Empirical Economics (2023) 64:277–301
https://doi.org/10.1007/s00181-022-02247-z

Corruption and partisan polarization: evidence from the European Union

Nicholas Apergis[1] · **Mehmet Pinar**[2,3]

Received: 31 July 2021 / Accepted: 10 April 2022 / Published online: 5 May 2022

Abstract

Recent work documents that even though partisan polarization may have detrimental economic and social outcomes, polarized societies lead to better governance and less corruption. However, the effect of corruption on partisan polarization has been mostly ignored by the literature. By using various measures of partisan polarization and corruption, this paper demonstrates that corrupt behaviours are associated with more partisan polarization in the European Union, indicating that a stronger presence of corruption leads to higher partisan polarization. The findings are robust to the use of different polarization measures, methodologies, and a battery of control variables. This paper's main finding, increased corruption leading to increased partisan polarization, provides another important mechanism beyond the standard socio-economic factors that led to the current rise in support of parties opposing to European Union and rise of populist parties in European Union. Polarized societies tend to generate inefficient economic outcomes and the alleviation of corruption could improve economic outcomes by decreasing partisan polarization.

Keywords Partisan polarization · Corruption · Elections · Panel methods · European Union

JEL Classification D72 · D73 · O52

✉ Mehmet Pinar
mehmet.pinar@edgehill.ac.uk

Nicholas Apergis
napergis@unipi.gr

[1] Department of Banking and Financial Management, University of Piraeus, Piraeus, Greece

[2] Business School, Edge Hill University, St Helens Road, Ormskirk L39 4QP, Lancashire, UK

[3] Facultad de Ciencias Económicas y Empresariales, Universidad de Sevilla, Avda. Ramón y Cajal, 1, C.P, 41018 Sevilla, Spain

1 Introduction

The global cost of corruption has been estimated at least at five per cent of global GDP (United Nations 2018). Mauro et al. (2019) document that the least corrupt governments collect in revenues as much as four per cent of GDP in taxes, as well as that the corrupted countries tend to spend less on education and health compared to the least corrupted ones (Mauro 1998; Delavallade 2006). Given the societal and economic effects of corruption, there has been widespread literature that examines the determinants of corruption. Most of this literature has found that corruption is associated with certain cultural, economic, social, and institutional factors (Treisman 2000, 2007; Jetter and Parmeter 2018).

Alongside the standard determinants of corruption, the role of governments has also been examined. Corruption is found to be decreasing with partisan polarization (Testa 2010; Brown et al. 2011; Melki and Pickering 2020), while this partisan polarization reduces the chances of parties to collude and increases the incentives of the opposition to monitor the corruption of incumbents (Brown et al. 2011). Similarly, Testa (2012) provides a theoretical framework to illustrate that highly heterogeneous societies are more likely to be politically polarized, while both political competition and partisan polarization may help to improve the quality of governments and their policies. Melki and Picketing (2020) demonstrate a robust negative relationship between state-level government corruption and ideological/partisan polarization in the US, suggesting that partisan polarization increases the expected costs of engaging in corruption. Del Monte and Papagni (2007) document that high political fragmentation and concentration lead to more corruption across the Italian regions. Even though the current literature has examined the effect of partisan polarization on corruption practices, our paper argues that increased corruption is also able to determine partisan polarization. The increased corruption practices decrease incumbent support in local elections and voter turnout, challengers' votes while eroding voters' identification with the party of the corrupted incumbent (Chong et al. 2015). Similarly, Sundström and Stockemer (2015) find that increased perception of corruption also decreases voter turnout in Europe. Finally, using 97 elections from the Comparative Study of Electoral Systems, Barlacu (2018) also highlights that voters consider ideology less in their voting decisions in countries with high levels of corruption. In other words, increased corruption behaviour could alter the 'status quo' of the voting behaviour and could lead to increased levels of partisan polarization.

The central claim of this paper is that increased corruption would lead to higher partisan polarization, as new political parties may emerge arguing that they combat against the corrupted incumbent and choose to distinguish themselves from the incumbent party. Therefore, increased corruption could lead to a more fragmented and polarized political arena. Given that the polarized political systems increase the relative price of investments (Azzimotti 2011), lower corporate investment levels (Azzimotti 2018), and generate higher political uncertainty (Azzimotti and Talbert 2014; Baker et al. 2014), understanding the effect of corruption on partisan polarization is an important research agenda, which has been mainly ignored by the existing literature, as most of this literature examines the causation from partisan polarization to corruption; this paper aims to fill this gap.

More specifically, this work aims to contribute to the literature by testing how corruption may have played a significant role in political competition (partisan polarization) across 25 European Union (EU) countries between 2003 and 2017. Even though the EU has implemented various measures to fight against corruption (European Council, 2010), there is a wide variation in corruption practices across EU countries (see European Commission 2014, on the EU Anti-Corruption Report for details). Most of the current studies on EU also focus on understanding the factors that affect corruption (Vachudova 2009, for post-communist countries; Pashev 2011, for Bulgaria; Beblavý and Sičáková-Beblavá 2014, for Slovakia; Elbasani and Šelo Šabić 2017 for Albania and Croatia; Lacatus and Sedelmeier 2020 for Bulgaria and Romania; Alfano et al. 2020, for a panel set of EU countries); in contrast, in our paper, we explicitly check how changes in corruption affect political competition (partisan polarization) so as to better understand how corruption can have economic and social implications through its effect on political competition (partisan polarization).

The remainder of the paper is organized as follows. Section 2 offers an overview of the existing literature and provides partisan polarization measures used in this study. Section 3 provides the estimation methodology, while Sect. 4 provides the details of the data used. Section 5 provides the estimation results, while a set of robustness checks is also reported in Sect. 6. Section 7 provides a set of channels through which corruption could affect partisan polarization and finally, Sect. 8 concludes.

2 Partisan polarization and its potential determinants

This section provides some of the potential determinants of partisan polarization, which are clustered under two broad categories: corruption (the main channel being analysed in this paper), and institutional and socio-economic factors. As our goal is to explore how changes in corruption affect partisan polarization, there are also country-specific time-invariant factors, such as cultural and geographical factors, which would be tackled in the empirical analysis; hence, below, we only discuss those factors that are likely to change over time and capture the time-invariant country-specific factors via country fixed effects.

2.1 Corruption

Political theorists have been examining the electoral response to corruption practices. The findings provide a conflicting set of results. In one end, the relationship between charges against corrupted incumbents and the voter tends to punish corrupted behaviours by voting less in favour of corrupted incumbent (Welch and Hibbing 1997; Ferraz and Finan 2008; Bågenholm 2013; Chong et al. 2015; Ecker et al. 2016). Furthermore, perception of corruption also detrimental effect on public support for the political system (Linde and Erlingsson 2013). On the other hand, there also exist many papers that find that the politicians and parties that have been involved in corruption scandals suffer only minor losses and get re-elected (Choi and Woo 2010; Vivyan

et al. 2012; Basinger 2013; de Sousa and Moriconi 2013; Konstantinidis and Xezonakis 2013). It has been found that corruption is not being punished when partisan bias (i.e. party supporters are more tolerant towards corruption cases when they affect their own party) is in place (Adnuzia et al. 2013; de Sousa and Moriconi 2013), or corruption is being ignored if incumbents do a good job in managing the economy (Choi and Woo 2010), or ideologically close parties are not being available to switch (Charron and Bågenholm 2016), or personal benefits are obtained due to corrupted activities (Fernández-Vázquez et al. 2016), among other factors.

Bågenholm and Charron (2014) demonstrate that corruption has been the main agenda among the established parties from the main opposition, while new parties are also established to use corruption as their main campaign strategy to make significant electoral gains relative to the previous elections, compared to parties that do not politicize corruption. Furthermore, Chong et al. (2015) and Barlacu (2018) document that increased corruption practices erode voters' identification with the party of the corrupted incumbent, which potentially alleviates the partisan bias and can allow switching to ideologically different parties. Overall, based on the above mechanisms, our expectation is that relatively higher corruption at the country level could lead to the establishment of new parties and increased partisan polarization.

2.2 Institutional quality and socio-economic factors

The quality of institutions has been found to be one of the main drivers of economic development (Knack and Keefer 1995; Acemoglu et al. 2001, 2005; Rodrik et al. 2004; Pinar 2015 among others). Acemoglu et al. (2001) and Acemoglu et al. (2005) suggest that institutional aspects are closely associated with the abuse of public power. In countries where the quality of institutions is strong, there is less room for public abuse and the quality of institutions is also positively linked to a generalized public trust (Robbins 2012). Therefore, in countries where there exists a better set of institutions and key civil liberties are respected, we expect a higher trust in the political system, which could decrease extreme levels of partisan polarization, as the rules of the system allow for less room for 'the misuse of public offices for private gain' (Treisman 2000).

There is a large strand of literature also highlighting the link between other socio-economic variables and partisan polarization. The recent rise in support of parties opposing to EU and the rise of populist parties in the EU is found to be negatively associated with income and education (Hobolt 2016; Goodwin and Heath 2016; Becker et al. 2017; Ford and Goodwin 2017; Rodrik 2018; Dijkstra et al. 2020). The argument behind the vote for the populist parties is that individuals lacking opportunities and future prospects (i.e. less educated and low pay), thus, left behind by the modern economy, are found to vote for anti-establishment political options (Ford and Goodwin 2017; Rodríguez-Pose 2018). Furthermore, the higher level of natural resources is found to be associated with rent-seeking behaviours (Torvik 2002; Hodler 2006; Wick and Bulte 2006; Itzetzki 2011), with higher levels of natural resources leading to higher political fragmentation, competing for such resources. Furthermore, another dimension found to be important in partisan polarization is the political divide between rural and urban areas (Scala and Johnson 2017; Rodden 2019), where rural areas

were more likely to vote for Eurosceptic parties (Dijkstra et al. 2020). Furthermore, globalization and openness to trade have been both closely associated with the size of government expenditure (Alt and Lassen 2006; Rodrik 2018), which could also affect partisan polarization.

Finally, fiscal policy adjustments are also found to affect the voting behaviour (Tabellini and Alesina 1990; Alesina et al. 1998; Brender 2003; Shi and Svensson 2006; Arvate et al. 2009; Chortareas et al. 2016; Corvalan et al. 2018; Deniz et al. 2021; Ziogas and Panagiotidis 2021). Tabellini and Alesina (1990) provided a theoretical framework showing that a majority of the voters favours a budget deficit and the polarization among voters is higher with increased budget deficit. On the other hand, both Brender (2003) and Arvate et al. (2009) found that voters penalize budget deficits and budget surpluses increase the chances of re-election. Similarly, Ziogas and Panagiotidis (2021) found that voters do not punish governments if they follow fiscal adjustment to reduce deficits and government spending cuts. However, the existing studies also found that the increased government spending during or prior to the election period also increased the likelihood of re-election (Chortareas et al. 2016; Corvalan et al. 2018).

3 Methodology

Given that the goal of this work is to explore the role of corruption in the partisan polarization process, the model specification is indicated below:

$$\Delta POLAR_{i,t} = \sum_{t=1}^{15}\sum_{i=1}^{25}\gamma_{it}\,\Delta\text{POLAR}_{i(t-1)} + \sum_{t=1}^{15}\sum_{i=1}^{25}\delta_{it}\,\Delta\text{CORRUPTION}_{i(t-1)} + \sum_{t=1}^{15}\sum_{i=1}^{25}\theta_{it}\text{X}_{i(t-1)} + a_i + v_{it}. \quad (1)$$

The model includes $N = 25$ countries (indexed by i), observed over $T = 15$ periods (years) (indexed by t), and allows for country-specific effects (a_i) for the *ith* individual unit. In a panel country framework, the disturbances $v_{i,t}$ are uncorrelated. They are assumed to be independently distributed across countries with a zero mean. To avoid the presence of potential endogeneity issues, we estimate the dynamic panel data model using the general method of moments (GMM) estimation recommended by Arellano and Bover (1995) and Blundell and Bond (1998). The presence of endogeneity potentially could come through reverse causality between partisan polarization and corruption. As a matter of fact, the literature supports the presence of reverse causality, i.e. running from partisan polarization to corruption. More specifically, Brown et al. (2011) advance the hypothesis that partisan polarization acts as a constraint on corruption, while Testa (2012) provides a formal analysis of how partisan polarization raises electoral stakes and, thus, reduces corruption. Brown et al. (2011) assert that the capacity to collude in corruption is facilitated when candidates are ideologically proximate. Moreover, the ameliorating effect of partisan polarization is plausibly reduced

when incumbents are not re-running for office. Perceived responsibility for corruption is highly likely to increase when the incumbent is eligible for re-election. Ferraz and Finan (2011) provide solid favourable evidence of the hypothesis that re-election eligibility affects corruption using Brazilian data.

In addition, this part of the empirical analysis makes use of the panel causality test introduced by Dumitrescu and Hurlin (2012), while it considers two dimensions of heterogeneity, i.e. both the heterogeneity of the regression model used to test the causality and the heterogeneity of the causality relationships. The test, which is based on the vector autoregressive scheme (VAR), assumes that there is no cross-sectional dependency. Yet, Monte Carlo simulations show that even under the conditions of cross-sectional dependency, this test can generate strong results. When there is cross-sectional dependency, simulated and approximated critical values, obtained from 50,000 replications, are used. The corresponding Wald statistic is defined as:

$Z_{N,T} = \sqrt{N}/2K\left(W_{N,T}-K\right)$, where K is the number of lags in the corresponding VAR model, and:

$$W_{N,T} = 1/N \sum_{i=1}^{N} W_{i,T}$$

where W_{iT} stands for the individual Wald statistical values for cross-section units.

4 Data

The analysis employs annual data from 25 EU countries. The country list is offered in Table 5 in Appendix. This section provides the details on how partisan polarization is measured and the measures used for corruption and other control variables.

4.1 Measuring party fractionalization and partisan polarization

A popular proxy used is the political fractionalization (PF) based on the Herfindahl–Hirschman type of index (similar to those of fractionalization indices proposed by Alesina et al. 2003); it measures the probability that two representatives picked at random from the parties in the legislature will be of different parties (Del Monte and Papagni 2007; Dalton 2008; Funke et al. 2016; Karahasan et al. 2021). The PF of a country j is calculated as follows:

$$PF_j = 1 - \sum_{i=1}^{n} V_{ij}^2 \tag{2}$$

where V_{ij} is the vote share of political party i in country j. The political fractionalization index ranges between 0 and 1, where a higher value presents more fragmented political competition.

Even though the political fractionalization index provides how fragmented the political system is, this measure does not capture how polarized the political systems are,

as it does not differentiate for the ideological positions of the parties involved. It is possible to observe high levels of partisan polarization in less fragmented party systems or lower levels of partisan polarization within a more fractionalized system (Pelizzo and Babones 2007). Therefore, the literature has also been using different partisan polarization measures by taking explicitly into account the ideological position of the parties. Most of the cross-country analyses on partisan polarization have been using political factors coming from the Database of Political Institutions, first constructed by Beck et al. (2001), and updated by Cruz et al. (2018). The database of political institutions provides the ideological position of major parties based on their economic attitudes, where political positions are coded as one, two, and three if a party is considered to stand in the left, centre, and right spectrum, respectively. Using these data set, Brown et al. (2011) obtain the partisan polarization measure by estimating the greatest ideological distance between the four major parties and coding their partisan polarization measure as one if elected bodies only feature centre-left or centre-right representation across the largest parties, and partisan polarization coded two in states featuring a large left- and right-wing presence across elected officials. A similar measure is obtained by Testa (2010), who has used the ideological distance between governing and opposition parties.

In a similar context, Potrafke (2009) and Potrafke (2010) use the index of governments' ideological positions, first introduced by Budge et al. (1993) and updated by Woldendorp et al. (1998) and Woldendorp et al. (2000). This index places the cabinet on a left–right scale with values between 1 and 5, where a value of one is assigned if the share of governing right-wing parties, in terms of seats in the cabinet and in parliament, is larger than 2/3, and 2 if it is between 1/3 and 2/3; the index is 3, if the share of centre parties is 50%, or if the left- and right-wing parties form a coalition government that is not dominated by one side or the other, and the index is symmetric and takes the values of 4 and 5, if the left-wing parties dominate.

Partisan polarization measures used by the literature (Potrafke 2009, 2010; Brown et al. 2011; Testa 2012) only differentiate the parties based on whether they are positioned in the left, centre, or right political spectrum and do not differentiate how far left or right a political party is positioned. However, Döring and Manow (2019) database offers a wider range of left–right scales of political parties, ranging between 0 and 10 with the use of party expert surveys, with 0 representing extreme left and 10 extreme right. Assessing the ideological stance of the political parties based on the experts' survey is commonly used and accepted as the most reliable measure for party positions (Benoit and Laver 2006; Bakker et al. 2015). With the use of the Döring and Manow (2019) database, we calculate the partisan polarization (PP) based on the calculations of Dalton (2008) and Wang (2014) as follows:

$$PP_j = \sum_{i=1}^{n} V_{ij} \times \left(\frac{LRS_i - AIP_j}{5} \right)^2 \tag{3}$$

where V_{ij} is the vote share of the political party i in country j, LRS_i is the left–right scale position of party i, and AIP is the weighted average of the ideological position of country j (which is calculated by the weighted average of the political positions of

parties in a given country). Higher scores represent more of an ideologically polarized political system. Beyond the partisan polarization index, we also use three additional measures. We use the ideological position difference among the parties that govern (GOVIDEODIF), with 0 if there is a majority government. The highest ideological difference among the four major parties (IDEODIF4), and the ideological difference between the two major parties (IDEODIF2), with higher measures suggesting higher partisan polarization.

4.2 Corruption

To test the effect of corruption on partisan polarization, our analysis uses two different indices available for a large sample of countries, which have been used widely in the existing literature. The first index is compiled by Transparency International, named the Corruption Perceptions Index (CPI), which ranges between 0 and 100, where higher values represent lower levels of corruption. The second index is the Control of Corruption (WGI-CC), obtained from the world governance indicators of the World Bank, which measures corruption between −2.5 and + 2.5 scale, with higher levels presenting lower levels of corruption.

4.3 Control variables

We control for the institutional quality differences among countries by controlling for various institutional quality proxies. We control for five governance measures from World Governance Indicators (WGI): Voice and accountability (WGI-VA) (ranging from −2.5 to + 2.5), Political Stability (WGI-PS) (ranging from −2.5 to + 2.5), Government effectiveness (WGI-GE) (ranging from −2.5 to + 2.5), Regulatory Quality (WGI-RQ) (ranging from −2.5 to + 2.5), Rule of Law (WGI-RL) (ranging from − 2.5 to + 2.5) indexes, sourced from the World Governance Indicators database, with higher values indicating better governance. Moreover, we use the data on Property Rights (FH-PR) and Civil Liberties (FH-CL) indexes from the Freedom House (FH) database, with FH-PR and FH-CL indexes taking values from 0 to 40 and 0 to 60 (higher index values denote more certain legal protection of property, as well as stronger civil liberties), respectively.

Other control variables include socio-economic variables that are identified to be important for partisan polarization in Sect. 2.2. We control for GDP per capita (in logs) (GDPpc), trade openness defined as the sum of imports and exports of goods and services (as % of GDP) (Trade Open), total natural resources rents (as % of GDP) (Natural Resources), urban population (as % of the total population) (Urban), total population (in logs) (POP), and general government final consumption (as % of GDP) (GOVEXP). These data were sourced from the World Development Indicators database. General government net lending/borrowing (as % of GDP) (GOVBUDGET) is obtained from the World Economic Outlook of the IMF. Furthermore, we control for the trade freedom index from the Economic Freedom index (Trade freedom), which is obtained from the Freedom of the World database (with the index ranging from 0 to 100 and higher denote stronger freedom in trade transactions). Finally, data on the

mean years of schooling (MYS) were sourced from the Human Development Reports data set. Table 6 in Appendix provides the description of the variables and sources of data, and Table 7 in Appendix offers descriptive statistics.

5 Empirical analysis

We first provide the estimation results when we used the GMM system of equations. In particular, we used the lagged first-differences of the series as instruments for the equations allowing for the levels of the control variables to be correlated with the unobserved country-specific effects while permitting suitably lagged first-differences of these variables to be used as instruments in the equations. In summary, we used lagged differences of the dependent variable as instruments for the equation in levels in addition to lagged levels of it as instruments for equations in first differences. Although there may be a correlation between the levels of the control variables and the country-specific effect in the level equation, there is no correlation between the differences of these variables and the country-specific effect. Before moving to the results, the relevant diagnostics are also reported in Table 1. In all cases, the serial correlation in the error term is tested by using the Arellano–Bond test. The AR (2) test results suggest that the null hypothesis is rejected, indicating no second-order serial correlation. Furthermore, difference-in-Hansen is the test of validity of GMM instruments and the test of overidentification is based on the Hansen J statistic. The null hypothesis is that the instruments are valid (i.e. uncorrelated with the error term), and that the exclusions restrictions are valid (i.e. the instruments are correctly excluded from the second-stage equation), suggesting that the use of the system GMM is well defined.

The first empirical results are reported in Table 1 with columns indicating certain specifications, while all variables are expressed in logarithms, except those already in percentages. Significant lags (where possible) have been determined through the Akaike criterion. In particular, Columns (1) through (5) display the estimates with respect to the CPI, while Columns (6) through (10) show the estimates in relevance to the CCI. More specifically, Column (1) shows the results when partisan polarization is measured through the Party Polarization (PP) variable, Column (2) when partisan polarization is measured through the Political Fragmentation (PF) variable, Column (3) when partisan polarization is proxied as Ideology difference between parties that govern (GOVIDEODIF), Column (4) when partisan polarization is depicted through the variable of highest ideological difference among 4 major parties (IDEODIF4), and Column (5) when partisan polarization is proxied as ideological difference among 2 major parties (IDEODIF2). Similarly, columns (6) to (10) present the results when WGI-CC is used as a corruption proxy. All ten specifications contain the remaining control variables. The results remain consistently similar across both definitions of corruption. More specifically, the estimates clearly document a negative and statistically significant association between the two variables, implying that lower levels of the corruption indexes (i.e. stronger corrupt behaviours) are associated with more partisan polarization, indicating that a stronger presence of corruption leads to higher partisan polarization conflicts across the political parties within the country.

Table 1 Partisan polarization and corruption: GMM estimates

Variables	1	2	3	4	5	6	7	8	9	10
CPI	− 0.046***	− 0.043***	− 0.051***	− 0.043***	− 0.040***					
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]					
CCI						− 0.060***	− 0.055***	− 0.059***	− 0.052***	− 0.063***
						[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
WGI-VA	− 0.033**	− 0.030**	− 0.030**	− 0.025**	− 0.029**	− 0.034**	− 0.031**	− 0.033**	− 0.036**	− 0.040**
	[0.03]	[0.04]	[0.04]	[0.05]	[0.04]	[0.03]	[0.05]	[0.03]	[0.02]	[0.02]
WGI-PS	− 0.046***	− 0.044***	− 0.045***	− 0.041***	− 0.036***	− 0.050***	− 0.048***	− 0.054***	− 0.056***	− 0.047***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
WGI-GE	− 0.020*	− 0.016	− 0.017*	− 0.012	− 0.013	− 0.022*	− 0.020*	− 0.025*	− 0.029**	− 0.018*
	[0.08]	[0.11]	[0.10]	[0.15]	[0.13]	[0.08]	[0.08]	[0.07]	[0.05]	[0.10]
WGI-RQ	− 0.042***	− 0.036**	− 0.040***	− 0.035**	− 0.030**	− 0.044***	− 0.043***	− 0.047***	− 0.041***	− 0.033**
	[0.00]	[0.02]	[0.00]	[0.02]	[0.05]	[0.00]	[0.00]	[0.00]	[0.00]	[0.03]
WGI-RL	− 0.026*	− 0.020*	− 0.014	− 0.019*	− 0.011	− 0.030*	− 0.024*	− 0.020*	− 0.024*	− 0.014
	[0.08]	[0.10]	[0.15]	[0.10]	[0.18]	[0.08]	[0.09]	[0.10]	[0.08]	[0.15]
FH-PR	− 0.030**	− 0.025*	− 0.031**	− 0.023*	− 0.020*	− 0.037**	− 0.032**	− 0.030**	− 0.035**	− 0.028**
	[0.05]	[0.07]	[0.05]	[0.08]	[0.09]	[0.02]	[0.04]	[0.05]	[0.02]	[0.05]
FH-CL	− 0.027*	− 0.023*	− 0.024*	− 0.02	− 0.015	− 0.030**	− 0.026*	− 0.024*	− 0.026*	− 0.020
	[0.07]	[0.10]	[0.09]	[0.12]	[0.16]	[0.05]	[0.07]	[0.08]	[0.07]	[0.12]
Natural Resources	0.031**	0.026*	0.023*	0.029*	0.025*	0.035**	0.026*	0.020*	0.014	0.012
	[0.05]	[0.08]	[0.09]	[0.06]	[0.08]	[0.04]	[0.07]	[0.10]	[0.13]	[0.17]
Urban	0.032**	0.025*	0.027*	0.020*	0.016	0.033**	0.025*	0.019	0.013	0.012
	[0.05]	[0.08]	[0.07]	[0.10]	[0.14]	[0.05]	[0.08]	[0.12]	[0.17]	[0.20]
POP	0.035**	0.030**	0.021*	0.025*	0.016	0.032**	0.027*	0.020*	0.013	0.010

Table 1 (continued)

Variables	1	2	3	4	5	6	7	8	9	10
	[0.04]	[0.05]	[0.09]	[0.07]	[0.15]	[0.04]	[0.07]	[0.10]	[0.19]	[0.23]
POP(− 1)	0.017	0.014	0.008	0.011	0.012	0.022*	0.016	0.015	0.005	0.011
	[0.13]	[0.15]	[0.26]	[0.17]	[0.18]	[0.09]	[0.12]	[0.16]	[0.33]	[0.18]
Trade Freedom	− 0.045***	− 0.040***	− 0.035**	− 0.030**	− 0.032**	− 0.057***	− 0.052***	− 0.044***	− 0.040***	− 0.035**
	[0.00]	[0.00]	[0.03]	[0.05]	[0.04]	[0.00]	[0.00]	[0.00]	[0.00]	[0.03]
MYS	− 0.064***	− 0.055***	− 0.055***	− 0.048***	− 0.043***	− 0.066***	− 0.061***	− 0.050***	− 0.052***	− 0.043***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
MYS(− 1)	− 0.029*	− 0.026*	− 0.028*	− 0.024*	− 0.022*	− 0.032**	− 0.026*	− 0.030**	− 0.021*	− 0.016
	[0.06]	[0.07]	[0.06]	[0.08]	[0.09]	[0.03]	[0.07]	[0.05]	[0.09]	[0.12]
GOVEXP	0.049**	0.045**	0.053***	0.048**	0.051***	0.054***	0.045**	0.052***	0.048**	0.044**
	[0.02]	[0.03]	[0.01]	[0.02]	[0.01]	[0.00]	[0.03]	[0.01]	[0.02]	[0.03]
GOVBUDGET	0.063***	0.058***	0.061***	0.060***	0.065***	0.067***	0.061***	0.068***	0.065***	0.059***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Diagnostics										
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R2-adjusted	0.69	0.61	0.62	0.62	0.56	0.73	0.69	0.64	0.63	0.57
AR(2)	[0.62]	[0.58]	[0.52]	[0.53]	[0.55]	[0.64]	[0.56]	[0.51]	[0.44]	[0.48]
Hansen Overidentification	[0.96]	[0.96]	[0.97]	[0.94]	[0.96]	[0.99]	[0.94]	[0.95]	[0.96]	[0.96]
Difference-in-Hansen	[0.99]	[0.99]	[0.99]	[0.99]	[0.98]	[0.99]	[0.98]	[0.98]	[0.99]	[0.98]

All equations include time dummies, which are treated as exogenous, while the lags have been determined through the Akaike criterion. The GMM instruments are collapsed to avoid over-proliferation following Roodman (2009). AR(2) is the test for auto-correlation of order 2 in first-differenced errors. Difference-in-Hansen is the test of validity of GMM instruments in the levels equation. The test of overidentification is based on the Hansen J statistic. The null hypothesis is that the instruments are valid (i.e. uncorrelated with the error term), and that the exclusions restrictions are valid (i.e. the instruments are correctly excluded from the second-stage equation)

*$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$

In terms of the remaining determinants of partisan polarization, the estimates provide evidence on the following estimates: all five institutional variables, i.e. Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, and Rule of Law exert a negative and statistically significant impact on partisan polarization. The same is also true for the variables of Property Rights, Civil Liberties, and Freedom to Trade. When it comes to the economic variables, higher levels of education lead to a lower level of partisan polarization, while stronger urbanization, more natural resources rents, and higher population levels all lead to stronger levels of partisan polarization. In terms of the two fiscal-related variables, the findings display the presence of a positive impact of fiscal measures on partisan polarization. These findings provide support to the divided government hypothesis. The basic point of this hypothesis is higher variations of fiscal measures are critical for political fragmentation, because higher fiscal expenses lead to higher levels of policy divergence and less policy agreement, thus, making it more difficult to obtain policy consensus.

6 Robustness analysis

6.1 Results with the pooled common correlated effects (PCCE) estimator

Both the party polarization and corruption are likely to be cross-sectionally dependent. Policies and institutional quality in neighbouring countries affect policies and institutional quality in countries. Kelejian et al. (2013) demonstrated that the institutional quality in neighbouring countries is positively associated with countries' own institutions. Using voice and accountability, rule of law, and government effectiveness from the World Governance Indicators, they found that spatial institutional spillovers are statistically significant and economically important. Pinar and Stengos (2021) discussed that the requirements of the Copenhagen criteria led to increased diffusion of institutional quality in the EU. Similarly, conflict in neighbouring countries is likely to spillover and affect the economic conditions (De Groot, 2010). Using extreme bounds analysis, Miller et al. (2018) found that mass-driven political events spread cross-nationally. Finally, voting behaviour is also spatially dependent. For instance, Larsson et al. (2021) showed that spatial proximity is a significant element in votes received by the Swedish Democrats in the 2014 and 2018 national general elections. They show that being spatially closer to relatively larger neighbouring regions is associated with the support for Social Democrats. In sum, political conditions and socio-economic conditions (institutions and policies) in neighbouring countries affect the political and socio-economic conditions of countries. Therefore, we use the pooled common correlated effects (PCCE) estimator recommended by Pesaran (2006) as a robustness check. The purpose of using this estimator is to account for unobserved common factors by augmenting the original model with cross-sectional averages of the dependent and independent variables (as proxies for the unobserved common factors) and to interact these with country-dummies in order to allow for country-specific effects. Overall, PCCE estimator of Pesaran (2006), based dependencies across units in heterogeneous panels, is an ideal tool for estimating the effect of idiosyncratic corruption on idiosyncratic partisan polarization. The PCCE estimator lends itself to this task because it

accounts for common factors, allows for individual-specific effects of these factors, and generates coefficient estimates based on the idiosyncratic fluctuations in the data.

The PCCE estimator is equivalent to ordinary least squares applied to an auxiliary regression augmented with the cross-sectional means of the variables. This estimator partitions the model by orthogonally decomposing corruption and partisan polarization using their cross-sectional means. In addition, the estimation can be viewed as a two-stage regression. In the first stage, the common effects are filtered out from the data by regressing each variable on the cross-sectional averages of all variables in the model. In the second stage, the PCCE estimate of an individual coefficient is obtained by regressing the residual from the corruption equation in the first stage (i.e. capturing idiosyncratic corruption) on the residual from the partisan polarization equation in the first stage (i.e. capturing idiosyncratic income). These residuals are valid estimates of the idiosyncratic components and can be compared to cross-sectionally demeaned corruption and partisan polarization (Westerlund and Urbain 2015). The new results are presented in Table 2. The estimates are based only on the long-run association of the control variables with the partisan polarization metrics, with the results providing robust support to the GMM results reported in Table 1.

6.2 Panel non-causality test

In this part, the panel non-causality test developed by Dumitrescu and Hurlin (2012) is also performed. This test is a simple version of the Granger test. Under the null hypothesis, it is assumed that there is no individual causality relationship from one variable to another exists. This hypothesis is denoted as the homogeneous non-causality (HNC) hypothesis. The alternative hypothesis is denoted as the heterogeneous non-causality (HENC) hypothesis. Under the alternative hypothesis, it is assumed that there is a causal relationship from one variable to another for a subgroup of individuals and the coefficients may differ across groups.

The results are reported in Table 3. According to them, we can conclude that both types of corruption do Granger-cause all five alternative partisan polarization metrics at the 1% significance level, while the vice versa is also true. In other words, there is bidirectional causality between the two variables under consideration.

7 Identifying the channels of the effect of corruption on partisan polarization

While the literature has provided evidence that corruption affects economic growth through a number of channels (Podobnik et al. 2008; Pulok 2010), certain transmission channels of corruption impacting on economic growth have been ignored; such channels are those of government spending, government deficit, and trade openness. In terms of the fiscal channels, the creation and execution of the public budget go through wide and complex decision-making management. Therefore, it is highly likely that the decisions pertaining to the scope and allocation of government spending are very propitious for certain forms of corruption (Delavallade 2006). Moreover, political

Table 2 Partisan polarization and corruption: PCCE estimates

Variables	1	2	3	4	5	6	7	8	9	10
CPI	− 0.059***	− 0.051***	− 0.052***	− 0.047***	− 0.045***					
	[0.00]	[0.00]	[0.00]	[0.01]	[0.01]					
CCI						− 0.068***	− 0.062***	− 0.063***	− 0.055***	− 0.067***
						[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
WGI-VA	− 0.036**	− 0.035**	− 0.030**	− 0.024*	− 0.026*	− 0.040***	− 0.034**	− 0.031**	− 0.032**	− 0.037**
	[0.03]	[0.03]	[0.05]	[0.08]	[0.07]	[0.00]	[0.03]	[0.04]	[0.03]	[0.02]
WGI-PS	− 0.050***	− 0.046***	− 0.043***	− 0.039***	− 0.034***	− 0.047***	− 0.045***	− 0.050***	− 0.052***	− 0.051***
	[0.00]	[0.00]	[0.00]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
WGI-GE	− 0.024*	− 0.017*	− 0.021*	− 0.010	− 0.011	− 0.029**	− 0.023*	− 0.022*	− 0.030**	− 0.016
	[0.08]	[0.10]	[0.09]	[0.18]	[0.17]	[0.05]	[0.08]	[0.08]	[0.04]	[0.12]
WGI-RQ	− 0.045***	− 0.041***	− 0.045***	− 0.032**	− 0.030**	− 0.052***	− 0.046***	− 0.050***	− 0.038***	− 0.032**
	[0.00]	[0.00]	[0.00]	[0.04]	[0.05]	[0.00]	[0.00]	[0.00]	[0.01]	[0.04]
WGI-RL	− 0.030**	− 0.024*	− 0.011	− 0.019*	− 0.008	− 0.036**	− 0.026*	− 0.018	− 0.022*	− 0.010
	[0.05]	[0.08]	[0.19]	[0.10]	[0.27]	[0.05]	[0.07]	[0.11]	[0.09]	[0.25]
FH-PR	− 0.034**	− 0.031**	− 0.036**	− 0.022*	− 0.018*	− 0.038***	− 0.030**	− 0.029**	− 0.033**	− 0.023*
	[0.04]	[0.05]	[0.03]	[0.09]	[0.10]	[0.01]	[0.05]	[0.05]	[0.04]	[0.08]
FH-CL	− 0.030**	− 0.026*	− 0.022*	− 0.018	− 0.012	− 0.036**	− 0.025*	− 0.028*	− 0.021*	− 0.014
	[0.05]	[0.08]	[0.09]	[0.11]	[0.23]	[0.03]	[0.08]	[0.06]	[0.08]	[0.13]
Natural Resources	0.029*	0.023*	0.020*	0.032**	0.022*	0.040***	0.023*	0.019*	0.010	0.012
	[0.06]	[0.08]	[0.10]	[0.04]	[0.09]	[0.00]	[0.08]	[0.10]	[0.22]	[0.19]
Urban	0.035**	0.029**	0.024*	0.017	0.011	0.037**	0.022*	0.015	0.010	0.005
	[0.03]	[0.05]	[0.08]	[0.12]	[0.19]	[0.02]	[0.09]	[0.16]	[0.23]	[0.34]

Table 2 (continued)

Variables	1	2	3	4	5	6	7	8	9	10
POP	0.038***	0.032**	0.020*	0.021*	0.011	0.040***	0.031**	0.019*	0.008	0.005
	[0.01]	[0.05]	[0.10]	[0.09]	[0.19]	[0.00]	[0.05]	[0.10]	[0.27]	[0.32]
Trade freedom	− 0.051***	− 0.044***	− 0.041***	− 0.034**	− 0.036**	− 0.061***	− 0.055***	− 0.046***	− 0.042***	− 0.040***
	[0.00]	[0.00]	[0.00]	[0.04]	[0.03]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
MYS	− 0.073***	− 0.058***	− 0.061***	− 0.053***	− 0.050***	− 0.072***	− 0.064***	− 0.053***	− 0.056***	− 0.050***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
GOVEXP	0.046***	0.044***	0.049***	0.054***	0.056***	0.060***	0.058***	0.064***	0.061***	0.058***
	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
GOVBUDGET	0.053***	0.050***	0.055***	0.057***	0.062***	0.063***	0.060***	0.068***	0.072***	0.069***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Diagnostics										
Fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R2-adjusted	0.72	0.66	0.60	0.64	0.62	0.75	0.72	0.67	0.65	0.60

*$p \leq 0.10$, **$p \leq 0.05$, ***$p \leq 0.01$

Table 3 Dumitrescu and Hurlin panel Granger non − causality test results

Null hypothesis	*p* value
Corruption does not cause partisan polarization	
Corruption perception index → Party polarization	[0.00]
Corruption perception index → Fragmentation	[0.00]
Corruption perception index → Ideology difference between parties that govern	[0.00]
Corruption perception index → Highest ideological difference among 4 major parties	[0.00]
Corruption perception index → Ideological difference among 2 major parties	[0.01]
Control of corruption → Party polarization	[0.00]
Control of corruption → Fragmentation	[0.00]
Control of corruption → Ideology difference between parties that govern	[0.00]
Control of corruption → Highest ideological difference among 4 major parties	[0.00]
Control of corruption → Ideological difference among 2 major parties	[0.00]
Partisan polarization does not cause corruption	
Party polarization → corruption perception index	[0.00]
Fragmentation → corruption perception index	[0.01]
Ideology difference between parties that govern → corruption perception index	[0.00]
Highest ideological difference among 4 major parties → corruption perception index	[0.00]
Ideological difference among 2 major parties → corruption perception index	[0.00]
Party polarization → control of corruption	[0.01]
Fragmentation → control of corruption	[0.00]
Ideology difference between parties that govern → control of corruption	[0.00]
Highest ideological difference among 4 major parties → control of corruption	[0.00]
Ideological difference among 2 major parties → control of corruption	[0.00]

corruption directly influences the decisions about the amount and allocation of government spending and government deficit, where political decisions usually take place (Hessami 2014; Sidorkin and Vorobyev 2018). Hessami (2014) also documents that corruption impacts positively not only the overall size of the government but also the structure of government spending. Hessami (2014) also provides supportive evidence that corruption leads to a bigger size of the government, while it favours more expenditure in the sectors of defence and energy, at the expense of social sectors, like education and health.

In terms of the association between corruption and trade openness, the literature offers two opposing views. More specifically, the favourable group argues that within the framework of the greasing hypothesis, corruption facilitates trade that may not have happened otherwise, while it promotes efficiency by allowing private sector agents to circumvent cumbersome regulations (Huntington 1968; Méon and Weill 2010). In contrast, the opponent group argues that the greasing effect of corruption can happen only as a second-best option in a bad institutional setting (Aidt 2009).

Table 4 Corruption, government spending, government deficit, trade openness, and real GDP per capita: PCCE estimates

Variables	GOVEXP	Trade open	GDP pc	GOVBUDGET
Corruption perception index	0.062***	− 0.039**	− 0.067***	0.065***
	[0.00]	[0.04]	[0.00]	[0.00]
R2 − adjusted	0.56	0.5	0.57	0.58
Control of corruption	0.056***	− 0.032**	− 0.057***	0.061***
	[0.00]	[0.05]	[0.00]	[0.00]
R2 − adjusted	0.53	0.48	0.54	0.57

Figures in brackets denote p values
***$p \leq 0.01$; **$p \leq 0.05$

This part of the analysis employs data on government spending, government deficit, trade openness, and real GDP per capita to display the empirical estimates of the effect of corruption on them. The results are reported in Table 4 and denote that corruption has a positive and statistically significant effect on government expenditures and government budget, while it exerts a negative and statistically significant effect on trade openness and real GDP per capita.

8 Conclusion

The existing literature examining the association between partisan polarization and corruption has been mainly dominated by studies exploring the effect of partisan polarization on corruption. However, there are also many political theories that explored the concept of how voters respond to the corrupt behaviour of incumbent governments. The existing literature provided a contradicting set of results, where either corrupted candidates were penalized or only suffered minor losses and got re-elected. With the use of a wide range of partisan polarization measures, this paper demonstrated that the increased corruption in European countries led to increased partisan polarization. This paper's main finding, increased corruption leading to increased partisan polarization, provides another important mechanism beyond the standard socio-economic factors that led to the current rise in support of parties opposing to EU and rise of populist parties in EU (Hobolt 2016; Goodwin and Heath 2016; Becker et al. 2017; Ford and Goodwin 2017; Rodrik 2018; Dijkstra et al. 2020).

Our findings also provide some policy implications. Given the current increased partisan polarization in EU and discontent, our findings suggest that one way to combat the partisan polarization is to improve the controls of corruption and improve the institutional quality to improve the economic prosperity of citizens and regain the trust of the citizens, which in turn could lower partisan polarization and enhance better economic outcomes.

Author contributions All authors contributed equally to the conceptualization, data curation, formal analysis, investigation, methodology project administration, and writing the original draft and review and editing.

Funding No funds, grants, or other support were received by any of the authors for the submitted work.

Data availability The data are freely available from the sources mentioned in the manuscript.

Declarations

Conflict of interest The authors declare no competing interests.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Consent for publication All authors agreed to publish the article.

Appendix

See Tables 5, 6, and 7.

Table 5 Country list

Austria	Estonia	Hungary	Luxembourg	Slovakia
Belgium	Finland	Ireland	Malta	Slovenia
Cyprus	France	Italy	Netherlands	Spain
Czech Republic	Germany	Latvia	Poland	Sweden
Denmark	Greece	Lithuania	Portugal	United Kingdom

Table 6 Description of the variables and sources of data

Variable name	Variable description	Source
CPI	Corruption Perceptions Index	Transparency International
WGI-CC	Control of corruption index from World Governance Indicators (WGI)	World Bank—World Governance Indicators
Party polarization (PP)	It measures the ideological polarization of the political system (see Eq. 3)	Döring and Manow (2019) database
Political fractionalization (PF)	It measures the probability that two representatives picked at random from the parties in the legislature will be of different parties (see Eq. 2)	Döring and Manow (2019) database
GOVIDEODIF	Ideology difference between parties that govern (0 if majority government)	Döring and Manow (2019) database

Table 6 (continued)

Variable name	Variable description	Source
IDEODIF4	Highest ideological difference among 4 major parties	Döring and Manow (2019) database
IDEODIF2	Ideological difference among 2 major parties	Döring and Manow (2019) database
WGI-VA	Voice and accountability from World Governance Indicators (WGI)	World Bank—World Governance Indicators
WGI-PS	Political Stability and Absence of Violence/Terrorism from World Governance Indicators (WGI)	World Bank—World Governance Indicators
WGI-GE	Government effectiveness from World Governance Indicators (WGI)	World Bank—World Governance Indicators
WGI-RQ	Regulatory Quality from World Governance Indicators (WGI)	World Bank—World Governance Indicators
WGI-RL	Rule of law from World Governance Indicators (WGI)	World Bank—World Governance Indicators
FH-PR	Property rights index from Freedom House (FH) database	Freedom House database
FH-CL	Civil liberties index from Freedom House (FH) database	Freedom House database
GDPpc	GDP per capita (constant 2010 US$)	World Bank—World Development Indicators
Trade open	Sum of imports and exports of goods and services (% of GDP)	World Bank—World Development Indicators
Natural resources	Total natural resources rents (% of GDP)	World Bank—World Development Indicators
Urban	Urban population (% of total population)	World Bank—World Development Indicators
POP	Total population	World Bank—World Development Indicators
GOVEXP	General government final consumption expenditure (% of GDP)	World Bank—World Development Indicators
GOVBUDGET	General government net lending/borrowing (% of GDP). Net lending (+)/borrowing (−) is calculated as revenue minus total expenditure	World Bank—IMF World Economic Outlook
Trade freedom	Trade freedom index from the Economic Freedom index	Economic Freedom index database
MYS	Average number of years of education received by people ages 25 and older	Human development reports database

Table 7 Descriptive statistics

	Mean	SD	Min	Max
CPI	66.32	16.36	34.00	97.00
WGI-CC	1.17	0.73	− 0.19	2.47
PP	3.99	0.87	1.51	6.66
PF	0.76	0.08	0.51	0.90
GOVIDEODIF	2.09	1.59	0.00	5.91
IDEODIF4	4.89	1.31	1.92	8.31
IDEODIF2	3.24	1.47	0.13	7.63
WGI-VA	1.20	0.27	0.37	1.80
WGI-PS	0.81	0.39	− 0.47	1.69
WGI-GE	1.26	0.51	0.20	2.35
WGI-RQ	1.28	0.38	0.15	2.05
WGI-RL	1.26	0.51	0.08	2.10
FH-PR	38.35	1.67	29.00	40.00
FH-CL	55.96	3.02	45.00	60.00
GOVEXP	20.15	2.79	11.98	27.93
GOVBUDGET	− 2.68	3.64	− 32.12	5.12
GDPpc	35,084	20,562	8894	111,968
Trade open	121.61	68.53	45.42	408.36
Natural resources	0.45	0.49	0.00	2.55
Urban	73.74	12.13	51.08	97.96
POP	18,837,280	23,814,902	398,582	82,657,002
Trade freedom	84.62	4.13	62.20	88.00
MYS	11.50	1.28	7.20	14.10

SD stands for standard deviation

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