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Gaining and losing EU Objective 1 funds: Regional development in Britain and the prospect of Brexit

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THE LONDON SCHOOL
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Gaining and losing EU Objective 1 funds: Regional development in Britain and the prospect of Brexit

Marco Di Cataldo

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Gaining and losing EU Objective 1 funds: Regional development in Britain and the prospect of Brexit

Marco Di Cataldo*

Abstract

Leaving the European Union will entail for UK regions losing access to the EU Cohesion Policy. Have EU funds been effective in the country, and what may be the consequences of an interruption of EU financial support to the UK's poorer regions? This paper studies the impact of 'Objective 1' funding – the highest form of EU aid – in Cornwall and South Yorkshire, two of the UK's most subsidised regions. We employ synthetic control, matching and difference-in-differences methodologies in order to assess the labour market and economic performance of the two regions. The results indicate that Cornwall and South Yorkshire performed better than counterfactual comparisons throughout the period in which they were classified as Objective 1. Unlike Cornwall, South Yorkshire lost Objective 1 eligibility in 2006 and this massively reduced its share of EU funds. Our findings indicate that, after 2006, South Yorkshire was unable to sustain the gains obtained in previous years. This suggests that while Structural Funds may be effectively improving socio-economic conditions of poorer regions, the performance of subsidised areas could be deeply affected by a reduction (or worse, an interruption) of EU aid.

Keywords: EU Cohesion Policy, Objective 1, Brexit, synthetic control method, UK.

JEL Classification: R11, O18, J60

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Gaining and losing EU Objective 1 funds: Regional development in Britain and the prospect of Brexit

1. Introduction

In June 2016, the United Kingdom voted to leave the European Union. ‘Brexit’ received high support from some of the UK regions that have been among the largest beneficiaries of EU Structural Funds. This reflects discontent with the EU and the way in which EU financial resources have been spent, and would seem to imply that EU Cohesion Policy has not succeeded in triggering greater development in these regions. But has this been the case? When (and if) the UK leaves the EU, these areas will no longer be eligible to receive EU funds, and the shift from a status of high subsidisation to one in which no more European funds are available may bring about a number of unexpected consequences. Might the loss of EU funding have any adverse impacts on future employment levels and economic performance of currently subsidised regions?

In order to answer these questions we look at two UK regions, Cornwall and South Yorkshire, which voted to leave the EU in the referendum on Brexit¹ despite being among the highest recipients of EU funds in the country. Cornwall has been and continues to be eligible for ‘Objective 1’ funding, the most significant form of EU financial help. The region began to be classified as Objective 1 in 2000 and has continued to be funded since then. Therefore, the flow of EU funds will be interrupted if and when the UK leaves the European

¹ 56% of Cornwall’s and 61% of South Yorkshire’s voting population favoured leaving the European Union in the referendum on Brexit, held on 23rd June 2016.

Union. Conversely, South Yorkshire was heavily supported in the past but lost its eligibility for this stream of funding in 2006. The particular evolution of this region's eligibility status allows us to investigate how the loss of Objective 1 funding affected its economy, learning relevant lessons on the potential impact of a similar loss in Cornwall and in other highly funded regions.

We study the effects of EU Objective 1 funds in these two regions using counterfactual methods. Our contribution to the literature is twofold. First, we provide evidence on the causal impacts of Objective 1 programmes and observe how the policy effects evolve over time; second, following an increasingly common approach in place-based policy evaluations (see Neumark and Simpson, 2015), we analyse the impact of policy interventions taking into account both the period in which the implementation takes place and the period following the programme's completion. By looking at the performance of regions after Objective 1 eligibility is lost, our analysis examines the persistency of the policy's impacts and investigates its capacity to produce self-sustaining regional development paths. The few works evaluating the impact of EU Cohesion Policy with counterfactual techniques have documented the potential for Objective 1 transfers to foster growth, spur investments, and generate jobs (Becker et al., 2010; 2013; Pellegrini et al., 2013; Giua, 2016). Only very recently, has scholarly research begun to examine the post-policy impacts of Objective 1 funds (Barone et al., 2016). However, no study has ever investigated the effects of these policies by considering their full cycle, i.e. from the moment in which a region is awarded the Objective 1 status to the period following the loss of Objective 1 funds.

We compare the trajectory of Cornwall and South Yorkshire with the one of 'synthetic' control regions created as the combination of English regions not eligible for Objective 1 funds. Our findings provide clear evidence of a significant reduction in unemployment in Cornwall, relative to the synthetic

control, during the period in which it was classified as Objective 1. South Yorkshire also displays a significant decrease in unemployment between 2000 and 2006, but the improvements are gradually offset during the following years. Our estimates suggest that after Objective 1 status is lost, South Yorkshire evolves towards the trend of a similar untreated region, indicating that Objective 1 funds produced very little permanent/structural effects overall. Difference-in-differences models of local unemployment growth estimated at the level of wards confirm this evidence. In addition, Cornwall appears to be closing the gap in GDP per capita relative to untreated regions during the Objective 1 period, while South Yorkshire's economic catch-up process loses pace and begins to revert when Objective 1 funds are no longer available.

Overall, the results indicate that Cohesion Policy has had a positive impact on the creation of jobs and the promotion of economic growth in poorer UK regions. However, these outcomes may not be persistent, and they may quickly disappear after the end of the high-intensity funding period, even in presence of transitional programmes that make the reduction of EU funds more gradual. Hence, the sudden interruption of Structural Funds to poorer regions that would result from Brexit could have relevant medium-run consequences on the economy and labour market of areas currently receiving the highest proportions of EU funds.

The paper is organised as follows. Section II introduces the background of the Objective 1 programme and reviews the literature on EU Cohesion Policy evaluations; Section III presents the quasi-experimental design; Section IV discusses the data and descriptive statistics; Section V presents the empirical results, beginning with the study performed at the regional level using the synthetic control method, and followed by the difference-in-differences model estimated at the level of wards; Section VI relates the empirical results to the

investment strategies of the two analysed regions; Section VII concludes by summarising the results and defining some paths for future research.

2. Institutional background and overview of the literature

Objective 1 programme. The European Cohesion Policy was established in 1988 as a set of regional investment programmes aiming to promote social and economic cohesion in the EU. Starting from the 1994-1999 EU investment period, Cohesion Policy expenditures represent approximately one third of the EU's total budget. Periodic variations have changed the way in which regions are classified for Cohesion Policy purposes. At the beginning of every new programming period, the European Commission revises the regional allocation of funds and the list of regions considered 'in most need of support'. The eligibility rule for determining 'Objective 1' status – i.e. 'Regions whose development is lagging behind' (European Commission, 2008a) – has always remained the same.² Objective 1 regions, receiving the large majority of Structural Funds³, are those whose average GDP per head is below 75% of the EU average for the last three years of available data before the start of a new programming period (Gripaios and Bishop, 2006).

Under the Objective 1 programme, regions are entitled to be financed through the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Agricultural Fund for Rural Development (EAFRD), and

² The name 'Objective 1' regions was changed into 'Convergence regions' for the 2007-2013 period and again into 'Less developed regions' for 2014-2020, but the rule of eligibility has not been modified.

³ Objective 1 regions received 71.6% of the total 2000-2006 Cohesion Policy budget (€213bn), despite representing only 37% of the total EU population (European Commission, 2010). For the 2007-2013 period the proportion of funds to 'Convergence regions' was increased to 82% (European Commission, 2008b).

the European Maritime and Fisheries Fund (EMFF).⁴ Among these, the most important sources of funding are the ERDF and the ESF. While the development goals to be achieved in each Objective 1 region vary according to specific regional plans, there exist a number of broad themes on which the ERDF and the ESF focus. Generally, the former fund is used for developing new infrastructure, fostering the competitiveness of SMEs, and promoting technological development and innovation, while the latter aims to improve employment opportunities, equip the workforce with better skills and better job prospects, and help unemployed and inactive people enter work (European Commission, 2008a).

The share of available financial resources is established before the beginning of each 7-year programming period by the European Commission on the basis of development plans jointly defined with the regions' managing authorities. Every managing authority is in charge of providing information on the programmes, advertising and selecting projects, and monitor their implementation. Depending on the type of project, the beneficiaries of the funds can be local Governments, education institutions, other public entities, enterprises, non-governmental organisations, or private citizens.

Regions classified as Objective 1 are expected to implement development programmes which would allow them to converge to higher levels of income and eventually lose their status of areas in highest need of support. As a consequence, the proportion of EU subsidies to these regions would progressively diminish. As the per capita GDP of Objective 1 regions becomes higher than 75% of the EU average, 'Phasing-in' or 'Phasing-out' transitional

⁴ A fifth source of funding is the Cohesion Fund, available to Objective 1 regions of Member States with a Gross National Income below 90% of the EU average. This rule has made UK regions not eligible to receive these grants.

programmes are put in place, reducing the amount of funds available to former Objective 1 regions.

Literature. The effectiveness of Cohesion Policy has been assessed in a vast number of evaluations performed with many different empirical methodologies. The majority of studies draw on samples of EU NUTS2 regions and employ cross-sectional or panel data (Cappelen et al., 2003; Ederveen et al., 2003; Rodríguez-Pose and Fratesi, 2004; Beugelsdijk and Eijffinger, 2005; Ederveen et al., 2006; Puigcerver-Peñalver, 2007; Esposti and Bussoletti, 2008). More recent works have attempted to address endogeneity issues by using instrumental variable models in combination with spatial econometric techniques (Dall’erba and Le Gallo, 2008; Ramajo et al., 2008; Mohl and Hagen, 2010; Bouayad-Agha et al., 2013). In spite of the large number of studies produced, this literature has reached no consensus on whether Structural Fund spending is beneficial (Cappelen et al., 2003; Bahr, 2008; Esposti and Bussoletti, 2008; Becker et al., 2012), beneficial under some conditions (Rodríguez-Pose and Fratesi, 2004; Mohl and Hagen, 2010; Becker et al., 2013; Bouayad-Agha et al., 2013; Rodriguez-Pose and Garcilazo, 2015; Crescenzi and Giua, 2016), insignificant (Garcia-Milá and McGuire, 2001; Dall’erba and Le Gallo, 2008) or even detrimental and unjustified (Boldrin and Canova, 2001; Dall’erba et al., 2009).

In order to provide more conclusive evidence on the effect of EU funds in European regions, a new strand of the literature has proposed novel estimation methodologies based on quasi-experiments and counterfactual comparisons.

A commonly used counterfactual approach evaluating EU Cohesion Policy exploits the eligibility rule for Objective 1 status as a threshold for a regression discontinuity design (RDD). Areas classified as Objective 1 (treated) are compared to similar areas with a GDP just above the 75% of the EU average.

Becker et al. (2010; 2013) and Pellegrini et al. (2013) use this methodology and find a positive and significant effect of Structural Funds on economic growth in Objective 1 regions, while Accetturo et al. (2014) uncover a negative impact of the funds on the degree of trust and cooperation among citizens. Adopting a spatial RDD methodology that compares areas across the boundaries of Objective 1 regions, Giua (2016) provides evidence on the positive and significant causal effect of Cohesion Policy in the municipalities of Italian Objective 1 regions. In these studies the effects of EU funds are assessed in a static framework, which does not allow for a change over time in the eligibility status of the regions. Whether a region is affected by reduction in the flow of funds deriving from the loss of Objective 1 status is a question that has been investigated by Barone et al. (2016), finding that the growth rate of Abruzzo (Italy) has significantly reduced in the period following the change in Objective 1 eligibility.

Increasingly, place-based policy interventions are evaluated across their full cycle, considering both treatment periods and post-treatment outcomes (e.g. Kline and Moretti, 2014; Einio and Overman, 2016). Yet, no study has ever looked at the impact of the EU Objective 1 programme from the moment in which eligibility is obtained by a region to the moment in which it is lost and beyond.

We do so in this paper, by testing the long-term effect of Cohesion Policy on unemployment and economic growth. Unemployment is a variable that has already been used in the literature as a measure to evaluate the effectiveness of Cohesion strategies (Garcia-Milá and McGuire, 2001). In addition, other studies have focused on the employment effect of EU policies (Becker et al., 2010; Giua, 2016). Economic growth is the most often used indicator to measure the success of Cohesion policies (e.g. Becker et al., 2010; 2013).

In addition, this paper contributes to the literature assessing the impact of place-based policy initiatives in the UK. While extensive research has been carried out to evaluate the effects of place-based policies promoted by the UK Government (e.g. Harris and Robinson, 2004; Devereux et al., 2007; Wren and Jones, 2011; Criscuolo et al., 2012; Faggio, 2015; Einio and Overman, 2016), very little evidence exists on the impact of European regional policies in the UK context. An important exception is the study by Criscuolo et al. (2012), investigating the role of firm subsidies granted by the British Government for stimulating employment in small firms of poorer regions, and finding a statistically insignificant correlation between Objective 1 eligibility and changes in firms' employment. The scarcity of research on the effects of Cohesion Policy in the UK is surprising, considering that the country has been for a long time among the highest recipients of EU funds.⁵

3. Cornwall and South Yorkshire as natural (policy) experiments

A peculiarity of the UK context is the way in which the geography of regions targeted by EU Cohesion Policy has evolved over time. During the 1994-1999 period, the UK Objective 1 regions were Merseyside in England, the Highlands and Islands of Scotland and Northern Ireland. For the 2000-2006 programming period the list of 'lagging behind' regions was radically modified. Of the aforementioned regions, only Merseyside retained Objective 1 support while three new regions were declared eligible: Cornwall and South Yorkshire in England, and West Wales and The Valleys in Wales. From 2007 Merseyside and South Yorkshire were no longer considered Objective 1, while Cornwall and

⁵ As an example, during the 2000-2006 period the UK received approximately €17 billion. Only Spain, Italy, Germany and Greece received more EU Funds during the same years.

West Wales conserved the status also for the 2007-2013 and the 2014-2020 periods (Appendix A1).

Table 1 summarises the amount of EU funds per inhabitant⁶ in 1994-1999, 2000-2006, and 2007-2013 obtained by English regions. It can be noted that all regions received some form of financial support, but the amount of funds awarded to those not eligible for Objective 1 is far lower than what was obtained by those considered in highest need of help.⁷

Given the strict and specific criterion adopted to assign the Objective 1 status, variations in eligibility like the ones experienced by Cornwall and South Yorkshire in 2000 represent almost unique cases in the history of Cohesion Policy. As Objective 1 regions are expected to use Structural Funds to improve their economies and converge to the average level of per capita income of the EU, it is very unusual for regions to 'switch' to Objective 1 in countries that have been part of the EU for a long time.

In the next paragraphs, we analyse the historical reasons that have brought Cornwall and South Yorkshire to be classified as Objective 1, and the evolution of their Cohesion Policy status from that moment until today.

⁶ These figures are based on 'payments' from the European Commission. Payments refer to the resources paid by the European Commission to EU regions and are available to be spent. Although they do not reflect the exact final spending of regions, they represent more accurate estimates of actual spending than European Commission's 'commitments', often used by Cohesion Policy evaluations as proxies for funds' expenditures.

⁷ During 1994-1999, the territory of Cornwall was classified as Objective 5b, i.e. 'Adapt agricultural structures and promote the development of rural areas', while South Yorkshire was classified as Objective 2, i.e. 'Reconvert region affected by declining industry'. The fact that the two regions were among the top receivers of Structural Funds in England before 2000 is accounted for in the empirical analysis.

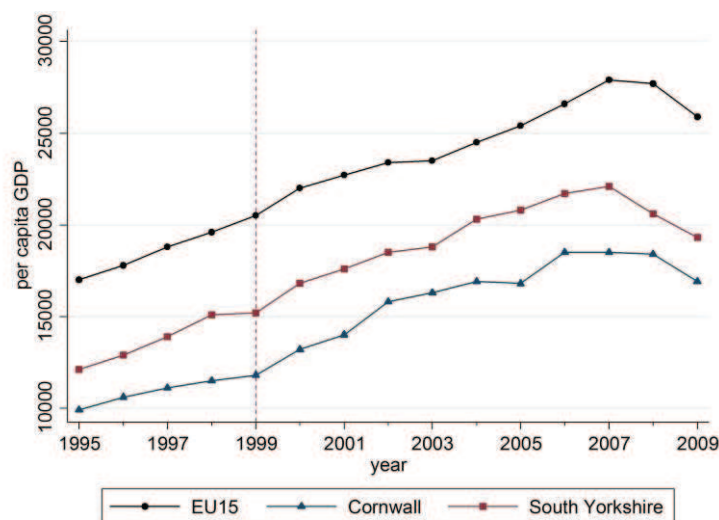
Table 1
Annual Euros of Structural Funds per inhabitant in English regions
1994-1999, 2000-2006 & 2007-2013

Region	1994-1999	Region	2000-2006	Region	2007-2013 ^a
Merseyside*	61.9	Cornwall & Isles of Scilly*	138.0	Cornwall & Isles of Scilly*	144.6
Tees Valley & Durham	32.1	Merseyside*	137.3	Merseyside	39.4
Greater Manchester	28.7	South Yorkshire*	126.8	<i>South Yorkshire</i>	34.3
<i>South Yorkshire</i>	27.5	Tees Valley & Durham	54.2	Tees Valley & Durham	22.3
Northumberland	27.0	Northumberland	52.3	Northumberland	22.3
<i>Cornwall & Isles of Scilly</i>	26.8	West Midlands	45.4	Greater Manchester	14.9
West Midlands	26.5	Greater Manchester	44.0	Cumbria	14.2
Cumbria	24.3	East Yorkshire	40.5	East Yorkshire	13.6
East Yorkshire	23.5	Cumbria	36.3	North Yorkshire	13.5
Derbyshire & Nottinghamshire	17.1	Devon	36.3	Lancashire	13.3
Devon	16.1	Lincolnshire	35.5	West Yorkshire	12.8
Shropshire & Staffordshire	14.5	Shropshire & Staffordshire	32.3	Cheshire	12.6
West Yorkshire	10.1	Lancashire	31.0	Derbyshire & Nottinghamshire	12.6
Lancashire	9.1	West Yorkshire	30.9	Lincolnshire	12.4
North Yorkshire	8.6	Derbyshire & Nottinghamshire	30.0	Leicestershire, Rutland	11.6
Lincolnshire	7.7	North Yorkshire	26.4	Shropshire & Staffordshire	11.4
Herefordshire, Worcestershire	7.1	Inner London	22.2	Herefordshire, Worcestershire	11.3
Inner London	5.3	East Anglia	21.1	West Midlands	11.2
Kent	3.8	Herefordshire, Worcestershire	20.5	Devon	10.3
East Anglia	3.5	Cheshire	18.3	Essex	9.6
Cheshire	3.3	Kent	17.6	Dorset & Somerset	9.2
Outer London	1.9	Outer London	16.6	East Anglia	8.9
Essex	1.5	Bedfordshire & Hertfordshire	16.4	Outer London	8.1
Gloucestershire, Wiltshire	1.4	Leicestershire, Rutland	16.0	Inner London	7.8
Dorset & Somerset	1.4	Gloucestershire, Wiltshire	15.5	Kent	7.7
Hampshire & Isle of Wight	1.3	Essex	15.3	Hampshire & Isle of Wight	7.7
Leicestershire, Rutland	1.2	Dorset & Somerset	15.0	Gloucestershire, Wiltshire	7.7
Bedfordshire & Hertfordshire	1.1	Surrey, East & West Sussex	14.4	Surrey, East & West Sussex	7.3
Surrey, East & West Sussex	0.9	Hampshire & Isle of Wight	13.9	Bedfordshire & Hertfordshire	6.8
Berkshire, Buckinghamshire	0.8	Berkshire, Buckinghamshire	13.6	Berkshire, Buckinghamshire	5.6

Notes: values are calculated as Structural Funds' payments from the European Commission divided by regional population. Source: DG Regional Policy. * **Objective 1 regions**; a / provisional figures.

Cornwall. Figure 1 plots the evolution of per capita GDP purchasing power standard, comparing the trends in Cornwall and South Yorkshire with the average of the EU as of 1999 (with 15 Member States). Between 1995 and 1999, Cornwall was growing at a slightly lower pace with respect to the EU15 – the 1995-1999 average growth rate of Cornwall was 4.5%, while in the EU15 it was 4.8%. On average, however, the growth rate of the region is comparable to that of the EU, as Cornwall's GDP per capita was €9,900 in 1995, equal to 58.2% of the EU15, and €11,800 in 1999, corresponding to 57.6% of the EU15.

Figure 1
GDP PPS per inhabitant (EUR), 1995-2009



Source: own elaboration with OECD data.

Despite Cornwall’s GDP per capita was way below the 75% threshold in the 90s, the European Commission entitled Cornwall to receive Objective 1 funding only from the programming period starting in 2000. The reason for this is that until 1998 Cornwall and its neighbour Devon were incorporated into a single statistical area with a GDP per capita above 75% of the EU. In 1998 the UK Government introduced a reform revising NUTS regional borders, splitting the Cornwall-Devon region into two separate statistical areas. Previously, under the ‘Devonwall’ political concept promoted by the UK Conservative Party from the 1970s, Cornwall and Devon had been linked together in an economic, political and statistical sense.

After the 1997 UK general elections and the defeat of the Conservatives, the Liberal Democrats withdrew their support to the ‘Devonwall’ project, opening the doors to the statistical separation of the two regions and the possibility for Cornwall to be awarded Objective 1 status. Despite the existence of a political campaign for Cornwall’s separation from Devon, the change in regional borders and in EU funds eligibility was hardly predictable (Willett, 2013). The requests of separation were complicated by the presence of political elites and

stakeholders in Cornwall believing that the unity between Devon and Cornwall was best serving their interests, due to the possibility of having a stronger 'lobbying voice' by staying together (Stanyer, 1997). In addition, the Labour party winning the 1997 national elections was not particularly keen on devolving political autonomy to territories it did not control politically⁸ (Willet and Giovannini, 2014).

Importantly, the reasons behind the attainment of the Objective 1 status in Cornwall are independent from any circumstance directly affecting the long-term economic trajectory of the region. The 1998 reform justified the division of Devon and Cornwall on the basis of "the very different economic conditions of the two counties, and Cornwall's sparsity of population, geographical peripherality and distinct cultural and historic factors reflecting a Celtic background" (House of Common, 1998). The economic differences between Cornwall and Devon emphasised by the UK Government are evident if the levels of per capita GDP of the two regions are compared.⁹ However, when looking at other measures of economic prosperity such as the Total Household Income or the Gross Disposable Household Income¹⁰, the figures for 1997-1999 appear very similar for the two regions and in both cases above the 75% EU threshold (Gripaios and McVittie, 2003). This suggests that Cornwall was "somewhat fortunate to be awarded Objective 1 status" (Gripaios and McVittie,

⁸ In the 1997 elections the Labour party obtained the relative majority of votes only in one of five Cornish constituencies (the other four were won by the Liberal Democrats), while in the 1992 elections the Labour was the third party after Conservatives and Liberal Democrats. The 1998 reform was promoted by the Labour-led central government. Given the historical political weakness of the Labour in Cornwall, the Devon-Cornwall 1998 separation was not easily foreseeable, due to the fact that it would have meant a political victory for an opposition party, the Lib Dem, which had begun to back the separatists' requests. The separation has been the result of lobbying activities which eventually led the national government to include the Cornwall-Devon division in the reform (Willet, 2013).

⁹ In 1999, the per capita GDP of Cornwall was €11,800, while Devon's was around €15,900.

¹⁰ Total Household Income (THI) is calculated as all income received by household residents in a region, while Gross Disposable Household Income deducts from THI expenditures on taxes, social security, pension contributions and interest payments.

2003: 372), as the principal reason for the region's qualification for financial support was the way borders have been re-drawn (Gripaios and McVittie, 2003; Gripaios and Bishop, 2006).

Therefore, the sudden increase in EU grants can be considered exogenous to the pre-treatment economic trend of the region, making it possible to identify the effect of EU-financed programmes by looking at the evolution of the regional labour market before and after the attainment of the Objective 1 status.

The Objective 1 status of Cornwall was confirmed in 2006 for the 2007-2013 period, and again in 2013 for the 2014-2020 period (Appendix A1). This makes Cornwall the region that received the largest proportions of EU funds per capita in England from 2000 onwards (Table 1). And yet, this did not prevent the Cornish population to vote in majority for leaving the EU at the 2016 Brexit referendum. The outcome reflects a progressive increase of anti-EU feelings among Cornwall's citizens over the last twenty years.¹¹

South Yorkshire. With respect to Cornwall, the attainment of Objective 1 eligibility in South Yorkshire has occurred in a 'less unexpected' way. Formerly specialised in manufacturing, South Yorkshire has gone through a period of deindustrialisation which brought to the closure of most coal mines in the early 1990s. The region's economic decline was seriously addressed by the central Government only from 1997 onwards, when the newly-elected Labour Government promoted interventions tackling the growing unemployment by matching national resources with the EU funds (Kirk et al., 2012). From 1994 to 1999, the South Yorkshire territory was classified as Objective 2. The proportion

¹¹ According to a 1997 survey, when asked whether Britain should unite with the EU or protect its independence, 37% of respondents were hoping for more independence (6-10 on a scale 0-10, with 0 corresponding to full European integration and 10 to full independence) rather than more integration, 46% were hoping for more integration (0-4) (Heath et al., 1999). In 2015, these percentages had drastically changed. 49% were in favour of more independence, 28% supporting more integration (Fieldhouse et al., 2016).

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of EU funds available to the region increased massively from 2000, when South Yorkshire became eligible for Objective 1 support.

Unlike the Cornwall case, there has been no border re-definition behind the change of status of the region. Hence, anticipation effects and externalities may affect our estimates if we assume that people and firms react to the change in eligibility before this has actually occurred. However, the fact that South Yorkshire's per capita GDP was swinging above and below the 75% threshold just before 2000 – it was 74.2% of the EU15 in 1997 and 76% in 1998¹² – made it more difficult to predict a future Objective 1 eligibility, and therefore behave in such a way that could anticipate the inflow of EU funds to the region.

Moreover, the per capita GDP trend of the region has been almost parallel to the one of the EU15 in the years preceding the eligibility change (Figure 1). South Yorkshire's growth rate during the 1995-1999 period was 5.9%, slightly above the EU15's 4.8%. The region continued catching up with the EU average during 2000-2006 period and due to this increase in income and to the Eastern Enlargement – an exogenous event which made the 75% threshold easier to be exceeded– during the 2007-2013 period South Yorkshire lost the status of Objective 1 becoming a Phasing-in region.

The Phasing-in status entitled South Yorkshire to receive 'transitional funding', that is, more resources than any other non-Objective 1 region but less than Cornwall, the only English Objective 1 region during the programming period starting in 2007 (Table 1). This status was confirmed in 2013, when South Yorkshire was defined as a 'Transition region' for the 2014-2020 period, i.e. with

¹² The region was entitled to receive Objective 1 funds despite the fact that its GDP was above 75% of EU average in 1998 because the EU considers the average GDP of the three years of available data before the beginning of the period to classify the regions. Final data for 1998 was presumably not yet available in 1999, when the final decision over eligibility was made.

an average GDP per capita between 75% and 90% of the EU average. This gives the possibility to obtain more funds than ‘more developed regions’ (GDP per capita above 90% of the EU average), but less than ‘less developed regions’ (former Objective 1).

Hence, starting from 2000 South Yorkshire has absorbed large shares of EU funds. This has allowed to promote a vast number of development projects across the region. Nonetheless, this flow of funds has not managed to change the attitudes of the population regarding the EU and the process of European integration. The EU was seen with scepticism in South Yorkshire before 2000, and the period of intense funding has not mitigated these feelings.¹³ This has led to an overwhelming request to leave the EU at the 2016 Brexit referendum – 61% of the total voters in the region.

Potentially confounding policies. The main policy for employment promotion in Cornwall and South Yorkshire besides EU Cohesion Policy was the Regional Selective Assistance (RSA) programme (renamed in 2008 as Grant for Business Investment (GBI)), financed by the UK national Government and intended to ‘create and safeguard’ employment in the poorest areas of the country (Criscuolo et al., 2012). The RSA schemes are no longer in force in England since 2014.

Through this policy, the Government provided grants to manufacturing firms located in UK areas characterised by low GDP per capita and high unemployment. Changes in eligibility for RSA occurred in coincidence with the start of new EU programming periods. We attempt to minimise the potentially

¹³ A 1997 survey on attitudes towards the EU shows that in South Yorkshire 38% of respondents were hoping for more independence rather than more European integration (6-10 on a scale 0-10), of which 22% thought the UK should ‘Do all it can to protect independence’ from the EU (10); 31% were hoping for more integration (0-4) (Heath et al., 1999). In 2015, 48% were hoping the country would become more independent from the EU, while 31% were hoping for more integration (Fieldhouse et al., 2016).

confounding effect of this policy in the empirical analysis, by exploiting variations over time in the geography of RSA support schemes.

4. Data and descriptives

The main outcome variable used to evaluate the effectiveness of Objective 1 funding in Cornwall and South Yorkshire is unemployment, proxied by the share of people claiming Job-Seeker's Allowance (JSA) unemployment benefits.¹⁴ Data are obtained from the Office for National Statistics (ONS) Nomis database and are available from the year 1992. Although the share of unemployment benefit claimants is not an official measure of unemployment, it is a less noisy indicator than the unemployment rate¹⁵ and the only one available for areas smaller than UK Local Authorities. As shown in Appendix A2, during the period in which Cornwall and South Yorkshire have received Objective 1 funds, the rate of UK unemployment benefit claimants and the unemployment rate display similar trajectories. Figure A2 shows that from 2000 the dynamics of unemployment in the UK have followed upward and downward trends. The unemployment rate was 5.5% in 2000, peaked at 8% during the crisis and declined to 6.2% in 2014.

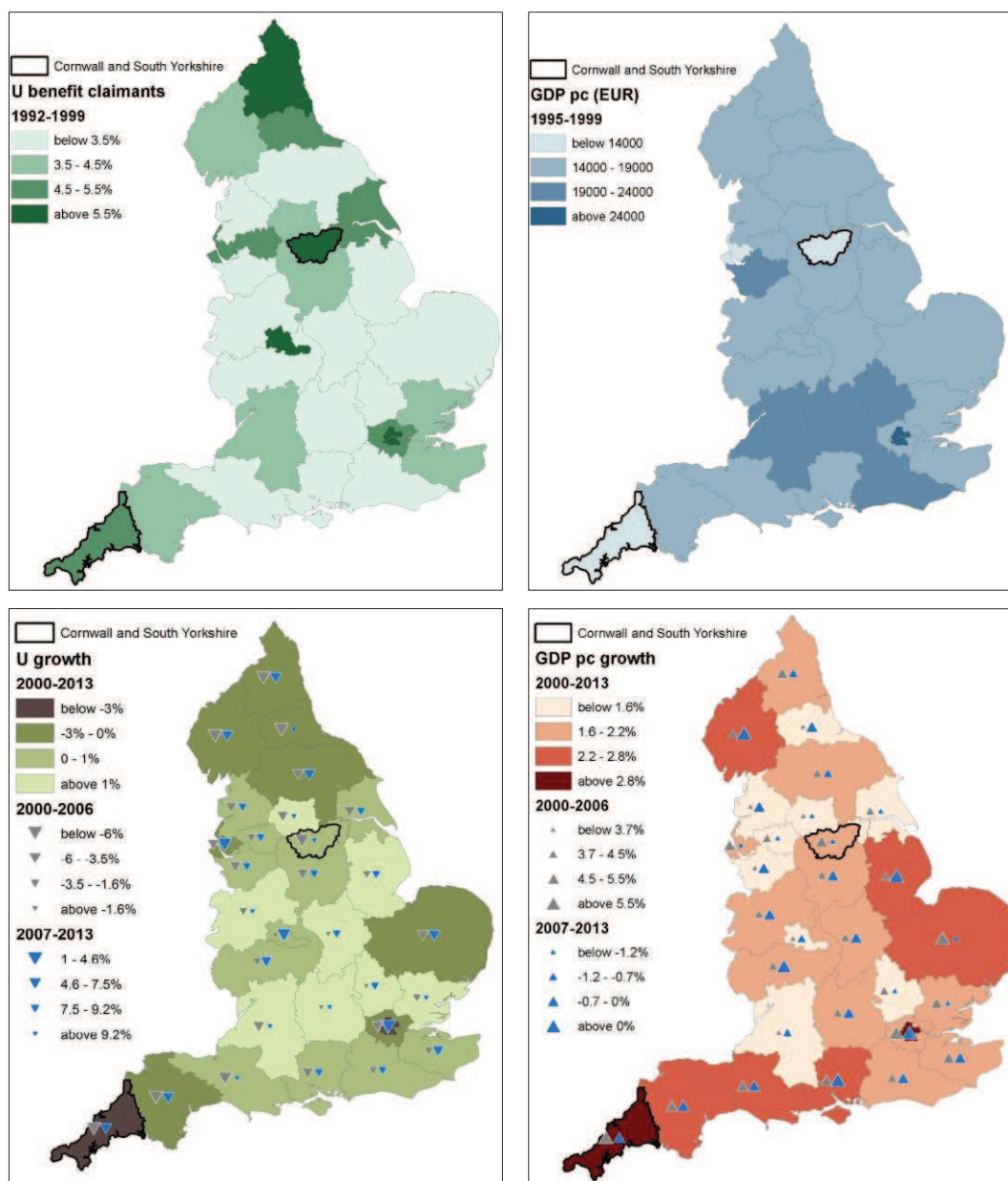
A second outcome variable used in the analysis is per capita GDP, available only at the regional level from 1995 onwards. Information on this variable is obtained from OECD statistics.

¹⁴ Job-Seeker Allowance unemployment benefit is paid by the UK national government to unemployed people who are actively seeking work. All citizens of England, Wales, Scotland and Northern Ireland are equally entitled to apply for JSA.

¹⁵ The JSA claimant count is often used as a proxy for unemployment. Due to sampling variability, the estimates of unemployment produced by the Labour Force Survey (LFS) are highly volatile. For this reason, JSA benefit claimant count is a less distorted and more reliable indicator than the unemployment rate, particularly when focusing on subsets of the UK population and on small administrative areas (ONS, 2013).

Figure 2 describes the level and growth of unemployment and per capita GDP of English NUTS2 regions during the analysed period. The upper quadrants of the Figure show the percentage of unemployment benefit claimants and the level of income before 2000. Cornwall and South Yorkshire were among the regions with the highest percentage of unemployed people, and among the poorest regions in the country. The bottom quadrants of Figure 2 suggest that during the 2000-2013 period Cornwall has been one of the top performing regions in England both in terms of unemployment reduction – a decrease by over 3% – and in terms of economic growth – an increase by over 2.8%. Conversely, the performance of South Yorkshire during the same period has been in line with the England average. The variation of unemployment and per capita GDP has been similar to the one of most English regions. South Yorkshire experienced one of the largest unemployment reductions and fastest GDP pc growth during the 2000-2006 period; however, the following years have been characterised by growing unemployment – over 9% increase – and an economic recession – over 1.2% reduction in GDP per capita.

Figure 2
Unemployment benefit claimants and GDP per capita levels and growth, English regions



Source: own elaboration with Nomis and OECD data.

We analyse these trends more thoroughly in the empirical analysis.

Two different spatial dimensions are used for the counterfactual study: regions and wards.

Regions. The analysis performed at the regional level exploits two main sources of data. The first is Eurostat Regio, providing data from 1995 until 2014; the second is the Quarterly Labour Force Survey Local Area Data (LFS LAD),

containing information on employment, economic activity and related subjects at the level of UK Local Authority Districts from 1992 to 2006. The period is collapsed from quarterly to yearly. The final dataset is composed of LFS variables from 1992 to 2006, Eurostat and OECD variables from 1995 to 2014 and the unemployment proxy available from 1992 to 2014.

NUTS2 regions are characterised by an average population of 1.7 million inhabitants, of which 2.8% claiming unemployment benefits (2000-2014 average).

Wards. The lowest level of aggregation used in this study is the one of electoral wards. Ward-level units allow to capture localised unemployment clusters, because most ward boundaries have been used by the ONS in 2001 to draw Output Areas (for which data is not available), a geographical classification of socially homogeneous areas in terms of household tenure and population size. The wards of England have an average population of around 5000 inhabitants (with high variance across wards, see descriptive table in Appendix A3).

Due to the 1996 revision of frozen ward boundaries, the unemployment variable is only available for wards from 1996. Data on other variables at ward level is obtained from the 1991 UK Census. The following Censuses cannot be used because they relate to different ward classifications. The variable for wards' residents is given by the number of 1991 residents interpolated between 1996 and 2014 by assigning the average population growth rate of the region to its constituent wards.

5. Results

5.1 Regional level analysis

Synthetic control method – main results. In order to compare the unemployment trend of the treated regions with appropriate counterfactuals, we adopt the synthetic control method for comparative case studies developed by Abadie and Gardeazabal (2003) and Abadie et al. (2010; 2015) (see Annex for an explanation of this methodology). The synthetic control units are constructed on the basis of a number of labour market indicators related to the typology of the labour force, the sectorial composition and the level of education and training. In addition, we control for the level of GDP per capita.¹⁶ We also account for the fact that Cornwall and South Yorkshire were receiving EU funds during 1994-1999 by controlling for the amount of Structural Funds obtained in the pre-treatment period.

Table A4 in the Appendix summarises pre-treatment average values of all variables used to construct the synthetic region, comparing them to the averages for Cornwall, South Yorkshire and England. Table A5 presents the list of ‘weights’ used to obtain the synthetic regions. In the case of Cornwall, Devon provides almost 60% of the weights, not surprisingly given the strong connection with the Cornish economy discussed above. The remaining weights are from regions being among the highest recipients of Structural Funds during 1994-1999. In the case of South Yorkshire, the main weights come from Tees Valley and East Yorkshire, also obtaining high shares of EU funds before 2000. In both cases, the synthetic regions have an average value of per capita

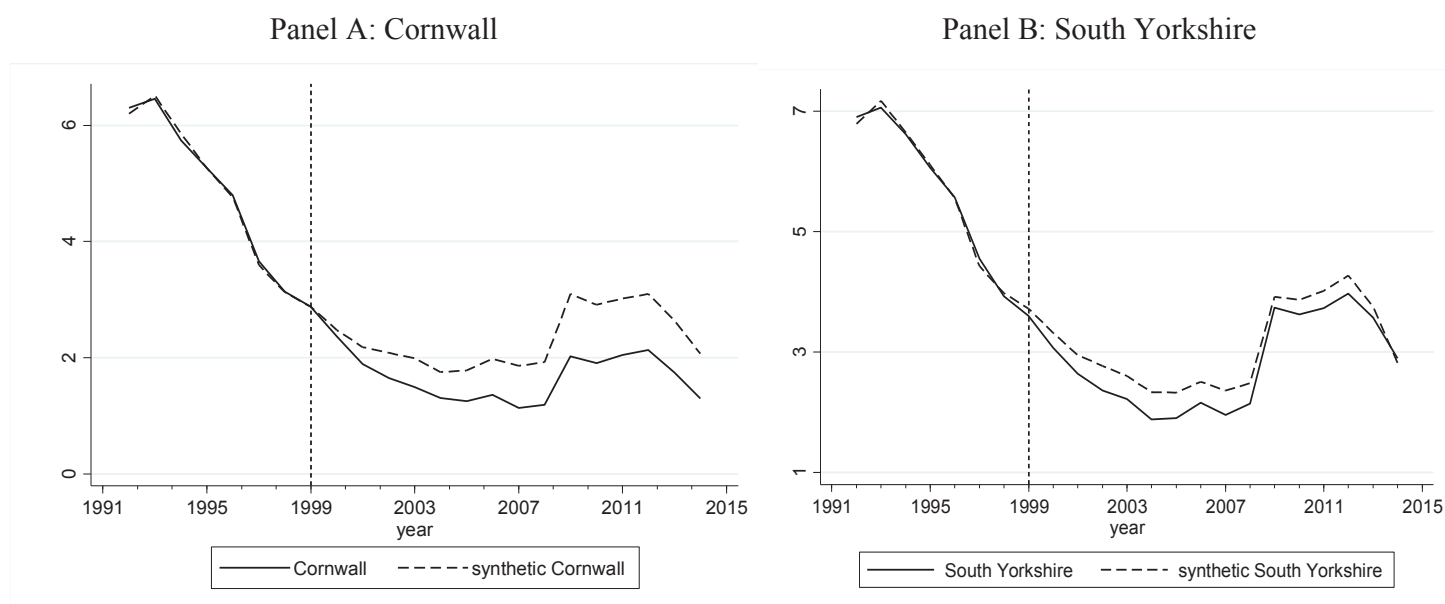
¹⁶ By construction, Cornwall and South Yorkshire are the regions with the lowest per capita GDP among all regions in the sample (Merseyside is excluded), making it impossible for the synthetic region to perfectly match the treated region on this characteristic. Nonetheless, including this control is important in order to minimise convergence effects not being determined by Structural Funds support.

Structural Funds in the pre-treatment period that is above the English average and close to the figure of the two treated regions.

Figure 3 plots the unemployment trend for Cornwall and South Yorkshire with the estimated trend of the respective synthetic regions between 1992 and 2014. The pre-treatment indicators predict well the evolution of unemployment trajectories of the treated regions until 1999, suggesting that treatment and control regions are running in parallel before the start of the treatment.

Panel A of Figure 3 reports the evolution of unemployment in Cornwall and its synthetic counterpart. From 2000 onwards a gap is clearly visible, indicating that Cornwall reduced its unemployment more than the synthetic control during the 2000-2006 and the 2007-2013 programming periods. South Yorkshire and synthetic control are displayed in panel B of Figure 3. In this case, the two unemployment trends diverge marginally in 1999. Nevertheless, the largest gap between the two lines is visible during the period in which South Yorkshire was entitled to receive Objective 1 funds, i.e. 2000-2006. South Yorkshire's lower line suggests that the region has reduced the proportion of unemployed people more than a region similar in all relevant characteristics except for not having received Objective 1 aid. South Yorkshire's gap with the synthetic region tends to reduce over time. From the year 2008, treated and control regions report increasingly similar levels of unemployment, up to the point that the two lines overlap again in 2013-2014. This suggests that when South Yorkshire was classified as Phasing-in, unemployment has grown faster than in the synthetic region, completely offsetting all labour market improvements of the previous seven years.

Figure 3
Unemployment trends 1992-2014: treated vs. synthetic regions



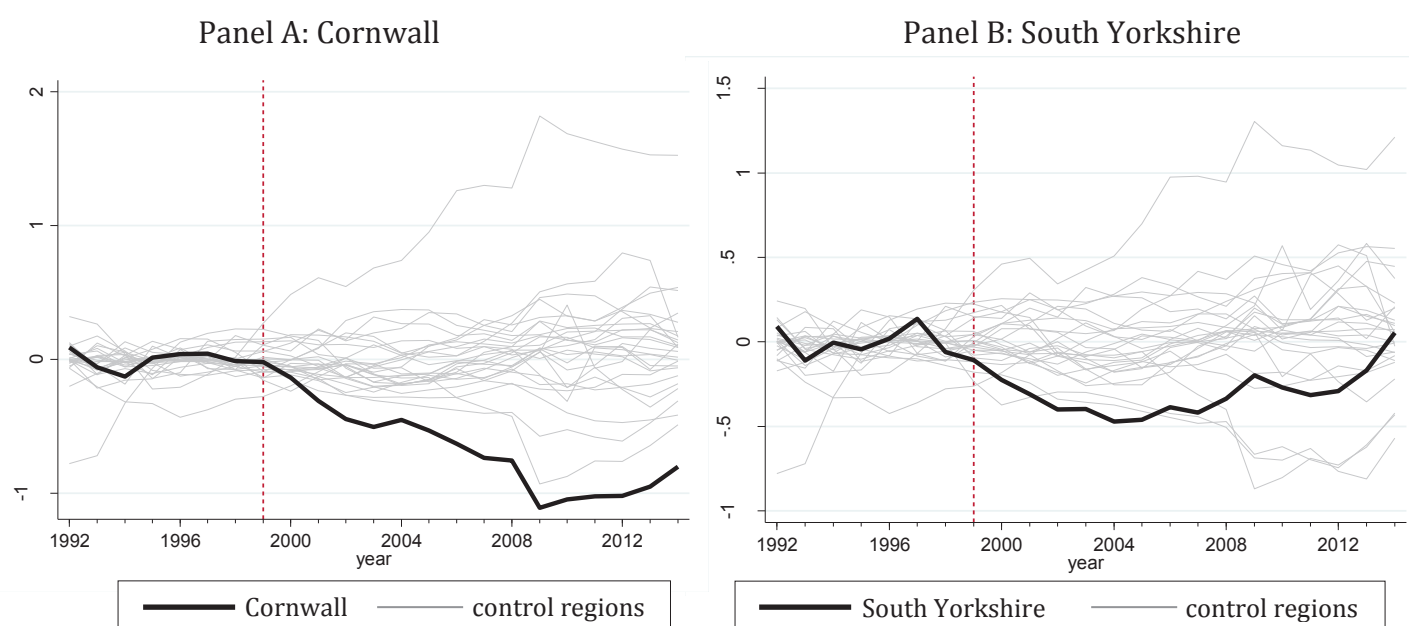
Source: own elaboration with Nomis data.

In order to test for the significance of the estimated effects we follow Abadie et al. (2010) and run a series of placebo studies by iteratively applying the synthetic control method to every other untreated English region. We shift Cornwall and South Yorkshire among the control units and reassign the treatment to each one of the regions in the sample. We then compute the gap between the two trends for all iterations and compare it to the one estimated for the two treatment regions. The results of the placebo test are displayed in Figure 4.

Panel A provides clear evidence of a significant effect for Cornwall. No other region in the sample has witnessed a reduction in unemployment as large as the one experienced by Cornwall. A difference in the gap between Cornwall and every other English region is visible from 2002 and increases over time, until it stabilises in 2009. This suggests that throughout the Objective 1 period Cornwall has reduced the proportion of unemployment benefit claimants more than regions not eligible for Objective 1 grants. The difference between

Cornwall's and the synthetic region's unemployment changes is equal to 0.93 percentage points¹⁷, corresponding to a percentage of unemployment benefit claimants approximately 30% lower than the control region.

Figure 4
Unemployment gap in treated regions and placebo gaps



Panel B of Figure 4 tests the significance of the estimated gap for South Yorkshire. Between 2001 and 2005, South Yorkshire's proportion of unemployment benefit claimants was lower than any other English region not eligible for Objective 1 policies, indicating a statistically significant difference between treatment and control during the period. However, during the following years the gap becomes progressively closer to zero. This means that South Yorkshire was capable of reducing unemployment more than regions not in receipt of Objective 1 funds, but only temporarily. In the long-run, we do not find any significant effect on the unemployment trend of the region.

¹⁷ This has been calculated as: $(U_{\text{Cornwall 2013}} - U_{\text{Cornwall 1999}}) - (U_{\text{synthetic 2013}} - U_{\text{synthetic 1999}}) = (1.74 - 2.88) - (2.69 - 2.89) = -0.93$.

Robustness tests. One concern with these estimates is the presence of externalities potentially confounding the selection of untreated areas. The regions neighbouring Cornwall and South Yorkshire might have benefitted from the improved economic and labour market conditions of Objective 1 regions, or they might have lost out key assets (in the form of human capital and firms) due to the attractiveness of EU projects. In an attempt to minimise spillover effects, the main estimations are replicated by excluding from the donor pool of the synthetic controls all regions sharing a border with Cornwall or South Yorkshire.

In the case of Cornwall, the strong proximity between the Cornish and the Devon economy makes Devon as the region most likely to be affected by treatment externalities. Similarly, all regions neighbouring South Yorkshire (North Yorkshire, East Yorkshire, West Yorkshire, Lincolnshire, Derbyshire and Nottinghamshire) may be conditioned by the fact that the region was awarded Objective 1 funds. The results of the ‘leave-neighbours-out’ exercises are reported in Appendix A6 alongside synthetic controls’ weights. Spillovers do not seem to be a major factor in this context as the results of these estimations are not significantly different from the ones presented in Figure 3.¹⁸

As a second test to assess the credibility of the main synthetic control estimates, we artificially anticipate the start of the Objective 1 period. If, as we argue, the reduction in unemployment is driven by EU funds, then by anticipating the treatment we should find no significant difference in unemployment before 2000.

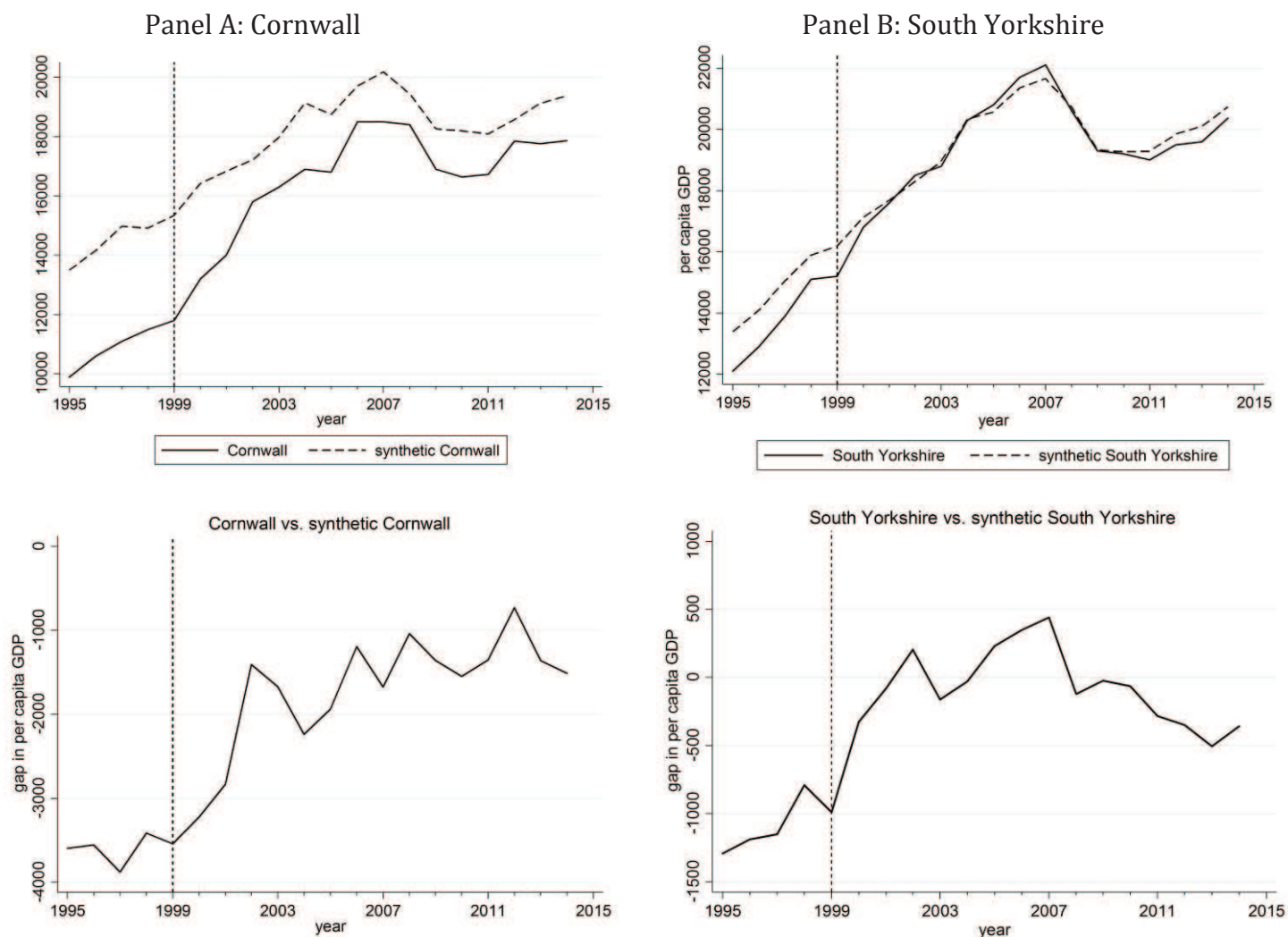
¹⁸ This way of controlling for externalities is imperfect. However, in absence of data on migration and mobility of firms across regions, it is the best possible way to control for the relocation of economic activity towards the treated regions.

This placebo study is performed by using 1992-1996 values of the control variables to construct the synthetic regions, and allow for treatment effects to materialise in 1997. The results of the test are displayed in Appendix A7. As shown in the two figures, there is no evidence of a significant divergence of unemployment trends between treated and synthetic regions before 2000. This is reassuring regarding the existence of any anticipation effect. The estimated effect during Objective 1 years seems to have little to do with labour market and economic changes occurring in expectation of future Objective 1 eligibility.

Effect on per capita GDP. The main intention of Cohesion Policy is to foster the economic development of European territories. The effectiveness of EU regional policies is generally evaluated by looking at the impact they produce on the economic growth rate of targeted regions. For this reason, we extend our empirical analysis by considering per capita GDP as an alternative outcome variable.

In order to replicate the synthetic control analysis, we adopt a number of variables referring to key factors generally identified as growth determinants in the literature. The level of private capital investment, the stock of infrastructure, and the degree of technological development and innovation – regarded as key drivers on long-run economic growth (e.g. Sala-i-Martin, 1996; OECD, 2009) – are proxied by the percentage of gross fixed capital formation, the number of kilometres of roads per regional area, the share of human resources in science and technology and the number of patent applications per thousand inhabitants, respectively. These variables are used to predict the synthetic control regions' pre-treatment trends of GDP per capita.

Figure 5
Per capita GDP trends 1995-2014: treated vs. synthetic regions



Source: own elaboration with OECD data.

Given that Cornwall and South Yorkshire are the regions in the sample with the lowest income per inhabitant, by definition the pre-treatment GDP per capita levels of treated units cannot be replicated by the synthetic controls. This implies that the trends of treated and counterfactual regions are not overlapping in the pre-treatment period. However, as shown in Figure 5, both Cornwall and South Yorkshire's trajectories run in parallel with the ones of their relative synthetic counterparts before 2000, indicating that the growth rate of treatment and synthetic units is similar prior to the beginning of the Objective 1 period.

The results of the empirical test indicate that Cornwall has partially closed the income gap with the synthetic control region. The bottom-left quadrant of Figure 5 illustrates that the distance between Cornwall and control region is progressively reducing over time. The fastest catch-up of Cornwall is visible during the first treatment years.

South Yorkshire has grown faster than the synthetic region over the analysed period. The top-right quadrant of Figure 5 indicates that the treated region has experienced high growth rates while receiving Objective 1 funds, overcoming the control region in terms of GDP per capita in 2005. This tendency is interrupted and reverted from 2008, when South Yorkshire's worse growth performance widens the income gap between the two regions (bottom-right quadrant, Figure 5).

These results should be taken with caution, due to the imperfect method of calculating the synthetic controls, and to the relatively short number of pre-treatment years. Having taken these caveats into consideration, the findings are generally in line with the ones obtained using unemployment as outcome variable. Objective 1 funds seem to be effective in both regions, but South Yorkshire's conditions are progressively deteriorated when the region loses the Objective 1 status.

5.2 Ward-level analysis

Difference-in-differences. We test the robustness of the results obtained with the synthetic control method and unemployment as dependent variable using data at the level of wards. By taking the 134 wards of Cornwall and the 94 wards of South Yorkshire as treatment units, we estimate their mean

unemployment growth during periods of highest EU financial support with a difference-in-differences (DiD) model.

For each of the two Objective 1 regions, the comparison groups are obtained from the 8,269 wards of all English regions not eligible for Objective 1 funds. Rather than comparing the 134 and 94 treated wards to all 8,269 wards from untreated regions, we limit the analysis to the wards in the control group which are most comparable in terms of their observable characteristics. In order to identify the most similar control wards to the treated wards, we resort to the propensity score matching (PSM) method. The *psmatch2* estimator (Leuven and Sianesi, 2003) is used to match wards from either Cornwall or South Yorkshire one-to-one without replacement with a set of untreated wards, using the nearest neighbour algorithm. The matching is based on a number of key socio-economic characteristics from the 1991 Census and on pre-treatment unemployment.¹⁹ In such a way, we obtain a set of control wards whose ex ante probability of receiving treatment – as predicted by pre-treatment variables – is sufficiently similar to the one of treated units (Rosenbaum and Rubin, 1983).

Table A8 in the Appendix reports the covariates' balancing tests for wards of Cornwall and South Yorkshire. There is no statistical difference between treated and control wards for all observable socio-economic characteristics, suggesting that the PSM has produced suitable control groups.

¹⁹ Given that almost all covariates are taken from the 1991 Census, they have no time variation. Therefore, the PSM has been performed with a collapsed (cross-section) dataset for the pre-treatment period. The selection of control groups has been done by matching one-to-one treatment wards with untreated wards on the basis of 1991 covariates and wards' unemployment averaged between 1996 and 1999. For each treated ward, our matching algorithm finds a control unit with similar characteristics. The selection of wards as controls from the cross-section dataset has been used to compute DiD estimates. Hence, the sample of wards used for DiD estimates is made of treated wards (Cornwall or South Yorkshire) and matched wards.

The DiD analysis is performed with panel data from 1996 to 2014. We estimate different versions of the following model:

$$Ugrowth_{i,t} = \beta Obj1\ region_i + \gamma (Obj1\ region_i \times period_t) + \delta_t + \varepsilon_{i,t}$$

where $Ugrowth_{i,t}$ is the annual growth rate of unemployment benefit claimants in ward i at year t ; $Obj1\ region_i$ is a dummy taking value one for wards belonging to treated regions (either Cornwall or South Yorkshire) and zero otherwise; $period_t$ is a dummy referring to the post-2000 period of reference (either the full period, 2000-2014, or one of the two sub-periods, 2000-2006 and 2007-2014); δ_t are a full set of year dummies; and $\varepsilon_{i,t}$ is an idiosyncratic error term. Given that eligibility for EU funds is assigned at the regional (NUTS2) level, standard errors are clustered at this level throughout the analysis. Our DiD specification, similar to Redding and Sturm (2008), allows for unobserved fixed effects in wards, which are differenced out as we compute unemployment growth rates. The coefficient of interest of the model, γ , compares the unemployment growth of treated wards with the one of respective groups of untreated wards, selected through PSM.

The results of the DiD model are presented in Table 2.

We begin the discussion of results with the estimates for Cornwall in columns (1) to (6). First, it can be seen that the dummy variable for Cornwall wards is insignificant in all different specifications, indicating no difference in unemployment growth between Cornwall and matched wards prior to 2000. Hence, the propensity score matching has produced comparable treatment and control groups on the basis of pre-treatment labour market conditions.

The interaction term between Cornwall wards and the $period_t$ dummy refers to the difference in unemployment growth between treated and control wards during Objective 1 periods. According to our results, unemployment in

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Cornwall wards decreased 3.8 percentage points faster than in control wards. This is a larger difference with respect to the one obtained from synthetic control estimates. The estimated gap between Cornwall and the synthetic control region corresponds to an annual average difference in unemployment growth of 2.5 percentage points. The discrepancy between the two results is probably due to the fact that the pre-treatment matching in the ward-level analysis is performed on a lower number of covariates (for example, data on Structural Funds' shares are not available at the ward level) and on a shorter time-span. For these reasons, we find more reliable the regional-level point estimates.

Column (3) shows that the difference in the rate of decrease of unemployment was higher during the first EU programming period, while in the second Objective 1 period it reduced in magnitude but remained marginally significant (column (5)). These trends are in line with the results of the synthetic control method, reporting a gap between treated and synthetic region developing mainly during the 2000-2006 period.

As discussed in section III, other policy initiatives for the promotion of employment were implemented in Cornwall in coincidence with the Objective 1 programme. In particular, the main Government policy aiming at the creation of new jobs was the Regional Selective Assistance (RSA). Before 2000, the large majority of Cornwall's territory was already considered eligible under RSA support schemes, but 48 wards of Cornwall became eligible to receive RSA transfers in 2000. Hence, one way to partially test whether RSA policies are confounding our estimates is to verify whether the results are sensitive to the exclusion of these wards. Columns (2), (4) and (6) of Table 2 report the estimate results of the model excluding the 48 wards eligible for RSA from 2000. As compared to full sample estimates, the coefficients are virtually unchanged. Therefore, it seems plausible to assume that Cornwall's change in

unemployment can be ascribed to the success of employment-promoting programmes funded by Structural Funds rather than to RSA policies.

The results of the model for South Yorkshire are displayed in the three final columns of Table 2. In all specifications, the growth rate of unemployment of South Yorkshire wards is not significantly different from the one of control wards before 2000, again suggesting that the PSM based on pre-treatment covariates has allowed to create comparable treatment and control groups.

The coefficient of the interaction term between treated wards and treatment periods in column (7) reports the difference in unemployment growth between South Yorkshire and control wards. The unemployment growth rate of South Yorkshire is not statistically different from the one of comparable wards. This confirms the synthetic control results in that EU policies seem to have produced no effect in the region over the 2000-2014 period.

When the full period is sub-divided into two sub-periods, the results are again in line with those obtained with regional-level data. The negative and significant coefficient of the interaction term in column (8) shows that for 2000-2006 the unemployment reduction in South Yorkshire is significantly higher than in control wards. Conversely, for 2007-2014 the coefficient comparing the unemployment growth rate of South Yorkshire wards to untreated areas of England is positive (albeit insignificant), suggesting that unemployment has increased relative to control wards (column (9)).

Table 2
Difference-in-differences estimates, 1996-2014

Dependent variable:	Period:								
	2000-2014 (1)	2000-2014 (2)	2000-2006 (3)	2000-2006 (4)	2007-2014 (5)	2007-2014 (6)	2000-2014 (7)	2000-2006 (8)	2007-2014 (9)
U growth									
Cornwall wards	0.00575 (0.0092)	0.00891 (0.0092)	0.00574 (0.0092)	0.00892 (0.0092)	0.00575 (0.0092)	0.00892 (0.0092)			
Cornwall wards × period	-0.0381*** (0.0130)	-0.0439*** (0.0131)	-0.0494*** (0.0135)	-0.0561*** (0.0135)	-0.0282* (0.0151)	-0.0334** (0.0151)			
South Yorkshire wards							-0.00087 (0.0081)	-0.00087 (0.0081)	-0.00087 (0.0081)
South Yorkshire wards × period							-0.0035 (0.0113)	-0.0258* (0.0134)	0.0160 (0.00974)
Year dummies	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	4,787	3,923	2,659	2,179	2,932	2,385	3,382	1,880	2,065
R-squared	0.372	0.353	0.091	0.084	0.458	0.440	0.643	0.332	0.694
Wards	268	220	268	220	268	220	188	188	188

Note: Clustered standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1. Sample of treated and matched wards. Cornwall's wards not eligible for RSA in 1993-1999 excluded from sample in specifications (2), (4), (6).

6. Regional investment strategies

According to our findings, Cornwall and South Yorkshire have reduced unemployment significantly more than other areas in England during Objective 1 periods. In this section, we relate this outcome to the policies financed through EU Structural Funds and promoting employment, skills, social inclusion, and other key educational and labour market goals in these two regions. Data from the European Commission allows to reconstruct the development strategies of Cornwall and South Yorkshire and the proportion of allocated funds during 2000-2006 and 2007-2013. In such a way, it is possible to observe how Objective 1 and Phasing-in programmes have been designed prior to their implementation.

The statistics on the proportion of EU funds committed by the European Commission are displayed in Table A9 in the Appendix. The total amounts of funds per capita are sub-divided by different fields of intervention. It can be noted that both Cornwall and South Yorkshire's 2000-2006 Objective 1 programmes have allocated a great deal of resources to direct measures for employment promotion and training – mainly through the European Social Fund (ESF) – in the following thematic areas: 'workforce flexibility & entrepreneurial activity', 'social inclusion', 'labour market policy and labour market actions for women', and 'educational and vocational training'.²⁰ Cornwall had planned to spend up to €28.7 per person every year during 2000-2006 in these themes, while South Yorkshire had earmarked up to €37.7 per inhabitant. Most of these interventions were financed by the European Social

²⁰ These initiatives were included within the strategic goal 'Developing people' of the Single Programming Document (SPD) for Cornwall (South West Observatory Skills and Learning, 2008), and the priority theme 'Building a learning region which promotes equity, employment and social inclusion' of the SPD for South Yorkshire (Government Office for Yorkshire and The Humber, 2008).

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Fund (ESF). The total 2000-2006 allocations from the ESF ²¹ amounted to approximately 20% (Cornwall) and 29% (South Yorkshire) of the total committed EU funds.

ESF-financed policies were not the only measures potentially contributing to reduce the number of people claiming unemployment benefits in the two regions. Projects focusing on development goals related to infrastructure, R&D and innovation, human capital, business development, and other investment areas, may have also produced significant employment boosts. Most interventions in these fields were mainly intended for the promotion of regional economic growth, and are likely to have contributed to the economic catch-up observed during 2000-2006.

The main difference between the strategies of the two regions is that South Yorkshire concentrated large shares of funds on two themes, 'Planning & rehabilitation' and 'SMEs and the craft sector', while Cornwall has distributed funds more equally across different fields of intervention.

If we look at the 2007-2013 programming period, the total funds to South Yorkshire's operational programme decreased by almost 70%. This reduction involved all investment pillars, including the proportion of resources directly promoting employment – calculated as the sum of 'lifelong learning, training, entrepreneurship', 'services for employment and training', 'social inclusion', and 'access to employment and sustainability' – which went down to €20.2 per person, i.e. almost halved with respect to the previous period. In contrast, Cornwall's effort to create new jobs and reduce labour market exclusion increased to €55 per person annually, 35% of the total committed funds. Yet,

²¹ The total ESF allocations for 2000-2006 were €101m for Cornwall (total EU funds in the region: €520m), and €365m for South Yorkshire (total EU funds in the region: €1,212m).

this investment was only partially successful given that, as shown by our results, the rate of unemployment reduction during 2007-2013 was lower with respect to 2000-2006.²²

7. Conclusions

The exit of the UK from the European Union will leave poorer UK regions without access to EU Structural Funds. In this paper we have looked at two regions that voted to leave the EU at the Brexit referendum, despite having benefitted from EU Cohesion Policy for many years. We have tested whether the most significant form of EU economic support – the Objective 1 programme – has been successful, and the extent to which a reduction of EU subsidies may affect the development trajectories of UK regions. Cornwall and South Yorkshire have been compared to synthetic control regions similar to them but not eligible for Objective 1 policies.

Our results indicate that Cornwall has made good use of Objective 1 funds. EU development policies have helped to lower the proportion of people claiming unemployment benefits and reduce the income gap with richer regions. South Yorkshire received Objective 1 funds for one single programming period, during which some significant improvements were visible. As compared to regions not eligible for Objective 1 support, South Yorkshire has grown faster and has seen unemployment diminish. However, these gains have not led to a different and self-sustainable development path. During the following period

²² The calculation of investment shares was obtained from commitment data. As such, they correspond to potential disbursement of funds, planned in accordance with the European Commission before the beginning of the programming periods. Hence, the shares of investments in Table A9 might not reflect the finances actually received and spent by the regions.

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the region displayed one of the worst performances among English regions, despite being still subsidised by the EU as part of the Phasing-in programme.

These findings should foster a careful reflection over the future of poorer UK regions in the event of an imminent exit of the country from the EU. Losing the possibility to access EU Structural Funds is likely to expose the economy of less developed UK regions to potential adverse effects. A region like Cornwall, which has benefitted from Objective 1 policies for a long period of time, faces the highest risks. In this sense, the experience of South Yorkshire may represent a valuable lesson; losing Objective 1 funds can produce a short-term shock, and the labour market and economy can continue struggling in the medium-term. Cornwall is not necessarily bound to follow the same destiny as South Yorkshire as the two regions differ in many respects, including the investment strategies adopted during Objective 1 periods. These differences, however, may not be sufficient for Cornwall to take a different post-policy development path. Unlike EU regions shifting from a status of 'Objective 1' to 'Phasing-out' or 'Phasing-in', Cornwall will not have the possibility of obtaining EU transitional funding. Hence, the loss of EU subsidies may be more likely to produce negative consequences on its economy if the national Government does not put in place any compensatory policy supporting its transition in funding environment. These potential repercussions apply not only to Cornwall but also to all economically disadvantaged UK regions dependent on EU aid, such as West Wales and The Valleys, the only other UK Objective 1 region at the moment of the Brexit vote.

More generally, the results of our analysis contribute to the current debate on the effectiveness of EU Cohesion Policy. The Cornwall case has shown that Objective 1 funding may be successful, even in a causal sense. However, the effects produced by these policies may not be long-lasting, rather they may disappear when the funding period has ended. Hence, when designing and

implementing development projects, EU Objective 1 regions should think carefully of what the legacy of the interventions will be. EU funds should be used to prepare the less advantaged territories for the moment when, inevitably, the resources will be cut down. Not doing so may imply that any improvement obtained during the Objective 1 period will vanish in the long term.

Our study is the first in the literature to empirically study the impact of a sudden increase and decrease in the availability of Structural Funds on the performance of less developed regions. The results of the analysis should be taken with caution, mostly because our investigation is based on two specific contexts. An important task for future contributions is to test the validity of our findings in other regions, assessing whether they evolve in similar ways as in the two case-studies analysed in this paper. In addition, the data at our disposal do not allow us to provide clear answers regarding the key mechanisms producing the effects we observe. Future research may attempt to identify the factors conditioning the long-term impacts of EU policies using different identification strategies.

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Annex

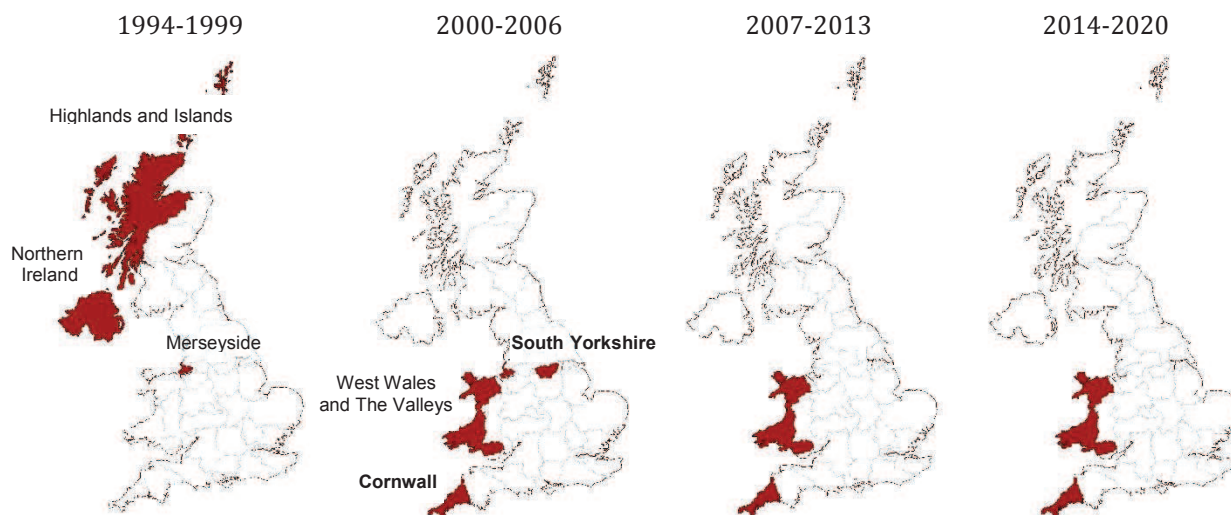
Synthetic Control Method

The Synthetic Control Method for comparative case studies (Abadie and Gardeazabal, 2003; Abadie et al., 2010; 2015) allows to assess the effect of policy interventions taking place at an aggregate level, using data for geographical units not exposed to the treatment but comparable to the treated region. The sample is made of $J + 1$ units, with $j = 1$ being the case of interest and $j = 2$ to $j = J + 1$ being potential comparisons. To construct the synthetic control we consider all English regions not receiving Objective 1 support during 2000-2006, using data from pre-intervention (T_0) and post-intervention (T_1) years. The control unit is obtained from a $(J \times 1)$ vector $\mathbf{W} = (w_2, \dots, w_{J+1})'$ made of nonnegative weights all summing up to one. Each value of \mathbf{W} represents a weighted average of values obtained from control regions, that is, a potential synthetic control. Let \mathbf{X}_1 be a $(k \times 1)$ vector of pre-treatment characteristics that can be used as predictors of labour market outcomes, and \mathbf{V} a $(k \times k)$ diagonal matrix whose values indicate the relative importance of each predictor. We look for a vector \mathbf{W}^* that minimises $(\mathbf{X}_1 - \mathbf{X}_0\mathbf{W})'\mathbf{V}(\mathbf{X}_1 - \mathbf{X}_0\mathbf{W})$, subject to $w_j \geq 0$ ($j = 2, \dots, J$) and $w_2 + \dots + w_{J+1} = 1$. \mathbf{V} is chosen such that the treated regions' trajectory in the pre-treatment period is best reproduced by the synthetic region.

Let Y_{jt} be the outcome of unit j at time t , \mathbf{Y}_1 a $(T_1 \times 1)$ vector collecting post-intervention values of the outcome variable and \mathbf{Y}_0 a $(T_1 \times J)$ matrix containing post-intervention values of the outcome for the control unit. The synthetic control estimator of the treatment effect on the treated region is given by the comparison of the different outcomes of the two units from the beginning of the Objective 1 programme until the end of the period. The synthetic control estimator is obtained as: $\mathbf{Y}_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt}$.

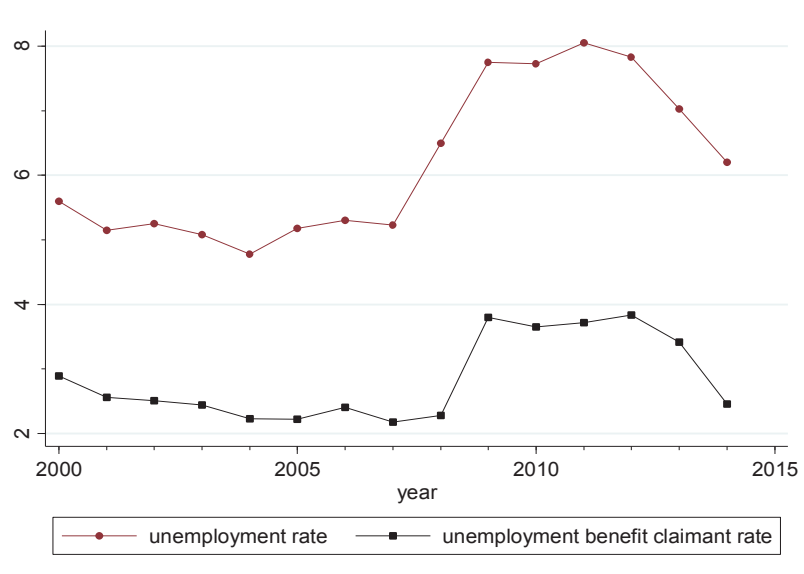
Appendix

A1 Objective 1 eligibility maps in the UK, 1994-1999, 2000-2006, 2007-2013, and 2014-2020



Note: shaded areas are Objective 1 regions

A2 UK rates of unemployment and unemployment benefit claimants, 2000-2014



Source: Nomis.

A3 Descriptive statistics – wards

Variable	Obs	Mean	Std. Dev.
Ward residents in 1991	8519	5267	3779
Unemployment (1996-2014)	161,240	1.871	1.555
Unemployment growth (1996-2014)	152,260	0.0056	0.401
Unemployment growth (1996-1999)	25,537	-0.177	0.204
Unemployment growth (2000-2014)	126,723	0.0424	0.420
Unemployment growth (2000-2006)	59,095	-0.0181	0.329
Unemployment growth (2007-2014)	67,628	0.0954	0.480
<i>Variables used for PSM:</i>			
Unemployment (1996-1999 average) ^a	8518	2.689	1.857
<i>1991 Census:</i>			
Employed people in agriculture, forestry and fishing ^a	8519	3.357	2.822
Employed people in mining ^a	8519	2.478	1.422
Employed people in manufacturing ^a	8519	15.50	3.663
Employed people in construction ^a	8519	6.817	1.455
Employed people in distribution and catering ^a	8519	18.71	2.609
Employed people in transportation ^a	8519	5.436	1.630
Employed people in banking and finance ^a	8519	10.78	3.336
Employed people in other services ^a	8519	25.11	4.402
Self-employed workers ^a	8519	7.301	3.570
Full-time workers ^a	8519	72.81	10.09
Female employment ^a	8519	10.24	1.469
Inactive population ^b	8519	32.80	5.996
People whose ethnic group is white ^b	8519	96.15	8.473
Migrants (within/between wards or from outside UK) ^b	8519	10.19	4.022
Students ^b	8519	3.102	1.417

Note: a / percentage of economically active population; b / percentage of residents.

A4 Pre-treatment characteristics: Cornwall, synthetic Cornwall, South Yorkshire, Synthetic South Yorkshire and England (1992-1999)

Variable	Source	Pre-treatment averages					
		Cornwall	Synthetic Cornwall	England ^e	South Yorkshire	Synthetic South Yorkshire	England ^f
Euros of Structural Funds per capita ^a	DG Regio	26.74	20.62	11.08	28.69	25.92	11.08
Per capita GDP ^a	OECD	10,980	15,665	18,054	13,840	19,640	18,155
Population in employment ^b	LFS LAD	53.23	53.77	58.57	52.20	53.69	58.51
Economically inactive population ^c	LFS LAD	41.14	40.32	36.51	41.04	39.73	36.53
Female employment ^b	LFS LAD	21.33	22.75	23.73	22.24	22.61	23.77
Full-time workers ^c	LFS LAD	52.35	52.92	56.72	49.47	51.58	56.61
Self-employed workers ^b	LFS LAD	11.64	7.54	7.64	5.17	5.41	7.42
Long-term unemployment rate ^a	Eurostat	26.18	27.07	25.13	29.98	35.41	25.27
Sectorial shares (percentage)							
Agriculture & Mining ^a	Eurostat	6.28	3.07	2.39	0.6	0.88	2.19
Manufacturing ^a	Eurostat	11.63	16.48	16.59	18.95	18.48	16.85
Construction ^a	Eurostat	5.41	4.87	4.64	5.61	4.83	4.64
Wholesale & retail trade ^a	Eurostat	25.80	25.34	25.90	27.33	25.66	25.95
Financial & insurance activities ^a	Eurostat	9.68	11.97	14.25	11.78	12.50	14.33
Real Estate; scientific activities; public administration and defense; education ^a	Eurostat	31.37	33.62	30.11	36.68	31.06	30.08
Education and training							
16-19 year old in full-time education ^b	LFS LAD	3.37	3.16	3.33	2.73	2.92	3.31
Working age population with NVQ 3 or above ^d	LFS LAD	33.88	33.97	36.37	31.45	33.42	36.35
Working age population receiving job related training ^b	LFS LAD	10.64	11.79	12.14	12.62	12.36	12.20

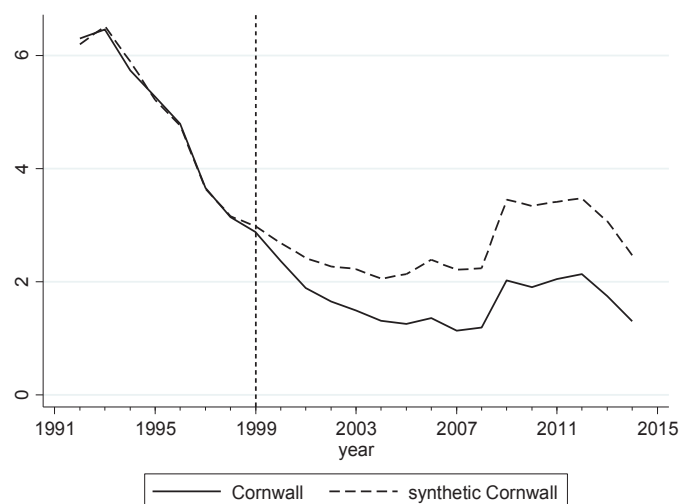
Note: Sectorial shares and LFS LAD variables are calculated as percentage of working age population. a / average for 1995-1999; b / average for 1992-1999; c / average for 1993-1999; d / average for 1994-1999; e / average for all English regions excluding Merseyside and South Yorkshire; f / average for all English regions excluding Merseyside and Cornwall.

A5 Synthetic control method – regional weights in the synthetic Cornwall and South Yorkshire

Region	Synthetic Cornwall Weight	Synthetic South Yorkshire Weight
Tees Valley & Durham	0.088	0.365
Northumberland	0.125	0.100
Cumbria	0	0
Cheshire	0	0
Greater Manchester	0	0.156
Lancashire	0	0
East Yorkshire	0	0.251
North Yorkshire	0	0
West Yorkshire	0	0
Derbyshire & Nottinghamshire	0	0
Leicestershire Rutland	0	0
Lincolnshire	0	0
Herefordshire Worcestershire	0	0
Shropshire & Staffordshire	0	0
West Midlands	0.212	0
East Anglia	0	0
Bedfordshire & Hertfordshire	0	0
Essex	0	0
Inner London	0	0.128
Outer London	0	0
Berkshire Buckinghamshire	0	0
Surrey East & West Sussex	0	0
Hampshire & Isle of Wight	0	0
Kent	0	0
Gloucestershire Wiltshire	0	0
Dorset & Somerset	0	0
Devon	0.575	0

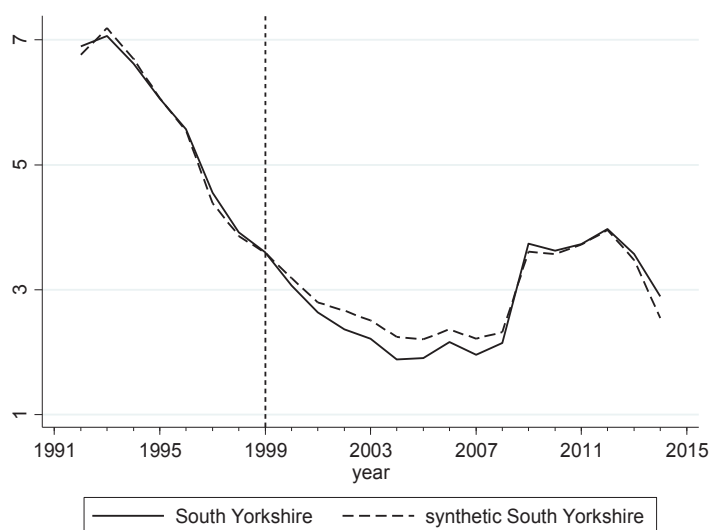
A6 Synthetic control analysis excluding neighbouring regions

A5.1 Cornwall vs. synthetic Cornwall, excluding Devon



Region	Synthetic Cornwall Weight
Tees Valley & Durham	0
Northumberland	0.052
Cumbria	0.305
Cheshire	0
Greater Manchester	0
Lancashire	0
East Yorkshire	0
North Yorkshire	0
West Yorkshire	0
Derbyshire & Nottinghamshire	0
Leicestershire Rutland	0
Lincolnshire	0
Herefordshire Worcestershire	0
Shropshire & Staffordshire	0
West Midlands	0.485
East Anglia	0
Bedfordshire & Hertfordshire	0
Essex	0
Inner London	0
Outer London	0
Berkshire Buckinghamshire	0
Surrey East & West Sussex	0
Hampshire & Isle of Wight	0
Kent	0
Gloucestershire Wiltshire	0
Dorset and Somerset	0.159

A5.2 South Yorkshire vs. synthetic South Yorkshire,



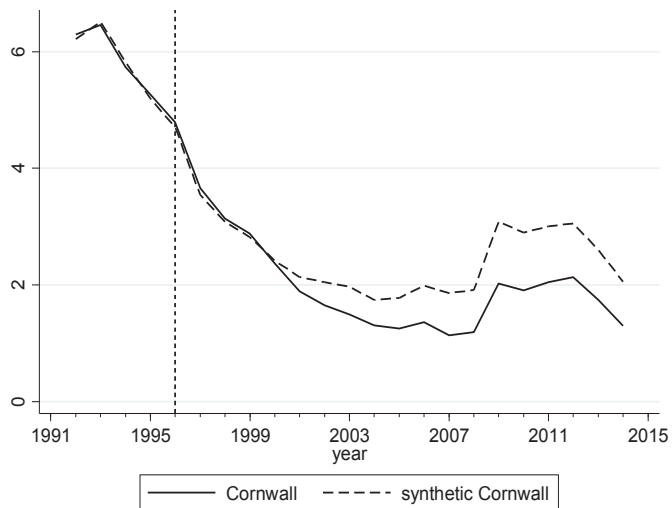
Region	Synthetic SY Weight
Tees Valley & Durham	0.434
Northumberland	0.026
Cumbria	0.124
Cheshire	0
Greater Manchester	0.237
Lancashire	0
Leicestershire Rutland	0
Herefordshire Worcestershire	0
Shropshire & Staffordshire	0
West Midlands	0
East Anglia	0
Bedfordshire & Hertfordshire	0
Essex	0
Inner London	0.179
Outer London	0
Berkshire Buckinghamshire	0
Surrey East & West Sussex	0
Hampshire & Isle of Wight	0
Kent	0
Gloucestershire Wiltshire	0
Dorset and Somerset	0
Devon	0

excluding regions neighbouring SY

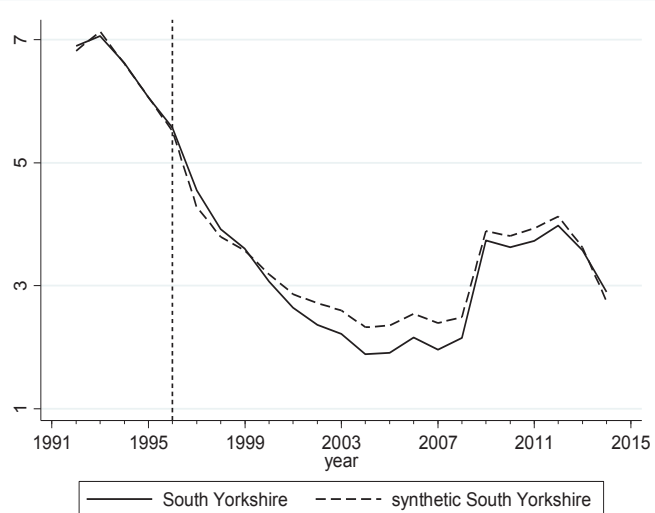
A7 Placebo study: treatment beginning in 1997

Unemployment trends 1992-2014: treated vs. synthetic regions

Panel A: Cornwall



Panel B: South Yorkshire



Source: own elaboration with Nomis data.

A8 Balancing tests, propensity score matching

Variable	Cornwall				South Yorkshire			
	Mean		t-test		Mean		t-test	
	Treated (Cornwall)	Control (matched)	t	p>t	Treated (South Yorkshire)	Control (matched)	t	p>t
Unemployment (1996-1999)	3.72	3.72	0.00	0.998	4.24	4.46	-0.75	0.453
<i>1991 variables:</i>								
Employed people in agriculture, forestry and fishing ^a	7.40	6.81	0.62	0.536	0.55	0.59	-0.3	0.768
Employed people in mining ^a	2.16	2.43	-0.64	0.521	4.77	5.08	-0.52	0.606
Employed people in manufacturing ^a	8.67	8.39	0.6	0.550	15.62	15.05	0.88	0.379
Employed people in construction ^a	8.62	8.20	1.03	0.302	7.20	7.02	0.59	0.559
Employed people in distribution and catering ^a	21.79	22.54	-0.84	0.404	18.48	17.93	0.91	0.363
Employed people in transportation ^a	4.45	3.93	1.47	0.142	5.82	5.45	0.9	0.369
Employed people in banking and finance ^a	6.78	6.60	0.49	0.626	4.57	4.75	-0.73	0.469
Employed people in other services ^a	26.44	26.78	-0.36	0.723	22.70	22.84	-0.13	0.896
Self-employed workers ^a	11.25	10.94	0.51	0.607	4.09	3.98	0.43	0.669
Full-time workers ^a	57.91	57.57	0.27	0.786	50.87	51.63	-0.73	0.466
Female employment ^a	21.38	21.39	-0.03	0.979	21.01	21.20	-0.93	0.356
Inactive population ^b	38.38	38.93	-0.66	0.511	35.39	35.64	-0.35	0.724
People whose ethnic group is white ^b	99.49	99.44	1.19	0.237	97.22	98.01	-1.13	0.261
Migrants (within/between wards or from outside UK) ^b	10.39	10.93	-1.18	0.238	9.02	9.96	-1.76	0.081
Students ^b	3.17	3.11	0.29	0.768	2.73	2.53	0.82	0.411
no of wards	134	134			94	94		

Note: a / percentage of economically active population; b / percentage of residents.

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A9 Committed EU funds by field of intervention in Cornwall and South Yorkshire, 2000-2006 & 2007-2013

Field of Intervention	Annual euros per capita		Field of Intervention	Annual euros per capita	
	Cornwall	South Yorkshire		Cornwall	South Yorkshire
	<i>2000-2006</i>		<i>2007-2013</i>		
1. Transport Infrastructure	7.2	9.6	1. Transport infrastructure	8.2	1.1
2. Telecommunication, energy & environment infrastructure	21.5	8.8	2. Telecommunication, energy & environment infrastructure	34.6	6.2
3. Social Infrastructure	1.1	2.1	3. Social infrastructure	0.1	-
4. Research, technological development & innovation	10.0	5.6	4. Research, technological development & innovation	37.8	11.4
5. Tourism & culture	6.3	-	5. Tourism & culture	1.5	0.1
6. Planning & rehabilitation	6.4	35.5	6. Urban & rural regeneration	3.3	4.4
7. Large business organisations	19.3	3.4	7. Investment in firms	14.1	6.0
8. SMEs & the craft sector	13.8	26.4	8. Lifelong learning, training & entrepreneurship	18.7	7.7
9. Workforce flexibility & entrepreneurial activity	13.8	10.3	9. Services for employment & training	1.8	0.4
10. Social inclusion	4.9	5.1	10. Social inclusion	14.4	4.5
11. Labour market policy & labour market actions for women	5.9	10.9	11. Access to employment & sustainability	20.3	6.7
12. Educational & vocational training	4.2	11.3	12. Human capital	1.7	0.1
13. Agriculture, forestry, fisheries, development of rural areas	25.0	-	13. Institutional capacity	0.1	0.1
Total	139.3	129.0	Total	156.4	48.5

Note: values are calculated from European Commission's committed allocations of EU funds by axis, divided by regional population. Source: DG Regional Policy.

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