Did regional EU funding impact the Brexit referendum?

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Abstract

Following a 2016 referendum on European Union membership where 51.9% of the British electorate voted to leave, the United Kingdom has decided to exit the EU and will therefore no longer receive regional EU funding. Previous studies on the voting pattern of the referendum have shown that the concentration of the Leave vote tended to be stronger in regions that have struggled economically in recent decades. This essay aims to examine the relationship between the Leave vote in local areas and regional EU funding, and to what extent the Leave vote was contingent on local economic growth factors such as the growth of GDP per capita, disposable household income and employment.

To determine the effect of the economic variables on the Leave vote, regressions were conducted using regional economic data covering the years 1998-2015. The results show that the relationship between regional EU funding and the Leave vote was positive and significant. The results further show that the relative impact of regional funding on the referendum was limited. These findings suggest that the referendum result was largely contingent on local economic growth factors.

1 Introduction

Following a 2016 referendum on European Union membership where 51.9% of the British electorate voted to leave, the United Kingdom has decided to exit the EU and will therefore no longer receive regional EU funding. Previous studies have shown several geographic voting patterns in the referendum. For instance, the Leave vote was concentrated in regions that have struggled economically in recent decades in the wake of neoliberal policies initiated in the 1980s and subsequent declining UK manufacturing (Arnorsson & Zoega, 2018). Similarly, Goodwin and Heath (2016) argue that the Leave vote was delivered by the nation's marginalized and "left behind" in terms of both economic developments over recent decades and the set of socially liberal values that have subjugated a large part of the media and political class. Los et al. (2017) further point out that the regions where the leave vote was strong tended to be highly dependent on EU trade for their local economic development while also having received regional EU funding over several decades, and therefore may have the most to lose from exiting the EU. This counterintuitive economic relationship between the EU and local areas in the UK is the primary motivation behind this essay.

In the run-up to the referendum, the campaigns for Leave and Remain placed little emphasis on the local economic benefits of European integration in terms of regional EU funding. The Remain campaign focused mostly on the UK's economy as a whole, while the Leave campaign's main issues were immigration and national sovereignty. The pro-leave narrative suggested that the regions that benefited most from the EU and globalization were the "metropolitan elites" (Los et al., 2017). Ironically, the Leave campaign's success may entail a fuller force of globalization, in terms of UK-specific rather than EU-based trade deals (Bogdanor, 2016).

The high concentration of the Leave vote in economically less well-off regions begs the question of the role of EU funding in these regions. This question is of relevance for the future of the EU because the concept of EU regional funding should have the potential to garner local support for EU integration and identity-building, even in countries like the UK, that are net contributors to the EU. Therefore, the purpose of this essay is to examine the relationship between the Leave vote on a local level and regional EU funding, and to what extent the Leave vote was contingent on other

local economic growth factors, such as GDP per capita, disposable household income, and employment.

Previous research has found local economic conditions important in explaining the voting pattern of the referendum (Arnorsson & Zoega, 2018; Goodwin & Heath, 2016). Fidrmuc et al. (2019) examined regional vote-shares against regional EU funding along with 2014 levels of GDP per capita and employment. They concluded that regional EU funding had a weak effect on the referendum outcome on a local level. A similar study by Huggins (2018) used regional vote shares against regional EU funding and demographic variables and found the effect of regional EU funding insignificant. This essay aims to contribute to existing research by focusing on EU funding rather than trade. Adding growth shares of economic variables[1] further makes it possible to analyze the effect of regional EU funds on the local Leave vote against a background of economic development over the last twenty years, rather than against current economic conditions. OLS-regressions of vote shares on growth shares on local economic variables were used to estimate results and draw conclusions. After performing robustness tests, the regression results show that regional EU funds had a significantly positive relationship with the Leave vote. They further show that the relative impact of regional EU funding on the referendum outcome was limited. These findings indicate that the referendum outcome was largely contingent on the local growth of GDP per capita, disposable household income, and employment.

The essay will be structured as follows: In the next section, a brief background to the Brexit referendum will be outlined. In the third section, details concerning the structure of regional EU funds will be explained. In the fourth section, previous research will be presented. Section five will introduce the empirical theory and the included data. Section six explains the methodology used in the analysis. Results will be presented in the seventh section, along with a discussion of the results. Lastly, concluding remarks will be presented in the eight section.

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[1] "Economic variables" refers to GDP per capita, disposable income, and employment and does not include EU regional funding.

2 Background

2.1 Approaching Brexit

On June 23rd, 2016, the electorate of the United Kingdom of Great Britain and Northern Ireland voted on the following question: "Should the United Kingdom remain a member of the European Union or leave the European Union?". Despite many warnings from economists and business leaders, the outcome was a majority vote for Leave at 51.9%. The result, which was followed by a dramatic fall in the Pound Sterling and the immediate resignation of Prime Minister David Cameron, indicated that a nearly 50-year period of political and economic European integration might have reached its peak.

The referendum outcome can be viewed as a culmination of brewing political and economic forces. It has generated an extensive amount of literature on Brexit in the context of populism and Euroscepticism; a vote of defiance against decades of globalism and uneven developments (e.g., Piketty, 2016; Watkins, 2016). In an attempt to analyze Brexit as an outcome of different driving socio-economic pressures, Clarke and Newman (2017) make the point that the way toward Brexit was led by Eurosceptic divisions within the Conservative party, as well as a class of "left-behind" voters who were successfully given a voice by the Leave campaign.

During the 1980s, the governing years of Margaret Thatcher, fundamental political steps were taken towards a "neoliberalization" of the UK. Economic rationalization processes were implemented, and many of the nation's industrial sectors were privatized (Hall, 2011). Meanwhile, regional aid was reduced for industry-dependent regions as a part of the Thatcher governments' economic restructuring plan. The 1980s then witnessed a staggering 30% decline in manufacturing employment (Jones & MacLeod, 2018). The Thatcher governments also undertook policies aimed at strengthening the financial and banking sectors, primarily located in the southeast of England, notably by a series of deregulations of the City of London financial business sector. Accordingly, Jones and MacLeod (2018) argue that these projects helped precipitate the widening of an already existing "north-south divide" of regions in the UK, where the wealthier south was gaining ahead of northern and midlands manufacturing regions.

2.2 The Leave vote - "A revolt of the regions"

Against this background of a "geography of deindustrialization" and economic inequality in the UK, it is important to consider to what extent the "left-behind" identity was strengthened by the austerity welfare reforms that were implemented by the Conservative (and Conservative-Liberal Democrat coalition) governments in the wake of the 2008 financial crisis. Fetzer (2018) emphasizes the role of welfare cuts in further penalizing the "left-behind" regions unable to benefit from globalization and growth. Fetzer also shows a significant connection between high levels of support for Brexit and those regions that had been exposed to austerity-induced welfare cuts.

The relationship between the UK and the EU has long divided the Conservative party. Crowson (2018) terms the original split as free marketeers versus factions of Eurosceptic nationalists. Since the UK joined the common market in 1973, Conservative referendum demands have surfaced repeatedly, especially notable during the Maastricht parliamentary process of 1991-93 (Mason, 2016). The referendum's initiation by Prime Minister David Cameron in 2013 can be seen as an attempt to control public opinion and pressures within his own party. Defectors from the Conservative party had largely powered the success of the Eurosceptic UK Independence Party (UKIP) in 2010s local elections. Cameron, who supported continued EU membership under terms of renegotiation, campaigned for Remain and was publicly supported by officials such as President Obama and leaders of many FTSE 100 companies (BBC, 2016). However, as reflected in the referendum result, macroeconomic arguments failed to resonate many voters' lived experiences (MacLeod & Jones, 2018).

Pervasive economic inequality and insecurity, comparable to the circumstances under which the "left-behind" identity was forged, can make voters and political parties more receptive to populist ideas (Guiso et al., 2017). Pastor and Veronesi (2018), similarly, argue that support for populist ideas can be explained as resistance to globalization and rising inequality. A telling example is the closing of a major steelworks in Redcar that cost 2,200 jobs, months prior to the referendum, as a result of an investment withdrawal from the multinational SSI (BBC, 2015). There was no government intervention like the ones that had benefited bankers in London. Such political abandonment serves as an understandable basis for voter resentment. The connection between Brexit and the "losers" of globalization was aptly expressed by former Prime Minister Gordon

Brown (2016), who suggested "It was a revolt of the regions - northern industrial towns hit by wave after wave of crushing global change - that pushed the Brexit vote over the edge" (see also Rodríguez-Pose, 2018). Aiming its message at those "losers", the Leave campaign adopted populist rhetoric, proclaiming the need to "take back control" of UK borders and welfare systems. The Leave campaign conjured three types of antagonists: immigrants benefiting from the "freedom of movement", metropolitan liberal elites, and bureaucrats in Brussels. In this way, it equated the Leave vote with an act of defiance against the establishment and made the path toward Brexit a cause where the "left-behind" could express their discontent.

In the context of Brexit as "a revolt of the regions" it is worth noting that Scotland, who voted decisively for Remain, may have particular reasons for wanting to remain in the EU. One of them is the possible independence of Scotland from the UK in the future.

3 The role of regional EU funding

The main source of regional funding that the UK receives from the EU is the Cohesion Policy, which is the EU's principal investment policy. The EU's desire for "cohesion" between richer and poorer regions was first mentioned in the 1957 Treaty of Rome. In 1986, The Single European Act established a legal basis for "regional policy" with the main objective to reduce economic and social inequalities and to support sustainable development in less prosperous EU regions. The Cohesion Policy is invested in the UK through the European Structural and Investment Funds (ESIF), which are comprised of the European Regional Development Fund (ERDF), the European Social Fund (ESF) and the European Agricultural Fund for Rural Development (EAFRD) (European Commission, 2014a).

The European Commission determines the level and nature of funding based on regional GDP per capita levels. Accordingly, each European region is placed in one of three categories: less developed (GDP per capita of less than 75% of the EU average), transitioning (GDP per capita between 75% and 90% of the EU average) and more developed (GDP per capita of more than 90% of the EU average). The principal aim of the Cohesion Policy in less developed and transitioning regions is to raise GDP closer to the level of the EU average and more developed regions. For more developed regions, the Cohesion Policy aims to foster economic competitiveness by

promoting innovation and environmental improvements. In the 2014-2020 EU budget, the Cohesion Policy payments set to be received by the UK amounted to €11.8 billion. Roughly one-quarter of these €11.8 billion was allocated to the two regions classed as less developed[2], another quarter was allocated to the eleven transitioning regions[3] (European Commission, 2014b).

Examples of recent Cohesion Policy funded projects in the UK are the £7.3 million development of a test center for wave and tidal energy devices in Scotland, and a £49 million contribution to the Cornwall Next Generation Broadband in southwestern England, aiming to attract businesses and inward investors to the region. (European Commission, 2014b). And so, although the UK is a net contributor to the EU, some of its regions have benefited from substantial regional aid.

4 Previous research

Following the referendum, many authors have attempted to analyze the result. Existing literature on the determinants of the referendum and geographical voting patterns presents a wide range of frameworks and explanations. Overall, the studies offer broad consensus in that the variation in the support for Brexit can be largely explained by economic and demographic factors (Arnorsson & Zoega, 2018; Becker et al., 2017 Goodwin & Heath, 2016).

Arnorsson and Zoega (2018) showed that areas in the UK with lower levels of GDP tended to vote Leave. This is confirmed by Becker et al. (2017), who additionally showed that areas with high dependence on manufacturing employment and low levels of income and employment tended to support Brexit. They both highlighted that support for leaving the EU falls with education and rises with age. On these grounds, they concluded that Brexit proved popular in areas that have struggled economically in recent decades. Los et al. (2017) further found that regions where the Leave vote was strong tended to have high levels of dependence on EU markets for their local economic development and high eligibility for Cohesion Policy payments. Similar conclusions were reached by Goodwin and Heath (2016) regarding the economic and demographic characteristics driving the Leave vote, with added emphasis on the positive relationship between age and the Leave vote.

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[2] Cornwall and Isles of Scilly, West Wales and the Valleys.

[3] Cumbria, Devon, East Yorkshire and Northern Lincolnshire, Highlands and Islands, Lancashire, Lincolnshire, Merseyside, Northern Ireland, Shropshire and Staffordshire, South Yorkshire, Tees Valley and Durham.

Furthermore, they emphasized the role of turnout in the referendum, finding that turnout was generally higher in areas that strongly voted for Leave.

In the context of Brexit, the role of turnout in the referendum has been widely discussed. Solijonov (2016) pointed out that a low degree of turnout can signal voter disconnect or mistrust against the political process. The findings of Goodwin and Heath (2016) were confirmed by Jones and McLeod (2018). They pointed to the fact that in many regions that voted strongly for Leave, turnout was between five and ten percentage points higher than recent general elections, which was notably the case in many northern former industrial towns. They argued that the nature of an in-out referendum provided an opportunity to make voices heard for those who felt abandoned by the political establishment after many years of uneven development. An alternative interpretation of Goodwin and Heath (2016) was offered by Jones and Manley (2017). Having developed a predictive model to study the geography of Brexit, they found a positive relationship between turnout and age. They argue that given that support for Leave increases with age, "Where turnout is high, therefore, more young people are likely to have voted, so that areas with low turnout should - ceteris paribus - have shown greater support for Brexit".

Regarding the impact of regional EU funding on the referendum result, the amount of literature is less extensive. There seems to be a consensus that the impact of regional EU funding is limited. Fidrmuc et al. (2019) examined the effect of regional EU funding on regional vote shares for Remain. Their model estimated the importance of Cohesion Policy payments, expressed as per capita receipts. This was analyzed directly and alongside regional levels of GDP per capita, wages, and employment rates. The analysis was carried out on both a larger and a more local level of regional aggregation. The study showed that Cohesion Policy was positively correlated with the Remain vote, but only at the local level. However, they found that most of the variation in support for remaining in the EU was explained by the other economic variables and concluded that the impact of regional EU funding is limited.

Huggins (2018) examined the role of EU regional spending in local areas in the referendum result. In a model similar to that of Fidrmuc et al. (2019), EU regional spending was expressed as per capita receipts, directly and alongside demographic factors of age and education level. The analysis

found the impact of regional EU funding positive but insignificant on the Remain vote. Thus, it echoes the conclusion of Fidrmuc et al. (2019), suggesting that the referendum outcome was better explained by demographic factors.

5 Empirical theory

This essay aims to examine the effect of regional EU funding, measured as Cohesion Policy payments on regional voting patterns, and the extent to which the Leave vote was contingent on local economic growth factors. Building on the previous research findings that the variation of the Leave vote can be largely explained by economic factors, the present investigation was conducted by a regression analysis of cross-sectional data. This enabled an analysis of regional voting patterns as an estimate of Cohesion Policy payments and economic developments under a near twenty-year period. Extending the framework established by Fidrmuc et al. (2019), this essay has intended to account for the impact that local economic developments, rather than current conditions, may have had on voter sentiment. Therefore, the economic variables were analyzed as growth shares from 1998-2015, and not as 2015 levels. For the purpose of a comprehensive investigation of the effect of the explanatory variables, the data for all economic variables has been calculated as growth shares for 1998-2015 using the following formula:

$$\%\Delta x = (x_{2015} - x_{1998})/x_{1998}$$

Further explanation of the variables will be provided in section 5.3.

5.1 Regression framework

The model used in this analysis to estimate vote-shares for Leave at the NUTS 3 regional level is based on the framework established by Fidrmuc et al. (2019). The regression model takes the following form:

$$Leave_i = \beta_1 + \beta_2 lnCP_i + \beta_3 GDP_i + \beta_4 GDHI_i + \beta_5 EMP_i + \beta_6 T_i + \varepsilon_i$$

Where the dependent variable *Leave$_i$* is the share of votes in favor of leaving the EU in each index region *i*, *CP$_i$* is the Cohesion Policy payments per capita, *GDP$_i$* is the growth share of gross

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domestic product per capita, $GDHI_i$ is the growth share of gross disposable household income per capita, EMP_i is the growth share of employment and T_i is a control variable for the turnout in the referendum. As the Cohesion Payments per capita are sums, they are expressed as logs. The remaining variables, which are all shares, are expressed as ratios.

For robustness testing, the results were controlled for turnout. The purpose of using a control variable is to better understand the relationship between the dependent and explanatory variables. By keeping the turnout-share constant and unchanged, any effect that turnout might have had on the Leave vote can be accounted for, for instance, the possibility of turnout being dependent on one of the explanatory variables.

5.2 Data

For regional classifications of all included variables, Eurostat's official geographical Nomenclature of Territorial Units for Statistics (NUTS) levels were used. The NUTS classification is a hierarchical division system for European regions. Within the UK, there are 37 NUTS 2 regions, which are divided into 179 NUTS 3 regions, which in turn are divided into 400 Local Administrative Units 1 (LAU 1) regions[4].

Table 1. NUTS structure of the UK

United Kingdom	NUTS 1	NUTS 2	NUTS 3	LAU 1
England	9	30	133	326
Wales	1	2	12	22
Scotland	1	4	23	41
Northern Ireland	1	1	11	11
Total	12	37	179	400

Note: This table presents the division of NUTS levels in the member states of the UK.

[4] NUTS 2013 boundaries were used.

In England and Wales, the LAU 1 regions corresponded with the electoral districts where the referendum results were reported. This was not the case for Scotland and Northern Ireland, which will be discussed more closely in section 5.2.1.

The data used in this analysis was gathered from several databases. The results and turnout of the 2016 Brexit referendum were published by the Electoral Commission for the 382 electoral districts of the UK. Data for regional EU funding, i.e., Cohesion Policy payments, are reported by the European Commission at the NUTS 2 regional level. The payments are published for programming periods and were retrieved for the periods 1994-99, 2000-06, and 2007-13. Population data for 2016 were retrieved from Eurostat for NUTS 2 and NUTS 3 regional levels. The data for GDP per capita and GDHI per capita is published by the Office of National Statistics (ONS) at the NUTS 3 regional level. The data for employment is published by the European Commission at the NUTS 3 regional level. All economic data were retrieved for the years 1998-2015. For complete variable definitions and sources of all data used, see appendix section A.1.

The data used in this analysis are not all recorded at the same level of aggregation. The referendum results are published at the level of electoral districts, the data for Cohesion Policy payments are published at the level of NUTS 2 regions, and the economic data are published at the level of NUTS 3 regions. The referendum results for the electoral districts were aggregated up to the level of NUTS 3 by adding up the number of Leave votes cast across the NUTS 3 region and dividing them by the number of valid votes cast. The same method was used to calculate the share of valid turnout out of the electorate for each electoral district. Additionally, the data for Cohesion Payments were aggregated down to the level of NUTS 3. This was done by dividing the sum of payments evenly across each NUTS 3 region within a NUTS 2 region. Ideally, an analysis on the NUTS 3 level would have been preferable. While the eligibility for Cohesion Payments is determined at NUTS 2 level, the NUTS 3 levels are closer to the level of where the funds are effectively spent. In this case, such an analysis is not meaningful due to the lack of variation at the NUTS 3 level.

5.2.1 Data limitations

Three main limitations regarding the data in this analysis have been observed and are detailed as follows:

The first limitation concerns a lack of economic data for the electoral district of Gibraltar, which is not included in the Eurostat NUTS hierarchy. Consequently, Gibraltar has been excluded from this analysis, reducing the number of relevant electoral districts to 381.

The second limitation concerns the process of aggregating the referendum result and turnout data for Northern Ireland and Scotland. Northern Ireland has the status of both a NUTS 1 and NUTS 2 region, containing eleven NUTS 3 regions. The referendum results for Northern Ireland were published by the Electoral Commission as the NUTS 1 level. For the purpose of a comprehensive NUTS 3 level analysis, the sum of the electorate, valid votes cast, and valid Leave votes were evenly divided over the eleven NUTS 3 regions, leaving the turnout and Leave share identical across these regions. Some of Scotland's electoral districts did not correspond with LAU 1 classifications, creating difficulties in aggregating referendum result data up to the level of NUTS 3. In the absence of an obvious strategy to transform these electoral districts into LAU 1 levels, an averaged aggregation of these electoral districts is used in the regression model. To test whether the uncertainty of this aggregation has a distortive effect on the regression model specified in section 5.1, a robustness analysis will be provided, comparing the averaged aggregation to an alternative regression model where Scotland is not included.

The third limitation concerns the relevant time period for the economic data. The earliest data available for GDP per capita at the NUTS 3 level was from 1998. Therefore, the relevant time period 1998-2015 was established for all economic data (not including data for Cohesion Policy payments) to calculate standardized growth shares for these variables. Furthermore, since the referendum took place in 2016, the programming period for Cohesion Policy payments 2014-2020 was deemed unlikely to have had much effect on voters.

5.3 Included variables

The outcome of the EU referendum is relevant to examine against the background of existing literature on Brexit as an act of establishment defiance from "left-behind" regions that had felt the economic consequences of globalization and deindustrialization, and yet seen little compensation in the wake of uneven economic developments. Previous studies have matched regional characterizations of economic decline with the Leave vote. For this reason, it is highly motivated to examine whether longer-term local economic developments, such as regional wealth, income, and employment, can reflect pro-Brexit sentiments.

**Table 2. Summary statistics of included variables**

Variable	N	Mean	St.dev.	Min	Max
Leave vote [%]	179	0.5108	0.1035	0.2138	0.7228
CP Payments 94-13 [€]	179	827.7	783.8	160.0	2876
GDP pc growth 98-15 [%]	179	0.2052	0.1337	-0.4621	0.7345
GDHI pc growth 98-15 [%]	179	0.2215	0.1200	0.0196	0.8897
Employment growth 98-15 [%]	179	0.1540	0.1598	-0.1791	1.068
Turnout [%]	179	0.7129	0.0505	0.5620	0.8025

Table 2 gives an overview of the summary statistics for all included variables. Note that the means are unweighted, meaning the average Leave vote is slightly different from the referendum result (51.9%). In the following section, all included variables will be described, and graphical representations will be shown for the Leave vote and Cohesion Policy payments.

5.3.1 Leave share

The dependent variable of this analysis, Leave, measures the regional vote-share in favor of leaving the EU. Leave shares for each NUTS 3 region were calculated by dividing the number of Leave votes by the number of valid votes.

Figure 1. The Leave shares
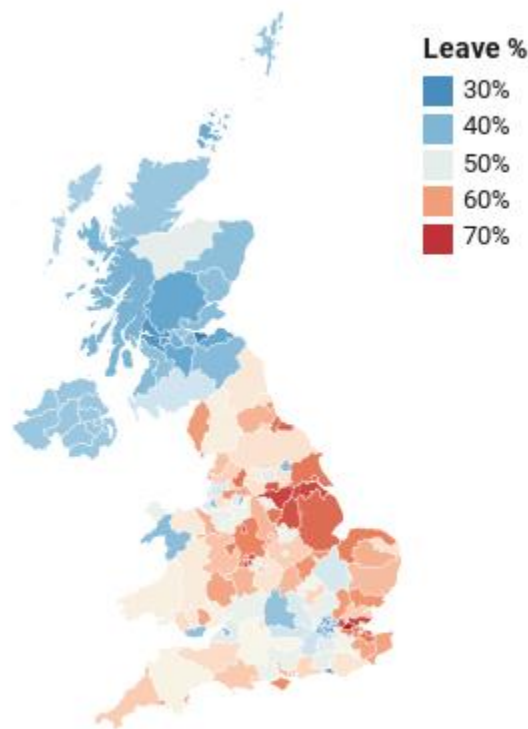
Source: Electoral Comission · Created with Datawrapper

Note: This figure shows the concentration of the Leave vote for each NUTS 3 region.

The variation in the levels of support for Brexit is considerable. The lowest Leave share was observed in Lambeth (London) at 21.4% and the highest in Thurrock (East England) at 72.3%.

5.3.2 Cohesion Policy payments per capita

The main explanatory variable of this analysis, Cohesion Policy payments, is used with the intention of examining a possible impact on voters' support for the EU, as expressed in the EU referendum. The eligibility for Cohesion Policy payments is determined based on regional GDP per capita, and less prosperous regions have received considerable sums of Cohesion Policy payments between 1994-2013. In conjunction with this, the observed tendency of such regions to support Brexit (Los et al., 2017) motivates the inclusion of Cohesion Policy payments as a variable. Founded on the discourse above, the hypothesis of this essay is that the Cohesion Policy payments will be positively correlated with the Leave shares.

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The Cohesion Policy payments, expressed as per capita receipts, measures the total sum of Cohesion Policy payments each NUTS 3 region has received per capita in the three programming periods that span from 1994-2013. To conform the total sum values to the regression framework, the sums reported for each programming period were transformed into fixed prices using the Consumer Prices Index including owner occupiers' housing costs (CPIH, 2015=100) published by the ONS.

Figure 2. The Cohesion Policy payments

Source: European Commission · Created with Datawrapper
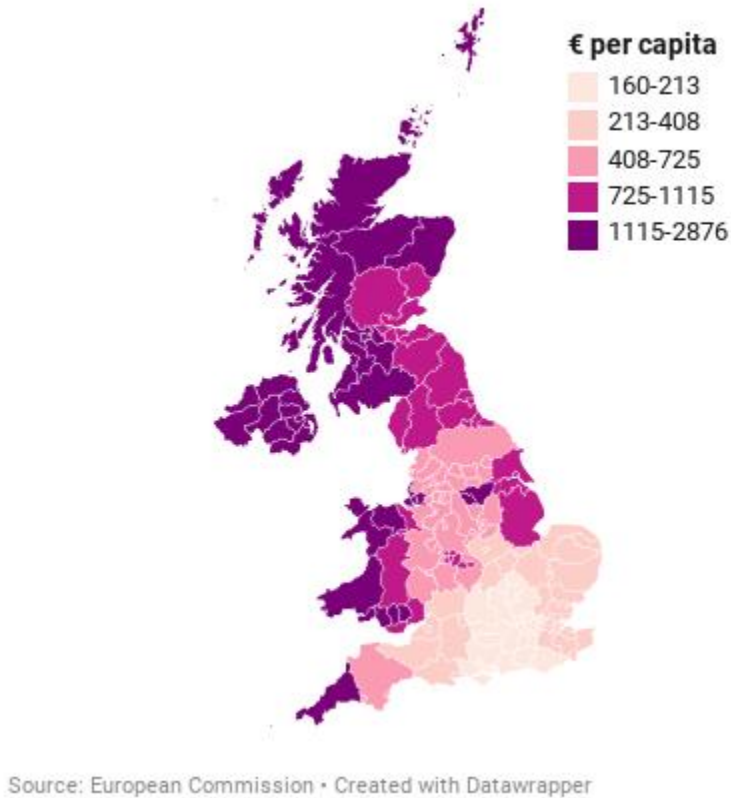
Note: This figure shows the Euro sum of per capita receipts for Cohesion Policy payments from 1994-2013 in each NUTS 3 region.

Figure 2 shows the Cohesion Policy payments per capita for each NUTS 3 region. As per the aggregation process down to NUTS 3 level, detailed in section 5.2, the per capita sums are left identical within each NUTS 2 region.

The regions that have received the largest amount of Cohesion Policy payments per capita from 1994-2013 are Highlands and Islands (Scotland), at € 2 876, and West Wales and The Valleys, at € 2 832. The lowest amount was received by Outer London at € 160.

5.3.3 GDP per capita growth share

GDP per capita is commonly used as an indicator of regional prosperity and wealth. As defined by the Organisation for Economic Cooperation and Development, "it is the standard measure of the value added created through the production of goods and services" (OECD, 2018). Alone, it may fall short as a measure of people's material well-being, which is the reason for also including alternative measures of regional economic prosperity in this analysis. The hypothesis of this essay is that GDP per capita growth will be negatively correlated with the Leave share. This is based on previous research findings that Brexit proved popular in areas that have struggled economically in recent decades.

GDP per capita growth share measures the growth shares of NUTS 3 regional GDP per capita from 1998-2015. The data for annual GDP per capita that was retrieved from the ONS was reported in current prices. To fit the regression framework, it was transformed into fixed prices using CPIH. The highest growth in GDP per capita was observed for Falkirk (Scotland) at 73.5%, and the lowest growth was observed for Thurrock (East of England) at -46.2%.

5.3.4 GDHI per capita growth share

GDHI is a way of measuring income. It measures the money that a household has available for spending after taking into account tax payments and social contributions. This makes it a common measure for people's material well-being and felt economic prosperity (OECD, 2018). For this reason, GDHI is included as a variable in this analysis as a complement to GDP. The hypothesis of this essay is that GDHI per capita growth will be negatively correlated with the Leave share. This is based on previous research findings that Brexit proved popular in areas that have struggled economically in recent decades.

GDHI per capita growth share measures the growth shares of NUTS 3 regional gross disposable household income from 1998-2015. The data for annual GDHI per capita that was retrieved from

the ONS was reported in current prices. To fit the regression framework, it was transformed into fixed prices using CPIH. The highest growth in GDHI per capita was observed for Hackney and Newham (London) at 88.9%, and the lowest growth was observed for Nottingham (East Midlands) at 2%.

5.3.5 Employment growth share

Employment growth is often a useful indicator of regional socio-economic development and prosperity. In this analysis, the employment growth share over the period 1998-2015 is used, since the longer-term perspective may mitigate the effects of exogenous factors such as employment rate sensitivity to economic cycles. Although employment growth is a convenient variable in this sense, it is worth noting that employment growth alone does not necessarily imply "better" jobs and sustainable regional economic development in terms of productivity and wages (International Labour Organization, 2020). For this reason, it is used as a complement to growth shares of GDP and GDHI. The hypothesis of this essay is that employment growth will be negatively correlated with the Leave share. This is based on previous research findings that Brexit proved popular in areas that have struggled economically in recent decades.

Employment growth share measures the growth shares of NUTS 3 regions in thousands of employed persons, from 1998-2015. The highest growth in employment was observed for Tower Hamlets (London) at 106.8%, and the lowest growth was observed for Dudley (West Midlands) at -17.9%.

5.3.6 Control variable: voter turnout share

Voter turnout in an election or referendum serves as an indicator of how citizens participate in the governing of their country. The turnout of the referendum was 72.2% nationwide (Electoral Commission, 2019). The discourse about the role of turnout in the referendum, detailed in section 4, motivates the inclusion of turnout as a control variable.

In this regression model, turnout measures the share of the electorate that cast valid votes in the referendum for each NUTS 3 regional level. The highest turnout was observed for Central

Hampshire (South East England) at 80.3%, and the lowest turnout was observed for Glasgow city (Scotland) at 56.2%.

6 Methodology

To analyze the effect of Cohesion Policy payments on the regional Leave share, a bivariate analysis and multivariate analyses were conducted using OLS. First, a bivariate analysis was conducted with the Leave share as the dependent variable to model the effects of the various explanatory variables separately. However, bivariate analyses may suffer from omitted variable bias if the various determinants are correlated, and therefore be misleading. Therefore, multivariate analyses were also performed.

The first of the multivariate analyses related the Cohesion Policy payments to the Leave share and subsequently the explanatory variables were added one by one to gauge the effect of each variable on the Leave share. This further enabled an analysis of whether the effect of Cohesion Policy payments changes when considered alongside the other explanatory variables. In the second multivariate analysis, a two-step hierarchical regression was performed. In the first step, the explanatory variables were considered together. In the second step, the regressions were rerun while omitting Cohesion Policy payments, providing a basis for determining the relative importance of Cohesion Policy payments as a factor in the referendum. To test for robustness, the multivariate regressions were run with the control variable, turnout. Finally, the robustness of the averaged aggregation process was tested using an alternative regression approach, described in the next section.

6.1 Alternative aggregation approach

When there are difficulties in aggregating data, an alternative regression can be used to test for robustness. This robustness analysis concerns the difficulties in aggregating the referendum result and turnout data for Scotland. In the averaged aggregation, the referendum result data for Scottish electoral districts[5] that did not directly correspond with LAU 1, or NUTS 3 levels were averaged

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5 East Dunbartonshire, West Dunbartonshire, Highland, Moray, Argyll and Bute.

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across NUTS 3 regions[6] that did not directly correspond with any electoral districts. The regression results were compared with the alternative regression that omitted Scotland all together to test the robustness of the averaged aggregation.

6.2 Econometric discussion

To examine whether the explanatory variables are linearly related, which could entail higher standard errors and a risk for misinterpretation of the coefficients, a Variance Inflation Factor (VIF) test for multicollinearity was conducted using EViews. The results[7] of the VIF test did not indicate multicollinearity. The correlation matrix[8] presents high correlations between some explanatory variables. However, since high correlation by itself is not sufficient to determine the removal of an explanatory variable (Jochumzen, 2017), and as per the results of the VIF test, no explanatory variables were removed.

To test for heteroskedasticity in the data, White's test[9] was used. The results indicated that the null hypothesis of homoskedasticity should not be rejected, and the data therefore does not suffer from heteroskedasticity. Still, all regressions were run with robust standard errors since the results displayed no notable differences in significance or coefficient levels.

7 Empirical results

Previous research on the relationship between the referendum result and Cohesion Policy payments found the local Leave share to be explained mostly by current local economic variables, and the effect of regional EU funding weak or insignificant. This study aims to contribute to the existing literature by examining the extent to which the Leave share was contingent on the growth of local economic variables, and whether the Cohesion Policy payments from 1994-2013 had a direct impact.

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[6] East Dunbartonshire, West Dunbartonshire and Helensburgh & Lomond; Caithness & Sutherland and Ross & Cromarty; Inverness & Nairn and Moray, Badenoch & Strathspey; Lochaber, Skye & Lochalsh, Arran & Cumbrae and Argyll & Bute.
[7] See appendix section A.2 for the results of the VIF test.
[8] See appendix section A.3 for the correlation matrix.
[9] Results for White's test (p-value): 0.2162.

In the following sections, this was done through a bivariate analysis and multivariate analyses, including a two-step hierarchical regression, as detailed in section 6. The first section presents the results of the bivariate and multivariate analyses. The second section describes the results for the robustness analysis concerning the alternative regression approach. This is followed by an analysis of how the control variable, turnout, might impact the effect of the Cohesion Policy payments. The third section provides a discussion of the results.

7.1.1 Bivariate analysis results

First, a bivariate analysis was performed with the Cohesion Policy payments and the other explanatory variables one by one. In table 3, the statistical relationships are presented between the Leave share and the various explanatory variables.

Table 3. Effects on the Leave share: Bivariate analysis

Variable	(1)	(2)	(3)	(4)
CP Payments 94-13 [€ln]	0.079***			
	(0.000)			
GDP pc growth 98-15		1.657***		
		(0.000)		
GDHI pc growth 98-15			1.679***	
			(0.000)	
Employment growth 98-15				1.539***
				(0.000)
Observations	179	179	179	179
R-squared	0.937	0.605	0.658	0.429

Note: This table shows the relationship between the dependent variable, the Leave share, and each explanatory variable. The significance levels of each coefficient are denoted: *** 1%, ** 5% and * 10%. P-values are in parentheses[10].

In column (1) of table 3, the Leave share is related to Cohesion Policy payments. The direct effect of Cohesion Policy payments is positive and statistically significant at the 1% level. The estimated

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[10] The significance level annotations apply to tables 3-6 and will not be provided for each table.

coefficient for Cohesion Policy implies that a 1% increase in Cohesion Policy payments would increase the Leave share by 0.079 percentage points. The result suggests that regions that have received more Cohesion Policy payments were more likely to vote for Brexit, and Cohesion policy payments alone explain 94% of the Leave share variation. This is not in line with previous research findings of a positive relationship between the Cohesion Policy payments and the Remain share. However, it confirms the hypothesis outlined in this essay of a positive relationship between Cohesion Policy payments and the Leave share. Columns (2) to (4) relate the Leave share to the local economic variables (GDP per capita growth, GDHI per capita growth, and employment growth) respectively. Unexpectedly, these variables all display significantly positive relationships with the Leave share. These results seemingly suggest that regions with higher shares of growth in regional wealth, disposable income and employment each were more likely to vote for Leave. This is not in line with the expectations that lower shares of growth in these economic variables are associated with higher levels of support for Leave. As mentioned in section 6, the bivariate results might be explained by omitted variable bias and be misleading, which is why multivariate analyses are performed in the next section.

7.1.2 Multivariate analysis results

The results from the multivariate analyses are presented in tables 4 and 5.

Table 4. Effects on the Leave share: Multivariate analysis

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CP Payments 94-13 [€ln]	0.079*** (0.000)	0.088*** (0.000)	0.094*** (0.000)	0.094*** (0.000)	0.005 (0.312)	0.015*** (0.008)	0.165*** (0.001)	0.016*** (0.001)
GDP pc growth 98-15		-0.292*** (0.001)	-0.249*** (0.003)	-0.249*** (0.003)		-0.287*** (0.000)	-0.206*** (0.001)	-0.200*** (0.001)
GDHI pc growth 98-15			-0.188*** (0.004)	-0.187*** (0.004)			-0.352*** (0.000)	-0.344*** (0.000)
Employment growth 98-15				-0.008 (0.902)				-0.121*** (0.000)
Turnout					0.672*** (0.000)	0.669*** (0.000)	0.738*** (0.000)	0.767*** (0.000)
Observations	179	179	179	179	179	179	179	179
R-squared	0.937	0.942	0.944	0.944	0.965	0.969	0.976	0.977

Note: This table shows the relationship between the dependent variable, the Leave share, and the explanatory variables, including turnout.

In table 4, column (1) again shows the result from the bivariate regression relating Cohesion Policy payments to the Leave share, which is positive and significant. In column (2), GDP per capita growth is added and shows a negative and significant relationship with the Leave share. This result is in line with the hypothesis, suggesting that regions with low levels of GDP per capita growth were more likely to support Brexit. In column (3), GDHI per capita growth is added and shows a negative and significant relationship with the Leave share. This result is in line with the hypothesis, suggesting that regions with low GDHI per capita growth were more likely to support Brexit. When employment growth is added in column (4), it shows no significant effect on the Leave share. Although the coefficient is negative, the significance level is not high enough to support the hypothesis that regions with lower levels of employment growth were more likely to support Brexit. Through columns (1) to (4), the effect of Cohesion Policy payments remains positive and significant, suggesting that the addition of explanatory variables does not diminish the effect of Cohesion Policy payments on the Leave share. Overall, these results strengthen the hypotheses, implying that regions with high eligibility for regional EU funding and low levels of economic development were more likely to support Brexit.

In columns (5) to (8), the regressions are controlled for turnout. When Cohesion Policy payments is the only explanatory variable, in column (5), its effect on the Leave share is no longer significant. This result implies that turnout may have been a stronger indicator of the voting pattern than Cohesion Policy payments alone. In column (6), GDP per capita growth is added and remains significant and negatively related to the Leave share. This is also the case for GDHI per capita growth, which is added in column (7). Employment growth is added in column (8), and now displays a negative and significant relationship with the Leave share. This is in line with the hypothesis, and further suggests that employment has a significant effect on the Leave share once turnout is controlled for. Therefore, results in columns (5) to (8) fully support the hypothesis that regions that have received high levels of regional EU funding, while also experiencing low growth levels of regional per capita wealth, disposable income and employment were more likely to support Brexit. Further, the results imply that these conditions influenced the Leave vote even when turnout levels are considered.

In columns (1) to (4), the coefficient of Cohesion Policy payments is slightly strengthened by the addition of each explanatory variable. While the increase is slight, this suggests that the inclusion of other explanatory variables does not diminish the strength of the Cohesion Policy as a determinant of the Leave share. When turnout is included in columns (5) to (8), the coefficients of the economic explanatory variables remain virtually unchanged. However, the coefficients for the Cohesion Policy payments drop. The estimated coefficient for the Cohesion Policy payments in column (8) implies that a 1% increase in regional EU funding would increase the Leave vote share by 0.016 percentage points, compared to 0.094 percentage points in column (4). While the effects of Cohesion Policy payments remain positive and significant in columns (6) to (8), this result indicates that turnout had an effect on the strength of Cohesion Policy payments as an explanatory variable.

Table 5. Relative effect of Cohesion Policy on the Leave share: Two-step hierarchical regression

Variable	(1)	(2)
CP Payments 94-13 [€ln]	0.016*** (0.001)	
GDP pc growth 98-15	-0.200*** (0.001)	-0.164*** (0.003)
GDHI pc growth 98-15	-0.344*** (0.000)	-0.336*** (0.000)
Employment growth 98-15	-0.121*** (0.000)	-0.126*** (0.000)
Turnout	0.767*** (0.000)	0.893*** (0.000)
Observations	179	179
R-Squared	0.977	0.976

Note: This table shows the relationship between the dependent variable, the Leave share, and the set of explanatory variables, including turnout.

To gauge the relative importance of Cohesion Policy payments as a determinant of the referendum, the regression presented in columns (1) is rerun while omitting Cohesion Policy payments. The results are presented in column (2). In column (2), the estimated effects and significance of the explanatory variables are virtually unchanged from the model in column (1). Furthermore, omitting Cohesion Policy payments has almost no effect on the model's R-squared value. This result concludes that Cohesion Policy payments have little additional explanatory power, indicating that the relative impact of Cohesion Policy payments on the referendum results was limited. This is in line with previous research findings that Cohesion Policy payments had a limited impact on the referendum outcome.

7.2 Robustness analysis

In the following section, the results from the alternative regression approach, omitting Scotland, will be compared with the results presented above to test for robustness. This is followed by an analysis of how the control variable, turnout, might impact the effect of the Cohesion Policy payments.

7.2.1 Robustness analysis: alternative regression

Table 6. Regression results comparison: Robustness test

Variable	(1)	(2)	Alternative approach (3)	Alternative approach (4)
CP Payments 94-13 [€ln]	0.079*** (0.000)	0.016*** (0.001)	0.084*** (0.000)	0.025*** (0.000)
GDP pc growth 98-15		-0.200*** (0.001)		-0.214*** (0.001)
GDHI pc growth 98-15		-0.344*** (0.000)		-0.291*** (0.000)
Employment growth 98-15		-0.121*** (0.000)		-0.150*** (0.000)
Turnout		0.767*** (0.000)		0.697*** (0.000)
Observations	179	179	156	156
R-squared	0.937	0.977	0.950	0.982

Note: This table shows the regression results provided in section 7.1 and the alternative regression results, respectively. In this table, only the bivariate results for Cohesion Policy payments and the results for including all explanatory variables, including turnout, are presented. See appendix section A.4 for the full regression results for the robustness test.

Table 6, columns (3) and (4) present the results from the alternative regression approach, where Scotland is omitted. When compared, the results are similar overall. In the alternative approach, all estimated coefficients are still significant, and the model's explanatory power remains high. The main conclusion is that this confirms and strengthens the results presented in section 7.1. The results indicate that there is seemingly no diverting effect on the results from the averaged aggregation of some Scottish electoral districts up to NUTS 3 level. However, when omitting Scotland there is a slight increase in the estimated coefficient for Cohesion Policy payments. This result suggests that the relationship of Cohesion Policy payments and the Leave share in Scottish regions may have been less positive.

7.2.2 Robustness analysis: the effect of turnout

The main purpose of controlling for turnout is to examine how the estimated coefficient for Cohesion Policy payments changes when turnout is controlled for. Models not controlled for turnout show the total effect of Cohesion Policy payments on the support for Brexit, including effects that Cohesion Policy payments may have had on turnout. Models controlled for turnout should capture any swings in Leave-support in regions with the same share of turnout. In the multivariate analysis, running the regressions with turnout only impacts the significance level of the Cohesion Policy payments when it is the only explanatory variable. This suggests that Cohesion Policy payments alone are not significant enough to explain the referendum result when turnout is considered. In the other multivariate regressions run with turnout, Cohesion Policy payments remain significant and positively related to the Leave share. The estimated coefficients of the Cohesion Policy payments are lower in the regressions run with turnout. This suggests that the inclusion of turnout diminishes the effect of Cohesion Policy payments on the Leave share, further highlighting the importance of turnout as a factor in the referendum. Overall, this robustness test indicates that the effect of Cohesion Policy payments alongside the economic explanatory variables remains positive and significant even when turnout is considered.

7.3 Discussion of the results

This study aims to examine the relationship between regional EU funding measured as Cohesion Policy payments, and voter behavior in the Brexit referendum and to what extent the referendum results were contingent on the developments of regional economic prosperity.

The results of the bivariate analysis show that Cohesion Policy payments were significantly and positively related to the Leave share, confirming the hypothesis of a positive relationship between the amount of regional EU funding and the Leave vote. This is not in line with previous research findings by Fidrmuc et al. (2019) and Huggins (2018), showing a positive relationship between regional EU funding and the Remain vote. An explanation for this could be that both their studies used data for Cohesion Policy payments from the 2007-13 programming period alone, which may reflect present conditions rather than account for long term development. The bivariate analysis of the present study further shows significant, albeit unexpectedly positive, effects of the coefficients for the economic variables. The most discernible explanation is that the bivariate analysis suffers

from omitted variable bias. Since the economic explanatory variables are positively correlated with each other, omitted variable bias tends to overestimate the effects of the coefficients included.

The results of the multivariate analysis show that the relationship between Cohesion Policy payments and the Leave share remains positive and significant when the economic explanatory variables were added to the regression. This is not in line with previous research, which has shown a positive correlation between Cohesion Policy payments and the Remain vote. An explanation for this could be that the explanatory variables used in previous studies were not measures of growth, but levels, or demographic variables. For this reason, the results of those studies may be difficult to compare to the present study. Further, the results of the present study show that the estimated coefficient for Cohesion Policy payments is not diminished by the inclusion of the economic explanatory variables. This suggests that Cohesion Policy payments still have a positive and significant relationship with the Leave share when considered alongside economic explanatory variables. Thereby, the hypothesis of a positive effect of Cohesion Policy payments on the Leave share is strengthened by the multivariate analysis.

When the regressions are controlled for turnout, the bivariate analysis of Cohesion Policy payments shows that the Cohesion Policy payments had no significant effect on the Leave share. Controlling the model for turnout serves to capture any swings in Leave-support in regions with the same share of turnout. Hence, the most straightforward explanation of the result is that turnout was a stronger determinant of the referendum result than Cohesion Policy payments alone. When the multivariate analysis is controlled for turnout, the results are similar to the uncontrolled multivariate analysis, with the exception that the estimated coefficients for Cohesion Policy payments are lower across the board. This result indicates that the relationship between Cohesion Policy payments and the Leave share is diminished when turnout is considered as a factor. A possible explanation is that regional EU funding may influence regional turnout, implying that the total effect of Cohesion Policy is interpreted as stronger when turnout levels are not included in the analysis. This confirms previous research findings by Goodwin and Heath (2016) by further emphasizing the importance of turnout as a factor in the referendum.

The results of the two-step hierarchical regression show that Cohesion Policy payments are of weak relative importance as a determinant of the Leave vote. The Cohesion Policy payments have little additional explanatory power in the regression model. This implies that the referendum result could be sufficiently explained by the economic explanatory variables, confirming the expectation that regions with low growth of regional wealth, income, and employment were more likely to support Brexit. This result is in line with previous research findings by Fidrmuc et al. (2019) and Huggins (2018), suggesting that regional EU funding had a limited impact on the referendum outcome.

To contribute to existing literature, this study intended to examine the relationship between the Leave vote on a local level and regional EU funding and to what extent the Leave vote was contingent on local economic growth factors of GDP, income, and employment. Overall, the regression results in this essay indicate that there was a positive and significant relationship between regional EU funding and the Leave share. However, when attempting to answer the question, "did regional EU funding impact the Brexit referendum?" it is worth noting that a statistical relationship does not equal causation: while regions benefiting from large sums of Cohesion Policy payments may have tended to support Brexit, this does not necessarily mean that there was an aversion against these payments among voters that led them to vote for Brexit. The result showing weak relative importance of the Cohesion Policy payments in terms of additional explanatory power further underlines this argument, indicating that the referendum results can be adequately explained by the economic explanatory variables.

The positive relationship between Cohesion Policy payments and support for Brexit, and the weak relative importance of Cohesion Policy payments could likewise reflect low degrees of visibility and voter awareness of regional EU funding. For instance, recent Cohesion Policy funded projects have involved cleaning up the environment and upgrading broadband connections. Improvements of this type undoubtedly benefit local citizens but are less visible than, for example, big physical infrastructure projects. While a positive and significant relationship was found in the present study, the referendum result was only marginally impacted by regional EU funding and was largely contingent on growth shares of regional wealth, income, and employment.

8 Conclusions

One of the consequences of Brexit is that the UK will no longer receive regional EU funding. Scholars and others have shown that the Brexit vote was in part driven by an open defiance of the establishment by "left-behind" regions. Considering this connection between perceived and real economic neglect and the Leave vote, examining the role of regional EU funding in determining the referendum outcome is relevant for the future of European integration.

The intention of this essay has been to examine the relationship between regional EU funding and the Leave vote, and to what extent the Leave vote was contingent on the developments of regional economic prosperity. This study mainly contributes to the existing literature by investigating whether the long term-growth of three complementary measures of regional prosperity, GDP per capita, GDHI per capita and employment, were sufficient in explaining the referendum outcome.

To further establish the results of the present investigation, analyses should be carried out at more disaggregated regional levels to draw conclusions about the relationship between Cohesion Policy payments and voter sentiment. Caution should be used when making inferences about individual voting patterns based on aggregated data. Nevertheless, aggregated data at the NUTS 3 level gives an overview of the local conditions that might have impacted the referendum outcome. The contributions of this essay to existing literature, the perspective of analyzing long term growth, could be expanded by including other terms for the explanatory variables. For instance, analyzing long-term sums of Cohesion Policy payments fails to account for instances where regional dependency on Cohesion Policy payments has changed over the course of several programming periods. For this reason, it could be relevant to consider only the latest programming period or growth rates for Cohesion Policy payments. Similarly, it might be of interest to consider economic conditions at the time of the referendum, expressed as 2015 levels, as they may have had a separate effect on voter sentiment. The study could further be developed by including demographic factors in the regression model. This could serve as a basis for understanding the importance of regional aspects in the referendum outcome, relative to individual voter characteristics.

The results of the present study show that there is evidence for a positive and significant relationship between the Cohesion Policy payments and the Leave share on a NUTS 3 regional

level. Results also show that the relative impact of Cohesion Policy payments as a determinant of the Leave share was limited and that the referendum was largely contingent on the growth of regional GDP per capita, GDHI per capita and employment. The results are in line with the common narrative that regions that have struggled economically in recent decades tended to support Brexit. Further, the present study confirmed the findings of previous research, in that regional EU funding had a limited impact on the referendum. These findings are of continued interest since the EU Cohesion Policy should have the potential to win the hearts and approval of "left-behind" regions. The outcome of the EU referendum shows that the EU cannot turn a blind eye to these sorts of regions without endangering the stability of the union. Finally, the results of the present study indicate that there is room for improvement from the EU and its champions in advertising projects such as the Cohesion Policy to garner support for future European integration.

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10 Appendix

A.1 Variable definitions and data sources

Variable	Definition and data source
Leave share	Share of votes for Leave out of total valid votes in the Brexit referendum for each electoral district. Data source: The Electoral Commission (2019)
Cohesion Policy payments	Historic EU payments (European Agricultural Fund for Rural Development, European Regional Development Fund, European Social Fund) [€] for each NUTS 2 region, 1989-2013. Data source: European Commission (2020a)
GDP per capita	GDP per head at current market prices [£] for each NUTS 3 region, 1998-2018. Data source: Office for National Statistics (2019a)
GDHI per capita	GDHI per head at current basic prices [£] for each NUTS 3 region, 1997-2017. Data source: Office for National Statistics (2019b)
Employment	Thousands of employed persons for each NUTS 3 region, 1980-2021. Data source: European Commission (2020b)
Turnout	Share of valid votes cast out of the electorate for each electoral district. Data source: The Electoral Commission (2019)

Note: This table shows the full set of variables, their definition and the data sources.

A.2 Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
CP Payments [€ln]	1.290	0.7752
GDP pc growth	1.105	0.9049
GDHI pc growth	1.097	0.9116
Employment growth	1.022	0.9785
Turnout	1.319	0.7582
Mean VIF	1.167	

Note: This table shows the results of the VIF test. Values larger than 10.0 may indicate a collinearity problem.

A.3 Correlation Matrix

	CP Payments [€ln]	GDP pc growth	GDHI pc growth	Employment growth	Turnout
CP Payments [€ln]	1.0000				
GDP pc growth	0.1824	1.0000			
GDHI pc growth	-0.0372	0.2274	1.0000		
Employment growth	-0.0425	0.0396	0.0544	1.0000	
Turnout	-0.4436	-0.1811	-0.1538	0.1164	1.0000

Note: This table shows the correlations between each of the explanatory variables.

A.4 Full results for robustness test: Alternative regression

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CP Payments 94-13 [€ln]	0.084*** (0.000)	0.093*** (0.000)	0.095*** (0.000)	0.097*** (0.000)	0.005*** (0.001)	0.027*** (0.000)	0.025*** (0.000)	0.025*** (0.000)
GDP pc growth 98-15		-0.291*** (0.001)	-0.263*** (0.002)	-0.252*** (0.003)		-0.316*** (0.000)	-0.234*** (0.001)	-0.214*** (0.001)
GDHI pc growth 98-15			-0.102 (0.158)	-0.085 (0.219)			-0.311*** (0.000)	-0.291*** (0.000)
Employment growth 98-15				-0.093 (0.134)				-0.150*** (0.000)
Turnout					0.577*** (0.000)	0.589*** (0.000)	0.676*** (0.000)	0.697*** (0.000)
Observations	156	156	156	156	156	156	156	156
R-squared	0.950	0.955	0.955	0.968	0.969	0.975	0.979	0.982

Note: This table presents the full results from the alternative regression that omits Scotland.

Presented are the relationships between the dependent variable, the Leave share, and the full set

of explanatory variables.