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Political polarization in the UK: measures and socioeconomic correlates

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Abstract

This paper evaluates the political polarization in the UK and analyzes its socioeconomic correlates based on detailed county-level panel data constructed from the British Household Panel Survey. Three different polarization measures, computed following different strands of the literature, are highly correlated and characterized by similar statistical properties, which implies they can be used interchangeably in the quantitative analysis. The empirical evaluation of the determinants of political polarization suggests that regional political polarization in the UK is positively associated with the variability of job status and negatively associated with an increase in the employment rate and an increase in the share of natives in the region. The findings of this paper fill the gaps in understanding the political polarization in the UK by clarifying its measurement, correlates, and trends.

Keywords Political polarization · Income inequality · Social inequality · Survey data

JEL Classification D31 · D63 · D72 · O15

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1 Introduction

Political polarization, generally defined as the divergence of individual attitudes about the desirable policies, is associated with social tensions (Esteban & Ray, 2011; Esteban et al., 2012), policy uncertainty (Funke et al., 2016), economic fluctuations (Azzimonti & Talbert, 2014) and low economic growth rates (Azzimonti, 2011). Nevertheless, while it has been intensively studied for the Unites States,[1] many questions remain about political polarization in other countries (Perrett, 2021). In particular, the ambiguity about the true trends and drivers of polarization in the UK have sparked debates about the "divided nation" in the aftermath of Brexit (Duffy, 2019). Some scholars have associated this national divide with a rise in nationalism and populism (Corbett, 2016; Pitcher, 2019) while others have alerted that the misplaced focus on a few political issues resulted in a biased evaluation of polarization in British society (Perrett, 2021; Evans & Neundorf, 2020). A better understanding of political polarization and its socioeconomic drivers is necessary to evaluate the political climate, the degree of societal divisions, and its economic consequences.

The purpose of this paper is to evaluate the political polarization in the UK and analyze its socioeconomic determinants based on detailed county-level panel data. I construct political polarization measures and economic and social indicators using the individual responses from the British Households Panel Survey (BHPS), aggregated over English counties and covering years 1991–2007.[2] The measures of polarization analyzed in this study consist of the inter-group polarization by Esteban and Ray (1994); the standard deviation of individual opinions as in Lindqvist and Östling (2010) ; and the ideology polarization by Abramowitz and Saunders (2008). I use confirmatory factor analysis to estimate the unobserved latent variable, political polarization, based on the vector of observed measures constructed from individual responses to survey questions. The survey questions used for this purpose are about a salient political issue: the role of public sector in the economy.

First, I compare the properties of the constructed county-level political polarization measures in cross section and over time in order to extract common characteristics. Second, I analyze the socioeconomic correlates of political polarization controlling for regional factors and common time trends. Third, I discuss the potential reasons behind the properties and trends of political polarization in the UK.

The analysis of the causes of political polarization is complicated by potential endogeneity issues, where the political polarization and its determinants are affected by common unobserved factors, or there is a potential feedback from the political polarization to social and economic policies (for example, through the "legislative

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[1] See, for example, Foster and Wolfson (2010) ; Duca and Saving (2016) and Duca and Saving (2017); Garand (2010); Lupu and Pontusson (2011) ; McCarty et al. (2003) and McCarty et al. (2006); Shor and McCarty (2011) .

[2] The BHPS data covers English regions starting from the first wave, 1991, and permit the construction of the balanced panel data on county level. The responses of individuals from Scotland, Wales and Northern Ireland were added in 1999 and 2001, respectively. These responses are not included in the analysis. The Understanding Society part of the survey does not include the questions on political attitudes, therefore, the data ends in 2007.

gridlock," as discussed in Jones, 2001). A number of recent studies have used panel data comprised of regional social and economic indicators and regional measures of political polarization (see, for example, Voorheis et al. (2015) and Winkler (2019)) to address the endogeneity problem. Panel data allows to control for unobserved region-specific fixed effects, and regional polarization measures are less likely to influence social and economic indicators, if the regional authorities are not responsible for redistributive policies. There are still a number of concerns about endogeneity, for example, if individuals self-select themselves into regions with particular political orientation. In order to (partially) overcome these concerns, I compute the political polarization measures and the socioeconomic indicators based on the responses of the individuals that did not change the county of residence during the periods in which they participated in the survey. This implies that the county can have a different number of inhabitants in different years, but the individuals that are active respondents cannot change their county of residence. Both the polarization measures and the socioeconomic indicators are constructed using the responses provided by the same individuals. Thus, the empirical approach taken in this paper is to evaluate the relationship between the socioeconomic characteristics of a group of individuals in a particular county and the political polarization characterizing this group. The socioeconomic characteristics considered include the median income and income inequality, the share of natives in the sample, the variability of educational achievements and job status, the variance of respondents' age, and the shares of employed full time within a county in a given year.

The findings of the paper can be summarized as follows. First, the measures of polarization are highly correlated and characterized by similar statistical properties, which implies they can be used interchangeably in the quantitative analysis. Second, political polarization in the UK has been characterized by a downward trend during the 1991–2007. This finding is consistent with the estimates provided by other studies which suggest that the political opinions in the UK have been characterized by convergence before the polarization sparked shortly before the EU referendum (Evans & Tilley, 2012; Duffy, 2019). As a robustness check, I compute an alternative polarization measure based on two statements regarding political opinions from the European Social Survey data, covering time period 2002–2018. The resulting polarization measures decline until 2010 and then increase for both underlying statements, suggesting that they reflect the overall trend in the British public's opinions. Third, political polarization is positively associated with the variability of job status and negatively associated with the increase in the employment and an increase in the share of natives in the region. At the same time, the time trends have the largest power in explaining the variation of political polarization within the counties and over time. These results hold regardless of whether the levels or the differences of political polarization are used as the dependent variable.

The findings of this paper fill the gaps in understanding the political polarization in the UK by clarifying the measurement, correlates, and trends in political polarization, based on the political issues related to the role of public sector in the economy.

The paper is organized as follows. Section 2 describes the political polarization measures constructed based on the BHPS. Section 3 discusses the potential social and economic determinants of political polarization, introduces the model used to

evaluate their influence on polarization, and describes the estimation results. Section 4 provides an alternative polarization measure based on the different dataset and elaborates on the potential reasons behind the trends in the political polarization in the UK. Section 5 concludes.

2 Measuring political polarization

Polarization refers to the extent to which the opinions on an issue are opposed (DiMaggio et al., 1996). It can be measured from individual social surveys by aggregating the answers to the relevant questions [see, for example, Lindqvist and Östling, (2010), Binswanger and Oechslin (2015), Winkler (2019)]. To measure political polarization in the UK, I use the data from the BHPS and compute the divergence of individual opinions on a particular political issue: the role of public sector in the economy. The BHPS contains three statements related to this political issue, as follows:

s_1 "Private enterprise is the best way to solve Britain's economic problems."
s_2 "Major public services and industries ought to be in state ownership."
s_3 "It is the government's responsibility to provide a job for everyone who wants one."

For each of these statements, the respondent is requested to choose one of the opinions: strongly disagree, disagree, neither agree nor disagree, agree, or strongly agree, which are coded as $O = \{-2, -1, 0, 1, 2\}$. I aggregate the individual responses on county level, so that the resulting political polarization measures are regional. I consider only the individuals that did not change their county of residence during the years when they were active respondents to the survey.[3] The data is available for years $t \in \{1991, 1993, 1995, 1997, 2000, 2004,$ and $2007\}$.

Several aggregation methods have been used in the literature for the construction of political polarization measures. I use three such methods and compare the properties of the resulting variables. In particular, I compute the polarization as the variance of the individual opinions (the measure by Lindqvist and Östling (2010)); the sum of individual ideological distances (Abramowitz and Saunders (2008) and Boxell et al. (2017)); and the sum of all the effective antagonisms felt by different groups towards each other (the measure by Esteban and Ray (1994)). The following notation facilitates the presentation of the formulas for the political polarization measures considered in this study.

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[3] There are 31,657 individual responses corresponding to the individuals that did not change their county of residence; this represent more than 90% of the total number of survey responses.

Let $a^s_{j,i,t} \in O$ be the individual score assigned to policy statement s by individual j residing in county i in year t, and $N_{i,t}$ the number of individuals who provided valid responses to the survey in county i and year t. Let m be the number of groups with different individual scores, $n_{k,i,t}$ the population share of group $k \in \{1, ..m\}$ in county i in year t, and $d_{k,p}$ the intergroup distance computed as the absolute value of the difference between the scores characterizing group p and group k. Let $p^s_{J,i,t}$ be the political polarization measure computed based on statement s according to method J for county i and year t.

The first political polarization measure, from Lindqvist and Östling (2010) , is computed as the standard deviation of the scores $a^s_{j,i,t}$ assigned to the statement s by the individuals j residing in the county i in year t:

$$p^s_{sd,i,t} = \sum_{j=1}^{N_{i,t}} \left(a^s_{j,i,t} - \frac{\sum_{j=1}^{N_{i,t}} a^s_{j,i,t}}{N_{i,t}} \right)^2 /(N_{i,t} - 1). \tag{1}$$

Political science studies, in particular Abramowitz and Saunders (2008) and Boxell et al. (2017), use the political polarization measure based on the sum of ideological distances on the political issue. Following these authors, the second polarization measure, $p^s_{id,i,t}$ (polarization based on ideological distances), is computed as the sum over all the individuals, in a given county-year, of the absolute value of their scores assigned to policy statement s, $a^s_{j,i,t}$, normalized by the number of individuals considered, as follows:

$$p^s_{id,i,t} = \sum_{j=1}^{N_{i,t}} \left(|a^s_{j,i,t}| \right) /N_{i,t}. \tag{2}$$

Esteban and Ray (1994) and Duca and Saving (2016) propose a measure of political polarization consistent with a number of axioms underlying the concept of polarization based on the effective antagonisms across different social groups. Following these authors, the third polarization measure, $p^s_{ea,i,t}$ (polarization based on effective antagonisms), is computed as the sum of all the effective antagonisms felt by different groups towards each other and proxied by the distances in the groups' specific scores towards the considered policy statements, $d_{k,p}$, as follows:

$$p^s_{ea,i,t} = \sum_{k=1}^{m} \sum_{p=1}^{m} n^2_{k,i,t} n_{p,i,t} d_{k,p}. \tag{3}$$

Thus, I obtain three measures of political polarization, $p^s_{J,i,t}$, $J \in \{sd, id, ea\}$, corresponding to each of the statements, $s \in \{s_1, s_2, s_3\}$. These statements are related to the same political issue and underline the unobserved political polarization, $P_{J,i,t}$, on the role of public sector in the economy. That is, for each J, given the vector $p^s_{J,i,t}$ of the observed political polarization measures, the latent variable $P_{J,i,t}$ represent a common factor that affects $p^s_{J,i,t}$. The relationship between the observed polarization measures corresponding to each particular statement and the unobserved political

Table 1 Correlation coefficients among the observed and estimated latent political polarization measures

	(1) $p^{s_1}_{sd}$	(2) $p^{s_2}_{sd}$	(3) $p^{s_3}_{sd}$	(4) P_{sd}	(5) $p^{s_1}_{id}$	(6) $p^{s_2}_{id}$	(7) $p^{s_3}_{id}$	(8) P_{id}	(9) $p^{s_1}_{ea}$	(10) $p^{s_2}_{ea}$	(11) $p^{s_3}_{ea}$
$p^{s_2}_{sd}$	0.724	1.000									
$p^{s_3}_{sd}$	0.545	0.582	1.000								
P_{sd}	**0.880**	**0.946**	**0.701**	**1.000**							
$p^{s_1}_{id}$	0.951	0.703	0.450	0.836	1.000						
$p^{s_2}_{id}$	0.777	0.922	0.507	0.913	0.817	1.000					
$p^{s_3}_{id}$	0.647	0.629	0.896	0.752	0.612	0.623	1.000				
P_{id}	**0.882**	**0.851**	**0.545**	**0.928**	**0.923**	**0.953**	**0.695**	**1.000**			
$p^{s_1}_{ea}$	0.760	0.552	0.297	0.633	0.840	0.672	0.441	0.739	1.000		
$p^{s_2}_{ea}$	0.683	0.650	0.373	0.674	0.747	0.793	0.510	0.767	0.810	1.000	
$p^{s_3}_{ea}$	0.475	0.333	0.320	0.407	0.518	0.421	0.519	0.478	0.566	0.595	1.000
P_{ea}	**0.762**	**0.645**	**0.358**	**0.706**	**0.847**	**0.804**	**0.529**	**0.833**	**0.906**	**0.964**	**0.673**

Note: This table reports the correlation coefficients among the observed and estimated latent (in bold) political polarization measures for the aggregated county-level data

polarization reflecting the divergence of opinions on the political issue about the role of public sector in the economy is modeled as follows:

$$p^s_{J,i,t} = \beta^s + \Lambda^s P_{J,i,t} + \mu_i + \epsilon_{i,t}, \ s \in \{s_1, s_2, s_3\} \tag{4}$$

where β^s is an intercept, μ_i is county fixed effect, Λ^s is the factor loading, $\epsilon_{i,t}$ is the error term, and $P_{J,i,t}$ is assumed to follow a normal distribution. Model (4) represents a version of the generalized structural equation model that can be estimated by maximum likelihood. Once the model is estimated, the political polarization is constructed as a predicted value of the common factor $P_{J,i,t}$ for each $J = \{sd, id, ea\}$.

Table 1 reports the correlation coefficients among the observed political polarization measures, p^s_J, and the estimated latent political polarization, P_J, corresponding to each $J = \{sd, id, ea\}$. The polarization measures are highly correlated with the correlation coefficients ranging from 0.297 to 0.964 and the estimation of Model (4) delivers all significant factor loadings. The remaining analysis focuses on the political polarization measures P_J, $J = \{sd, id, ea\}$.[4]

Figure 1 presents the distributions of the estimated political polarization measures P_J, normalized to zero mean. The polarization measures have similar statistical properties with the polarization based on the effective antagonisms having the smallest variance among the three measures.

The cross section of political polarization in English counties is presented in Fig. 2, where for each polarization measure, all the values are split into four groups denoted by different color. The darker color represents higher political

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[4] The results are very similar if the observed calculated measures p^s_J are used instead of P_J.
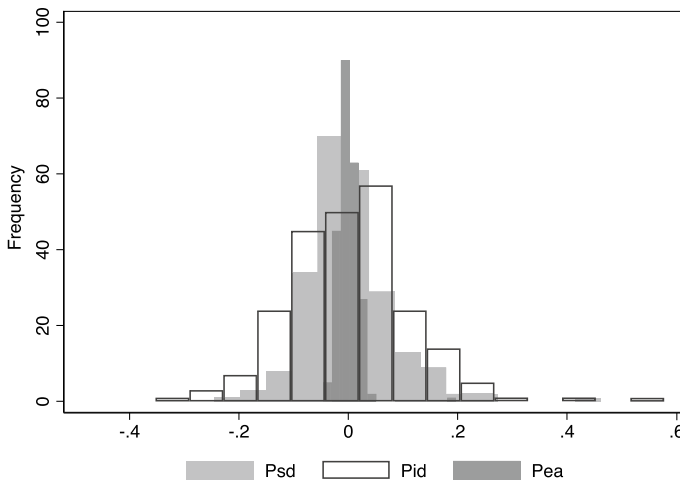
Fig. 1 Distributions of political polarization measures *Note:* This figure shows the distributions, normalized to zero mean, of county-level political polarization measures P_{sd}, P_{id}, and P_{ea}

Fig. 2 The cross section of political polarization measures *Note:* This figure shows the map of English counties by the level of political polarization measures P_{sd}, P_{id}, and P_{ea} in 1995 in the left, middle, and right graph, respectively. Darker colors correspond to higher political polarization

polarization levels. This representation suggests that even though the groups differ across P_{sd}, P_{id}, and P_{ea}, the patterns conveyed by each of these measures are relatively similar. That is, a county that is more polarized according to P_{sd} is also likely to be more polarized according to P_{id}, or P_{ea}.

Figure 3 presents the time series of the averages of polarization measures computed over all the counties, for different J. The three measures, P_{sd}, P_{id}, and P_{ea}, are highly correlated and, on aggregate, characterized by a negative trend, though there are some counties for which polarization is growing over time. All three polarization measures exhibit some fluctuations over time, a feature which is useful for the analysis of their determinants within a county.
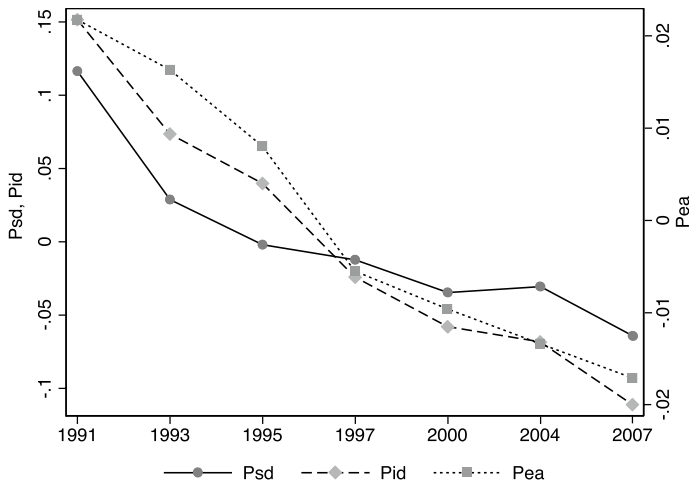
Fig. 3 The time series of political polarization measures, 1991–2007 *Note:* This figure shows the time-series data, averaged over all counties, of political polarization measures P_{sd}, P_{id}, and P_{ea} computed from the BHPS

The next section analyzes the potential determinants of political polarization based on the socioeconomic indicators constructed from the BHPS data.

3 The potential determinants of political polarization

I use the responses to the BHPS to construct a number of social and economic indicators that, according to the related studies, could influence the individual attitudes towards political matters and the political polarization at county level. These indicators are constructed using the characteristics of the same individuals for which the political polarization measures were constructed for a given county-year. The aggregation within counties allows me to build panel data which is sufficiently general to allow for characterization of the political polarization over time controlling for the county-specific fixed effects. At the same time, such aggregation produces county-specific measures which are not representative of the entire country, allowing to overcome some of the reverse causality issues, such as the potential feedback from the political polarization to government policies.

All the indicators are computed based on the responses of individuals that did not change their county of residence during the years when they participated in the survey. In this way, the possibility that the individuals self-select into particular regions is reduced. Moreover, the individual-reported variables used to compute economic and social indicators are reported in exact quantities (e.g., age in years, income in pounds) rather than in categories, as in other surveys. Thus, measurement errors associated with these variables are mitigated and random.

The indicators, selected based on the findings of the related studies and data availability, are as follows:

- *The income inequality.* This variable is computed as the Gini coefficient using the self-reported annual income over all individuals residing in a given county. Income inequality has been considered as the most robust correlate of political polarization (McCarty et al. (2003) and McCarty et al. (2006); Duca and Saving (2016) and Duca and Saving (2017); Grechyna (2016)). Given that the authorities of English counties are not responsible for any significantly redistributive policies, the feedback from the county-specific polarization to county-specific income inequality is less prominent, compared to other studies.

- *The median income.* Computed as the median annual income over all individuals residing in a county in a given year, this variable proxies the degree of economic development in a given county. It is another robust determinant of political polarization (Grechyna, 2016).

- *The variability of the highest educational qualification.* Computed as a dissimilarity index of the highest educational qualification, a categorical variable ranging from one, higher degree, to thirteen, no qualification, in a given county-year.[5] Higher variability of educational attainments may signal higher heterogeneity of individuals in the county, and can lead to higher political polarization.

- *The change in the fraction of natives among the respondents*, computed as the number of individuals who reported being born in the UK divided by the total number of individuals surveyed in a county-year. It has been shown that ethnolinguistic fractionalization is associated with higher political instability (see Esteban et al. (2012)). A larger fraction of natives is a proxy for lower fractionalization and should decrease political polarization.

- *The standard deviation of individual age in county-year.* More variability in age can potentially lead to higher political polarization if the attitudes about political matters are age-dependent. The empirical evidence suggests that political participation follows a U-shape during the individual life-cycle, rising with age until a peak and then declining (see, for example, Nie et al. (1974); Quintelier (2007); and Smets and Van Ham (2013)).

- *The variability of the job status in the county-year.* A job status (a categorical variable with possible options being self-employed, employed, unemployed, student, retired, family care, maternity leave, sick, government trained, and other status), may affect individual attitudes towards public policies. The variability of the job status, similar to the variability of the educational attainments, is computed as a dissimilarity index in a given county-year. Higher variability in job status may reflect higher social inequality and can lead to more divergent attitudes about political matters.

- *The fraction of employed full time.* This variable is computed as the ratio of the individuals who reported to be employed full time to the total number of individuals surveyed in a given county and given year. The availability of job potentially makes an individual more confident about the future and less

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[5] The dissimilarity index is computed as $(1/2) \sum |p - 1/S|$, where S is a number of categories and p are their relative frequencies in the data.

Table 2 Descriptive statistics: political polarization measures and socioeconomic indicators, county-level data

Variables	(1) Mean	(2) Std.dev.	(3) Min	(4) Max
P_{sd} (Polarization, std. dev.)	0.902	0.0807	0.657	1.363
P_{id} (Polarization, ideological dist.)	0.688	0.111	0.335	1.265
P_{ea} (Polarization, eff. antagonisms)	0.268	0.0205	0.222	0.465
Income inequality	0.435	0.0379	0.315	0.532
Median income	9.124	0.295	8.392	9.811
Employed share	0.586	0.0681	0.374	0.758
Employed share change	0.0020	0.0528	-0.136	0.172
Native share	0.953	0.0357	0.698	1.000
Native share change	0.0023	0.0396	-0.133	0.255
Education variability	0.478	0.0422	0.365	0.669
Job status variability	0.533	0.0495	0.384	0.682
Age variance	18.29	1.571	14.23	24.27
Population (in logarithms)	4.751	0.648	2.996	6.207

Note: This table reports summary statistics for the aggregated county-level data from seven waves of the BHPS based on 31,657 responses; the number of total county-year data points is 199; the number of counties considered is 34

dependent on government support programs. Thus, an employed individual is likely to support less government-oriented policies, other things equal.

- *The number of individuals surveyed in a given county-year.* This is a proxy for population size. Larger population implies more individual opinions and can increase political polarization.

The summary statistics of the resulting county-specific variables are reported in Table 2. These statistics are based on 31,657 individual responses aggregated over 34 counties.

I consider the model that relates the logarithm of political polarization to the linear combination of the socioeconomic characteristics of a county, as follows:

$$\ln P_{J,i,t} = \beta Y_{i,t} + \eta_i + \mu_t + \epsilon_{i,t}, \tag{5}$$

where $P_{J,i,t}$ is the county i year t political polarization measure, $J \in \{sd, id, ea\}$; $Y_{i,t}$ is a set of social and economic indicators characterizing county i in year t, η_i is county fixed effect; μ_t is time fixed effect; and $\epsilon_{i,t}$ is the error term. In all estimations, the errors are clustered at county level, so that they are robust to heteroscedasticity and serial correlation. Specification of dependent variable in terms of logarithms rather than levels facilitates interpretation and comparison of the results across different measures of polarization and mitigates the impact of outliers.

Table 3 Socioeconomic indicators and political polarization

Variables	(1) P_{sd}	(2) P_{id}	(3) P_{ea}	(4) ΔP_{sd}	(5) ΔP_{id}	(6) ΔP_{ea}
Income inequality	0.0549	0.272	0.0540	−0.104	−0.0345	−0.161
	(0.172)	(0.239)	(0.0943)	(0.167)	(0.238)	(0.112)
Median income	−0.0188	0.0159	0.0143	−0.0913	−0.0714	−0.0472
	(0.0492)	(0.0767)	(0.0303)	(0.0557)	(0.0819)	(0.0484)
Age variance	−0.00735	−0.0127	−0.00226	−0.0129**	−0.0231**	0.000904
	(0.00470)	(0.0107)	(0.00356)	(0.00525)	(0.00938)	(0.00411)
Employed sh. change	−0.137*	−0.204	−0.0655	−0.306**	−0.303	−0.0622
	(0.0715)	(0.136)	(0.0759)	(0.132)	(0.193)	(0.128)
Natives sh. change	−0.199*	−0.388*	−0.137	−0.0821	−0.0548	0.110
	(0.111)	(0.225)	(0.0903)	(0.126)	(0.198)	(0.173)
Job status variability	0.324**	0.592**	0.183*	0.508***	0.707***	0.270*
	(0.129)	(0.267)	(0.0982)	(0.140)	(0.234)	(0.139)
Education variability	0.0869	0.237	0.117	0.201	0.197	0.199
	(0.137)	(0.211)	(0.114)	(0.174)	(0.257)	(0.216)
Population	−0.0393	−0.0774	−0.0379	0.0167	0.0216	0.0258
	(0.0437)	(0.0711)	(0.0246)	(0.0425)	(0.0599)	(0.0480)
1995	−0.0394***	−0.0626***	−0.0365***	0.0644***	0.0558**	−0.00703
	(0.0116)	(0.0196)	(0.0101)	(0.0183)	(0.0237)	(0.0286)
1997	−0.0537***	−0.161***	−0.0887***	0.0716***	−0.00958	−0.0370*
	(0.0182)	(0.0319)	(0.00943)	(0.0213)	(0.0291)	(0.0195)
2000	−0.0795***	−0.223***	−0.110***	0.0684***	0.0346	−0.00136
	(0.0223)	(0.0420)	(0.0144)	(0.0195)	(0.0301)	(0.0219)
2004	−0.0862***	−0.271***	−0.138***	0.110***	0.0817**	0.0155
	(0.0290)	(0.0549)	(0.0175)	(0.0263)	(0.0386)	(0.0334)
2007	−0.123***	−0.346***	−0.155***	0.0804**	0.0411	0.0170
	(0.0367)	(0.0644)	(0.0205)	(0.0368)	(0.0553)	(0.0369)
Constant	0.192	−0.338	−1.330***	0.575	0.424	0.103
	(0.600)	(0.912)	(0.311)	(0.621)	(0.864)	(0.503)
Observations	199	199	199	199	199	199
R-squared (within)	0.470	0.718	0.770	0.325	0.220	0.125
N counties	34	34	34	34	34	34
County FE F-stat	70.13	515.33	32.504	56.62	40.76	75.02
Year FE F-stat	3.736	6.430	22.652	4.693	3.096	2.756
Controls F-stat	2.364	1.636	1.658	3.125	1.848	1.371
Adj. R-sq full	0.613	0.743	0.741	.219	.153	0.010
Adj. R-sq counties	0.118	0.069	−0.061	−0.066	−0.001	−0.042
Adj. R-sq years	0.434	0.562	0.535	0.177	0.078	0.046
Adj. R-sq controls	0.125	0.295	0.368	0.116	0.064	0.040

Note: This table reports the results of Model (5) estimation by OLS controlling for county and year fixed effects. The dependent variables are the logarithms of the three variants of polarization measures, P_{sd}, P_{id}, and P_{ea}, and their differences, in the first and last three Columns, respectively. The errors are clustered at county level

Columns (1)–(3) of Table 3 report the results of Model (5) estimation by OLS controlling for time and county fixed effects, for political polarization measures P_{sd}, P_{id}, and P_{ea}, respectively. The estimation results indicate the importance of the time trends in explaining political polarization in the UK during the period considered in the study. All of the year dummies have negative and significant coefficients, implying that the polarization decreased over time compared to the initial period, 1991. Besides, the variability of the job status is positively associated with political polarization, supporting the hypothesis that more diverse social groups are characterized by greater divergence of opinions on the role of government in the economy. The variability of the job status is a significant determinant of political polarization for all three polarization measures considered in the study. An increase in the employment rate is negatively associated with the political polarization measured as the variance of individual opinions, P_{sd}. At the same time, an increase in the share of natives in the county is negatively associated with polarization measured as the variance of individual opinions or the average ideological distance, P_{sd} and P_{id}. In particular, a one percent increase in the share of natives is associated with a reduction in the political polarization by 0.20–0.40 percent, on average. This finding is consistent with the related discussion by Esteban et al. (2012), who suggest that lower ethnolinguistic fractionalization is associated with lower political polarization.

The political polarization measures considered in this study are regional, and Fig. 2 suggests that there is a significant variation in polarization across different counties. The goodness-of-fit statistics, reported in the bottom rows of Table 3, allow for the comparison of the significance and relative explanatory power of the fixed unobservable regional characteristics, captured by county fixed effects, time-varying unobservables, captured by time fixed effects, and the set of time-varying and county-varying socioeconomic indicators in explaining regional political polarization. The reported F-statistics correspond to the Wald test of the joint significance of the set of county dummies, the set of year dummies, and the set of socioeconomic indicators, in the rows entitled respectively. The join significance of each of these sets of variables cannot be rejected, except for the significance of the set of socioeconomic indicators in the regressions with P_{id} or P_{ea} as the dependent variables.

Furthermore, I compare the explanatory power of the set of county dummies, the set of year dummies, and the set of socioeconomic indicators by estimating the model excluding the remaining variables. The corresponding adjusted R-squared coefficients are reported in the last tree rows of Table 3. The year dummies capture the largest fraction of the variation in the political polarization, suggesting that some events common to all of the counties are responsible for changes in the polarization during the considered period.

As a robustness check, I re-estimate Model (5) with the dependent variable being the growth rate of polarization (the first difference of logarithms) instead of the level. Columns (4)–(6) of Table 3 report the results for political polarization measures P_{sd}, P_{id}, and P_{ea}, respectively. The variability of job status and the change in the employment rate remain significant determinants of the changes in political polarization. Besides, the year dummies are still significant for P_{sd} and P_{id}. The next section elaborates on the possible reasons behind the importance of time trends for the political polarization measures.
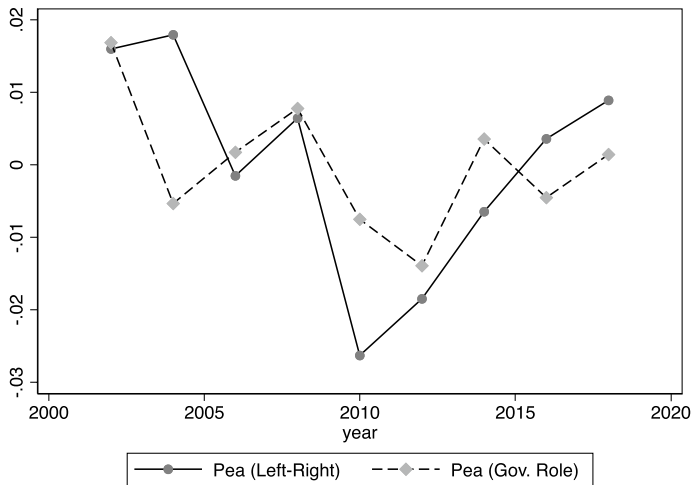
Fig. 4 The time series of political polarization measures, 2002–2018 *Note:* This figure shows the time-series of the political polarization measures $p_{ea}^{s_4}$ and $p_{ea}^{s_5}$, computed from the ESS survey

4 What explains polarization trends in the UK?

The analysis conducted in the previous section suggests that the common time trends explain a significant part of the variation in the political polarization measures, either in levels or in growth rates. This section elaborates on the possible reasons behind this finding.

One possible reason could be the particular dataset employed in this study. Given that the estimation of the political polarization is based on longitudinal panel data, one could argue that the convergence of individual opinions is a consequence of the estimation based on the sample of individuals which does not vary significantly over time with individual opinions converging due to aging, for example.

To rule out this possibility, I re-estimate the polarization measures, following the methodology outlined in Section 3, based on a completely different dataset: the repeated cross-section European Social survey (ESS), restricted to the UK data. The unit of observation for the resulting measures is country-year. This survey is available for years 2002–2018 and contains one statement on the role of public sector in the economy, as follows:

s_4 "The government should take measures to reduce differences in income levels."

In addition, I use a question from the ESS on the left-right scale individual political orientation. This question is not available in the BHPS survey but it allows for the construction of an alternative polarization measure that could be compared with the measures used in the previous section. The statement is as follows:

s_5 " In politics people sometimes talk of 'left' and 'right'. Where would you place yourself on this scale, where 0 means the left and 10 means the right?"

Figure 4 presents the political polarization measures $p_{ea}^{s_4}$ and $p_{ea}^{s_5}$, computed from the ESS survey, based on the individual responses to the statements s_4 and s_5. These polarization measures both follow a non-linear trend, suggesting that there has been a decline in the political polarization in the UK until approximately 2010, followed by a sharp increase until 2018. These trends are consistent with the decline in polarization observed in the BHPS data during 1991–2007, as reported in Fig. 3.

Other studies have discussed the non-linear trends in British political polarization. Perrett (2021) estimates the polarization in the UK using a different methodology and data, and obtains trends consistent with those reported in Figs. 3 and 4. Further exploration of the history of political movements in the UK during the last three decades points to the decline in the gap between Labour and Conservative parties' supporters during the late 1990s (Perrett, 2021; Curtice, 2010). In a similar vein, Evans and Tilley (2012) argue that the ideological convergence between the main parties resulting from Labour party's shift to the center explains the decline in British political polarization during the late 1990s. At the beginning of the 21-st century, the polarization increased as a consequence of the political fragmentation and important electoral shocks, including the growth in immigration after 2004, the Great Recession, and the Brexit Referendum (Perrett, 2021; Fieldhouse, 2021).

5 Conclusions

This paper analyzed regional political polarization in the UK. Three common measures of polarization were computed from the individual responses to political statements in the British Households Panel Survey. Given that the political statements considered are not directly comparable, I used confirmatory factor analysis to estimate unobserved political polarization underlying the individual responses to different statements. Different measures convey similar patterns of regional polarization and suggest that political polarization in the UK decreased during the period covered by the survey, 1991–2007.

Furthermore, this paper evaluated the basic socioeconomic determinants of political polarization using data constructed from the individual responses to the same survey. The results indicate that the variability of job status, the change in the share of natives, and the change in the employment rate are the most important factors associated with political polarization in a county. The common ideological shifts that occurred during the considered period and are captured in the time trends, explain a significant fraction of the variation in political polarization.

In an attempt to overcome some of the endogeneity problems in the estimation of political polarization determinants, this paper considered the dataset based on the individuals that did not change their county of residence during the years in which they participated in the survey. Nevertheless, further analysis of the political polarization determinants is necessary to evaluate the causes of political polarization. One possible approach would be to combine individual-level data with county-level data to establish causality (see, for example, Rode and Sáenz de Viteri (2018)). The implementation of such an approach controlling for individual region of residence

requires more data than the data available in the BHPS and is a promising area for future research.

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