflicts and societal norms towards corruption were overlooked and not covered. For example, Alfano et al. (2020) uses a variable that denotes if a country has been socialist in the past and finds significant positive relationship with levels of corruption. Factors such as these could significantly impact corruption, especially in interaction with the existing anti-corruption strategies in place and should be considered for future research. This research, due to its country-fixed effects could

not implement such variables, which poses a limitation which could be rectified in future research.

Lastly, this research has a limitation when it comes to the EPPO variable. As mentioned before, some countries within the European Union have opted out of participation in the project. This could be due to sovereignty concerns, or it could be endogenous to corruption as countries that are more corrupt would not want their practices to be uncovered. This aspect was not covered in this research and is something further research should address, as if true can be a big threat to the internal validity of the research.

In conclusion, although this research provides valuable insights into the effects on corruption in the EU, due to the limitations presented, the interpretation of the results should be met with caution. As mentioned, future research should aim to address these issues by making more comprehensive datasets, exploring other yet not discussed variables and by expanding the timeframe of the study.

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9. Appendix:

Figure 1: Variance Inflation Factor (VIF) test results

Variable	VIF	1/VIF
RuleofLaw	10.60	0.094353
GovtEff	10.14	0.098614
GDPperCapita	4.16	0.240185
EU	2.52	0.396205
DemIndex	2.09	0.477811
Decentralization	1.96	0.509516
GovtSize	1.86	0.536775
PartoftheEU	1.60	0.623118
PIFdirective	1.56	0.643002
EPPO	1.18	0.845667
WhistleblowerAct	1.08	0.922431
OLAF	1.06	0.725345
Mean VIF	3.52	

Figure 2: Woolridge Test for Autocorrelation in Panel Data

H0: no first-order autocorrelation	
F(1, 26)	83.197
Prob > F	0.0000

Figure 3: Modified Wald Test for Groupwise Heteroskedasticity

H0: $\sigma(i)^2 = \sigma^2$ for all i	
chi2 (27)	20436.73
Prob>chi2	0.0000