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I will survive! The impact of place-based policies when public transfers fade out

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Abstract: Are place-based policies capable of taking lagging areas to a higher growth trajectory permanently? We answer this key question by investigating what happens when strongly subsidised regions suddenly experience a substantial reduction in external funding. We analyse an extensive database and estimate the average causal impact of exiting the convergence region status of the EU regional policy via the mean balancing approach, an econometric technique created appositely to fully exploit time-series cross-sectional data. Such an approach also allows us to investigate the heterogeneity of the impact concerning relevant covariates. We find that regions which experienced a considerable reduction in funding in a period of economic expansion did not suffer from the loss of such funding. On the other hand, we find that the sharp reduction in funding during the crisis led to a negative, but not statistically significant, impact on economic growth. However, the impact varies with the features of the regions and the local economic context. These findings differ from previous literature and signal a long-term positive effect of the EU funds on growth and employment.

JEL codes: C23, O47, R11

Keywords: Place-based policy, European Union, mean balancing, regional growth

1. Introduction

Government efforts aimed at boosting the economic performance of specific regions are commonly termed place-based policies. These are selective policies, where only some areas and some units, either workers or companies, are targeted, while the other units bear the cost, in terms of higher taxes, fewer opportunities or intensified competition on the markets. Place-based policies typically target distressed areas with a high unemployment rate and low wages to counteract the centripetal forces governing economic processes which increase regional inequalities and make them persistent over time. Ideally, these should be temporary policies able to trigger growth mechanisms by tapping into under-utilised

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local resources; however, their effectiveness is a hotly debated issue, from a theoretical as well as empirical viewpoint (see, for instance, Duranton and Venables, 2019; Ehrlich and Overman, 2020).

This line of reasoning surely applies to the most extensive regional policy in terms of breadth, amount of resources involved and duration: the European Union (EU) regional policy. The bulk of this policy aims at supporting growth processes of the so-called convergence regions (known as Objective 1 regions until the 2000-2006 programming period), namely regions with a GDP per capita of less than 75% the EU average, through development programs aimed at infrastructures, business support, aid to research, development and innovation, improvement of human capital and support for public administrations. A large share of the EU Cohesion Policy budget (€347 billion in the programming period 2007-2013) is allocated to convergence regions. Although the effectiveness of this type of regional programs is inevitably heterogeneous, recent literature shows that they have an average positive impact on GDP and employment (see, among others, Becker et al., 2010; Pellegrini et al., 2013; Giua, 2017). After all, the EU regional policy is decidedly heterogeneous, both in terms of intensity of treatment[1] as well the combination of the different policy instruments, and the debate on what is the optimal amount and the optimal combination of the different types of programs is still in progress (see, for instance, Rodríguez-Pose and Garcilazo, 2015; Bachtrögler et al., 2019).

Considering the amount of financial support and its selectivity, tens of studies have assessed the effects of the EU regional policy on regions, firms and workers. On the other hand, only a few scholars have evaluated the impact of the EU regional policy once a region loses the convergence status. Convergence regions are expected to implement development programs which would allow them to converge to higher levels of income and eventually lose their status of areas in highest need of support. If they were to succeed, then the proportion of EU subsidies to these regions would progressively diminish (Di Cataldo, 2017). We argue that such research question is a crucial one for assessing whether a substantial amount of funds have merely prevented the deterioration of income and welfare standards in lagging regions which belong to a common market, or have removed some of the obstacles for economic growth, overcoming a possible poverty trap. Ultimately, this type of analysis reveals whether a transitory regional program can trigger a convergence process. This topic is all the more critical considering the recent evidence of a close relationship between local economic and industrial decline and voting for a populist/nationalist party all over the world (see, Rodríguez-Pose, 2018; Dijkstra et al., 2020). All

[1] There is vast heterogeneity in the amount of funds per capita among treated regions with the least intensively treated regions which could receive more than ten times less per capita public transfers than the most intensively treated regions. Such differences reflect the decision to allocate more resources to those regions that are particularly needy, to sustain areas experiencing economic and social distress as measured by specific indicators and to maintain qualitative judgment by the EU and individual Member States (Cerqua and Pellegrini, 2018).

previous studies (Barone et al., 2016; Di Cataldo, 2017; Becker et al., 2018) point towards a substantial decrease in the effectiveness of EU regional policy once a region loses the convergence status. However, considering that only a few studies have addressed this topic and given the limitations of their evaluation approaches (see Section 2), we argue that additional empirical evidence is needed.

A reliable answer to such a research question necessarily entails sound and comparable regional data, for a very long time-span, which also include transfer intensity as well as information on the exact timing of the policy implementation. Only recently has the European Commission created and made available such data, and our paper is the first one to exploit them in this strand of literature. It is also pivotal to adopt an econometric model that allows taking into account the evident endogeneity of the policy itself, which is concentrated in lagging-behind areas. We adopt a method recently proposed by Hazlett and Xu (2018), the mean balancing approach, which has been created appositely to fully exploit the information contained in time-series cross-sectional (TSCS) data. Similar to the synthetic control method (SCM), mean balancing copes with time-varying confounding by explicitly using the pre-treatment outcome data. It also allows accommodating for multiple treated units in a single run and reducing user discretion.

Our contribution to the existing literature is threefold. First, by using the mean balancing approach, we simultaneously consider all the regions that have had a considerable reduction of contributions over time, fully exploiting the cross-sectional and time dimensions of the available data. Second, differently from previous literature, in the construction of the counterfactual scenario, we control for past intensity of funds per capita for regions before the loss of convergence status (see Lo Piano et al., 2017). This allows us to create a counterfactual scenario which resembles in a better way the regions before the loss of convergence status, even concerning aid intensity. Besides, the availability of such variable allows us to compute the magnitude of the EU funds reduction precisely. Third, we directly tackle the issue of impact heterogeneity across PPs as well as across individual treated regions. Indeed, our approach considers different kinds of heterogeneity and their role in explaining regional growth.

The analysis has relevant policy implications. First, our paper tests the long-run effectiveness of the policy. In the face of the increasingly stringent financial statements in Europe, it appears necessary for policymakers to demonstrate the actual relevance of financial commitment and above all its transience over time.[2] This topic is of particular interest because it identifies the impact of policies on the regional economy and its resilience, especially in terms of human capital and infrastructure. The analysis can

[2] This is also true in other non-European countries. Regional policies play an essential role also in most of the other world powers. For instance, recently, the Chinese government implemented a substantial centralised regional policy. Besides, although the US does not have a centralised regional policy, Americans spend almost $100 billion per year on local development programs (Durbin et al. 2012).

help in identifying an "optimal" transition period before areas become ineligible for subsidies. Second, the investigation of potential sources of impact heterogeneity allows formulating exit paths that are better suited to the actual conditions of the growing/exiting regions, considering the policy mix between human capital, infrastructure, innovation and other important long-run growth factors.

The paper is organised as follows. In the next section, we provide an overview of the historical and institutional background of the EU regional policy. Sections 3 and 4 introduce the data and identification strategies we use. We present results in Section 5, including an investigation of the heterogeneity of the impacts. Section 6 concludes and discusses policy implications.

2. Policy background

Although the EU regional policy dates back to 1975, its relevance increased dramatically with the 1988 landmark reform, which followed the accession of Greece, Spain and Portugal to the EU and the widening of regional disparities within the EU over the previous 15 years. Since then, the importance of the EU regional policy has not ceased to increase. It consists of a set of regional investment programs: the European Regional Development Fund (ERDF), the European Social Fund (ESF), and the Cohesion Fund (CF). The ERDF is the centrepiece of the EU regional policy and contributes to a broad range of policy funding initiatives including transport, innovation, funding for SMEs, energy and environment, and urban regeneration. The ESF focuses on creating and maintaining employment opportunities, particularly business start-ups, and boosting female labour market participation. The CF assists Member States in undertaking major investments in transport infrastructure and environmental management to reduce socio-economic disparities in regions with less than 90% of the average EU gross national income (GNI) per head. The sum of these three funds is usually named EU Structural and Cohesion Funds (EUF). Since 1989, the bulk of the EU regional policy concerns the development and structural adjustment of the convergence regions, that is, the regions whose GDP per capita measured in purchasing power standards (PPS) is less than 75% of the EU average. The convergence region status is determined at the NUTS-2[3] level and in advance for a whole programming period of seven years.[4]

[3] NUTS stands for 'Nomenclature of Statistical Territorial Units'. NUTS-2 regions are defined by a minimum and maximum population threshold of 800 thousand to 3 million inhabitants and correspond to administrative divisions in EU member states.

[4] The 75% rule is not always observed. Political negotiations among the Member States have often influenced the allocation of the EU budget. Consequently, in the different programming periods, some regions have been entitled to receive assistance within the Ob. 1 framework, even if they did not comply with the criterion set in the regulations (Pellegrini et al., 2013). For instance, specific exceptions were granted to regions with a low population density and in peripheral locations (Becker et al., 2018).

As the per capita GDP of convergence regions becomes higher than 75% of the EU average, the regions lose convergence status. Considering the first four programming periods and using the NUTS 2013 regional classification, we find that 37 regions dropped out of the convergence status in the EU-15. While none of the regions that had received the convergence support in 1989-1993 dropped out of the program in 1994, 11 regions dropped out of the convergence status in 2000 and 26 regions followed suit in 2007. All these regions entered into a transitional program, reducing the amount of funds available to former convergence regions (Di Cataldo, 2017).[5]

Although the reduction of funds should be substantial after losing the convergence region status and entering in the “phasing-out” status, the peculiarities of the assignment mechanism behind the distribution of EU regional policy funds make this reduction rather heterogeneous across countries and programming periods. The identification of the aid intensity is based on a two-stage process: in the first stage, the amount of resources allocated to each country is identified by some clear and observable features such as eligible population, regional prosperity, national prosperity, and severity of structural unemployment for Ob. 1 and 2, as declared in the Article 7 of Council Regulation 1260/1999 of 21 June 1999. In the second stage, national and regional authorities bargain for the allocation of resources (see Bodenstein and Kemmerling, 2011; Cerqua and Pellegrini, 2018). The figures reported in Table 1 document that this bargaining process does not automatically bring to a substantial reduction in EU funds per capita for the regions which dropped out of the convergence status. For instance, while the intensity of treatment is about halved for Molise (ITF2), Kentriki Makedonia (EL52), Ciudad Autónoma de Melilla (ES64) and Região Autónoma da Madeira (PT30), there is no noticeable reduction in funding for Highlands and Islands (UKM6) and Cantabria (ES13). There is even an increase in funding for some regions belonging to the wealthiest EU countries such as Burgenland (AT11), Mellersta Norrland (SE32) and Berlin (DE30). This is a crucial piece of information for our research question, as it allows identifying those regions which did not reduce their EUF expenditure at the end of the convergence status and hence excluding them from the main analysis.

INSERT TABLE 1

We consider the period 1996-2001 for the expenditure relative to the 1994-1999 programming period, and the period 2002-2008 for the expenditure relative to the 2000-2006 programming period. This

[5] The only exception was the Italian region Abruzzi, which was the only EU region that exited the convergence program in 1996 without a smooth transitional regime. However, on an exceptional basis, the European Commission allowed Abruzzi to spend the EUF endowment up to 2000 (Barone et al., 2016). Transitional programs can be of two types: the ‘phasing-out’ program targets those regions which would have been eligible for funding in terms of the EU-15, but with a GDP per capita higher than the threshold of 75% in terms of the UE-27, while the ‘phasing-in’ program targets those regions which exited the convergence status as they now have a GDP per capita higher than the threshold of 75% in terms of the UE-15.

choice allows taking into account that the financial endowment received from the EU regional policy must be spent within two years from the end of a programming period (the so-called ‘n+2 rule’), and the fact that many convergence regions concentrate their EUF expenditure in the n+2 years.[6]

2.1 Previous literature

A sizable and increasing body of literature has empirically investigated the EU regional policy contribution to economic growth and convergence (see the meta-analysis by Dall’Erba and Fang 2017). Although the evidence is mixed, many studies find that the average impact on GDP of the regional transfers is positive, but with a limited magnitude (Cappelen et al. 2003; Becker et al. 2010; Pellegrini et al. 2013). Besides, the positive impact of the fund intensity on the growth of the convergence regions decreases when the regional transfers are higher (Cerqua and Pellegrini 2018), and there is a positive relationship between absorptive capacity - human capital and good institutions – and the effectiveness of the Cohesion Policy (Becker et al. 2013; Rodríguez-Pose and Garcilazo 2015).

Three studies previously looked at the impact of a considerable reduction of EU transfers on economic outcomes. They all find that the reduction in funding caused a drop in GDP per capita growth rate, suggesting that the EU regional policy does not allow regions to achieve a permanently higher GDP growth path. In particular, Barone et al. (2016) adopted SCM to analyse the economic outcomes of the Italian region Abruzzi, after losing its convergence status. By comparing Abruzzi with the other 7 southern Italian regions that did not exit the program, they find that losing the EU financial support has resulted in a 5.5% cumulative drop in GDP per capita over seven years. Using the same evaluation approach, Di Cataldo (2017) investigated the economic outcomes of an English region, South Yorkshire, after it lost convergence status. By contrast with Barone et al. (2016), he put in the donor pool the 27 English regions which were ineligible for convergence funds. The author finds that, due to the substantial reduction in EU funds, the region was unable to sustain the gains obtained in previous years in terms of employment and GDP per capita. Lastly, Becker et al. (2018) adopt a fuzzy regression discontinuity design (RDD) approach evaluating the economic outcomes of all 40 regions which exited the convergence program after the 1994-99 programming period or the 2000-06 programming periods. They find that previous GDP per capita growth gains seem to be largely undone once convergence status is lost. However, they do not find a reduction in the level of employment after the reduction in funding.[7]

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[6] The European Commission carries out strict enforcement over the financial endowment, and the EU would automatically recall the unspent part.

[7] See also Fortuna et al. (2016) for a simulation of the impact of a total cut in transfers to the convergence region of Azores in Spain. By using a computable general equilibrium model, they estimate that a sudden elimination of the EU transfers would cause an immediate 2% fall in GDP.

The above studies based on the SCM suffer from two limitations. First, they only look at one treated unit, in a context where the effects are likely to be heterogeneous across treated observations and programming periods. This means that studying a different treated region could have resulted in reverse outcomes. Second, at the time of these studies, accurate data on pre-treatment value of the EU expenditure per capita were not available and could therefore not be used in the creation of the counterfactual scenario. However, it has been shown that the heterogeneity in the amount of funds per capita among regions is a relevant variable in explaining regions' performances (see Cerqua and Pellegrini 2018). Due to the lack of data on EUF, Barone et al. (2016) created a counterfactual scenario having a much larger value of the EU expenditure per capita (€216.72) than Abruzzi (€82.07) over the pre-treatment period 1996-2001, while Di Cataldo's study (2017) created a counterfactual scenario with a much smaller value of the EU expenditure per capita (€50.06) than South Yorkshire (€115.68) over the pre-treatment period 2002-2008.[8] By exploiting the balancing properties of the fuzzy RDD, Becker et al.'s (2018) study should not suffer from the above limitations.[9] However, although this is arguably one of the most credible evaluation strategies for the estimation of the causal impact of regional policies (see Cerqua and Pellegrini, 2019), this evaluation approach does not allow the authors to investigate the heterogeneity of the impact between regions and across programming periods. Besides, differently from our analysis, Becker et al. (2018) considered all exiting regions as treated, even those not suffering from a reduction in EUF expenditure at the end of convergence status.

Scholars have also looked at more historical policies to investigate the long-term effects of a substantial reduction in public transfers to regions. For instance, Kline and Moretti (2014) study the long-run effects of a substantial regional development program which was intended to modernise the economy of the Tennessee Valley region in the US via a series of large-scale infrastructure investments. Using as controls authorities that were proposed but never approved by Congress, the authors find that the large gains in agricultural employment were eventually reversed when the program's subsidies ended. On the other hand, gains in manufacturing employment continued to intensify well after federal transfers had lapsed. They suggest that this pattern is consistent with the presence of agglomeration economies in manufacturing. A similar investigation has been conducted by Ehrlich and Seidel (2018), who analyse the long-term impact of a large-scale transfer program to stimulate economic development in the eastern part of West Germany over the period 1971-1994. The authors find the effects of such place-based

[8] This is a relevant point as Figures A1, A2 and A3 reported in the Appendix show that when controlling for the pre-treatment value of the EU expenditure per capita, the extent and the sign of the estimates change in several instances.

[9] However, considering the limited number of treated units, it is not guaranteed that the fuzzy RDD perfectly balance observed and unobserved covariates at the threshold, especially country-specific effects which might be predominant at a time of economic crisis. What's more, when the number of observations around the threshold is limited, RDD is highly sensitive to linearity and homogeneity assumptions (Ho and Rubin, 2011).

policy are persistent over time in terms of income, employment and capital stock. However, they also find evidence of significant local relocation of economic activity, leaving doubts about the overall additional effectiveness of the policy.

3. Data

We adopt the Cambridge Econometrics' European Regional Database (ERD), which consists of a wide range of economic and demographic indicators for the EU-28 countries at the NUTS-2 level. This dataset is consistent with Eurostat data but more complete. The ERD uses the NUTS 2013 regional classification, and it covers the period 1980-2015. We use the ERD to create several economic and demographic covariates to match on: i) the sectoral structure of the regional economy by adding the share of real gross value added (GVA) in agriculture and in the tertiary sector; ii) a proxy of the employment rate created by dividing workplace employment by resident population; iii) labour productivity; iv) the activity rate; v) features of the labour market such as the average yearly compensation and the average yearly number of hours worked; vi) and population density. ERD also allows us to create GDP per capita in PPS and employment measured in logarithmic terms, which will be our dependent variables. Furthermore, we also control for an index of quality of local government, which is derived from the European Quality of Government Index (EQI) dataset (see Charron et al., 2014).[10]

In our research, we exploit a crucial piece of information which was not available before 2018: the yearly estimate of the real expenditure of EUF for each NUTS-2 region. Indeed, in April 2018, the European Commission published the most comprehensive historical yearly record of the EU budget payments and an estimate of the real expenditure[11] from the European Regional Development Fund and Cohesion Fund to the NUTS-2 regions (see Lo Piano et al., 2017). Accurately controlling for the pre-treatment value of EUF expenditure per capita allows us to create the best possible counterfactual scenario for regions which exited the convergence program. Besides, it also enables checking the post-treatment gap in EUF per capita between treated regions and their counterfactual. As we shall see in Section 5, this is key information for investigating the heterogeneity of the impact across regions.

[10] This variable provides citizen-based perception and experience concerning corruption, quality and impartiality in terms of education, public health care and law enforcement (Ganau and Rodríguez-Pose, 2019). We thank Andres Rodríguez-Pose for providing us with this data.

[11] Real payments typically take place earlier and end earlier than the EU payments. In the analysis, we use the modelled real expenditure as the lag in EU payments may distort the economic analysis of the effect on the investments. This data can be downloaded here: https://cohesiondata.ec.europa.eu/Other/Historic-EU-payments-regionalised-and-modelled/tc55-7ysv .

As suggested by Crescenzi and Giua (2020), we take into account country-specific aspects related to national-level specificities in quality of governance and/or implementation models. This is all the more important if the period under analysis includes an economic recession having country-specific effects, such as the Great Recession. To this end, we additionally control for six dummy variables: three dummies for the countries with the highest number of treated regions, i.e. Greece, Italy, and the Iberian Peninsula (Portugal and Spain), a dummy for the UK and Ireland, a dummy for the Scandinavian countries (Denmark, Finland and Sweden) and a dummy for the European “core” countries (Austria, Belgium, France, Germany, Luxemburg, and the Netherlands).[12]

3.1 Sample selection

Our analysis covers the period from 1991 to 2015 and focuses on regions belonging to the EU-15 Member States, as the EU-12 accession countries did not receive any transfers before 2004.[13,14] The only EU-15 NUTS-2 regions we cannot analyse are the 5 French overseas-departments as data on GDP per capita in PPS are not available.[15] We consider as treated only the 23 regions which experienced a decrease in average EUF expenditure of at least 25% after losing the convergence status. However, in Section 5.2, we report the individual estimates of all 37 NUTS-2 regions, which lost the convergence status. Moreover, given the methodology adopted, we decided to drop the top decile of the wealthiest regions as their inclusion could lead to overfitting, since they cannot be considered a valid counterfactual for regions losing the convergence status. Therefore, the final sample is then made up of 23 treated regions and 169 control regions.

Differently from Becker et al. (2018), we analyse the impact of losing the convergence status in 2000 or 2007 separately. This choice is motivated by two reasons: (i) the entrance into the EU of the accession countries in 2004 ‘pushed-out’ of the convergence status in 2007 those regions that would have been eligible for funding in terms of the EU-15 but which had a GDP per capita higher than the threshold of 75% in terms of the UE-27. Therefore, these regions are, on average, poorer than the regions losing the convergence status in 2000; (ii) the regions belonging to the latter group had to face the reduction of the

[12] The definition of the latter three dummies follows the country clustering suggested by Artis and Zhang (2002).

[13] Almost all of the accession regions were much less economically developed than the treated regions, and none of the treated regions belongs to accession countries. The only exception is the Hungarian region HU10, which was assigned the convergence status only for the period 2004-2006. It is therefore unlikely that such a short treatment might have propelled a long-term growth process of the local economy. Given our research question, we did not consider this region in the analysis.

[14] By beginning in 1991, we include in the analysis the eight East Germany regions, increasing the number of regions considered.

[15] None of these five regions lost the convergence status in the PPs under analysis. In the analysis concerning regions which lost the convergence status in the programming period 2000-2006, we exclude from the analysis the German region (DE40) which had the convergence status only for a part of its territory.

EUF at a time of economic crisis. Further, several countries (Italy, Greece, the United Kingdom, Ireland, the Netherlands, Spain and France) opted for significant cutbacks in domestic regional policy funding during the economic crisis (EPRC 2010a; 2010b), and this has likely exacerbated the negative consequences of a reduction in EUF. Both reasons suggest that the regions exiting the convergence status in 2007 were more likely to suffer from the reduction in funding.

4. Methodology

In recent years, many scholars have proposed econometric approaches appositely designed to deal with TSCS data (see, Xu, 2017; Magnac and Gobillon, 2016; Imai et al., 2020). In our paper, we decided to use the mean balancing approach proposed by Hazlett and Xu (2018) as our primary evaluation method as it relies on minimum modelling assumptions (see below) and it transparently builds the counterfactual scenario. However, we will adopt other competing evaluation methods in the robustness section.

Hazlett and Xu (2018) propose a novel approach which is based on a generalised DID setting in which all units under consideration begin as untreated, and a subset of units receive a treatment that begins at a given time. This setting allows the treatment to have a long-lasting effect on the outcome, as long as we make a direct comparison between potential outcomes under the two treatment histories. This approach builds upon the SCM, which is a weighting-based approach that finds weights on control units that form a "synthetic control" unit whose pre-treatment history closely matches that of a single treated unit (Abadie et al., 2010). The mean balancing procedure chooses weights for the control units to obtain approximately equal means with the treated group in each pre-treatment periods and on optional pre-treatment covariates. Differently from other competing approaches (e.g. the generalised SCM), it is more transparent as it assigns a non-negative weight to each control unit. Mean balancing never directly fits a model; hence, chances of erroneous extrapolation based on estimated model parameters is minimised. An estimate of the Average Treatment Effects on the Treated (ATT) is obtained by taking the difference between the average of treated outcome and the weighted average of control outcome in the post-treatment period. This procedure is in the spirit of the SCM as it seeks balance on pre-treatment outcomes and covariates between the treated and controls. As in the SCM, the 'synthetic' unit is built as a weighted average of control units whose pre-treatment characteristics closely match the treated unit. Thus, the treatment effect, in each post-treatment period ($t > T_0$), is given by the difference between the average of post-treatment outcomes of treated units and the 'synthetic' control unit, as follows:

$$\widehat{ATT}_t = \frac{1}{N_{tr}} \sum_{G_i=1} Y_{it} - \sum_{G_i=0} w_i Y_{it}, \qquad T_0 < t \leq T,$$

where N_{tr} = number of treated, G_i is the group indicator, equal to 1 if *i* belongs to the treated group, and equal to 0 if *i* belongs to the control group, and Y_{it} is the outcome variable of unit i at time *t*, w_i is the control weight. It relies on minimum assumptions: (1) among units with the same pre-treatment histories, the unit that receives the treatment is independent of potential outcomes of untreated in the post-treatment periods, i.e. $Y_{it} \perp G_i | Y_{i,pre}$, $\forall t > T_0$; (2) each unit's expected post-treatment outcomes are approximately linear; (3) there exists a set of non-negative weights $\{w_i\}_{G_i=0}$ for the control units such that $\sum_{G_i=0} w_i = 1$ and the pre-treatment outcomes are balanced between the treatment and reweighted control group. Mean balancing allows for approximate balance, seeking balance on the first P principal components of the features, where P is chosen automatically by a method that minimised the worst-case bias. Standard errors are estimated via a bootstrap procedure.

Mean balancing inherits the same useful properties as the SCM in coping with time-varying confounding through explicitly using the pre-treatment outcome data, but offers additional advantages by (1) accommodating multiple treated units in a single run and by (2) improving feasibility and stability with reduced user discretion.

5. Results

We explore the effect of losing the convergence status on economic outcomes to assess whether the decrease in EUF had a negative causal impact on the regional economy. To this end, we adopt the mean balancing estimator described in Section 4. The estimates concerning GDP per capita in PPS are presented in Figure 1. The left and right panels of this figure report the impact of the convergence status loss in 2000 and 2007, respectively. On average, the five treated regions in 2000 did not suffer from a decrease in GDP per capita, while the eighteen treated regions in 2007 experienced a decrease in GDP per capita of €687.97, i.e. -3.18% after seven years from the loss of the convergence status. However, this negative impact is not significant at any statistical level (p-value = 0.585). As shown in Figure 1, the balance in the pre-treatment values of the outcome variable is nearly perfect in both instances. Table 2 shows that the pre-exit averages of the additional covariates are also matched quite well for both programming periods.[16] Overall, we are confident that the synthetic outcome provides a meaningful counterfactual that allows quantifying the effect of the loss of the convergence status on economic activity. These estimates suggest that there is no negative impact in losing convergence status in a period

[16] However, although mean balancing has strongly reduced the imbalance in pre-treatment EUF per capita, they are still about 25% larger in the treatment group. In the robustness analysis, we will show that a better matching on pre-treatment EUF leads to almost identical estimates for both programming periods.

of economic expansion, while the loss of this status during an economic recession leads to a reduction of economic growth.[17]

INSERT FIGURE 1 AND TABLE 2

Figure 2 presents the estimates concerning the log of overall employment. On average, treated regions experienced a decrease in employment in both programming periods. Such decrease was only temporary for the regions which lost convergence status in the 2000-2006 programming period, while it was more pronounced for the other regions, i.e. -2.96% after seven years from the loss of the convergence status. However, this decrease is not statistically significant (p-value = 0.492).

INSERT FIGURE 2

Overall, using the usual 5% threshold as statistical significance, our results show that, on average, the regions that have lost the convergence status did not experience a significant reduction in the growth rate of employment and income. This finding holds despite the generalised reduction in support from the EU regional policy experienced during the crisis. This result differs from previous literature and signals a more substantial long-term effect of EUF.

However, this result must be qualified. The average effect, although not significant, appears negative to an appreciable extent for the second period considered, which includes the crisis felt throughout Europe after 2007. Our results suggest that the effects of place-based policies also depend significantly on local and contextual conditions (Ehrlich and Overman, 2020), which explains part of the heterogeneity in the impacts that will be described in Section 5.2. A potential interpretation of our findings is that a substantial reduction in EUF has more negative consequences at a time of economic crisis, mainly for two reasons. First, many of the investments financed by EUF (infrastructure work but also private investments) require a sufficient demand to be productive. For example, an airport requires passenger and freight traffic: if this traffic slows down, it is possible that the contribution to local growth is negligible. This is especially true for regions in transition, which have faced the investment costs and are just beginning to enjoy the benefits. Second, the EU regional policy guaranteed support for demand which may not be offset by that of national funds in a period of crisis. This aspect, linked to the possible substitution between national and community resources to support growth, appears relevant especially in times of crisis: while for the regions that receive EU funds there is no reduction in EU resources in these periods, in many countries, such as Italy for example, which have registered more restrictive fiscal

[17] Table A1 in the Appendix displays the weights of each control region in the synthetic exiting region.

policies for the repayment of public debt, national resources have greatly decreased (EPRC 2010a; 2010b). The reduction in overall resources was, therefore, proportionately more intense for regions in transition in times of crisis, with inevitable consequences on growth.

5.1 Robustness

We subject our results on GDP per capita in PPS to a broad set of robustness checks and summarise the results of interest in Table 3. First, we use as alternative dependent variable GDP per capita rather than GDP per capita in PPS. The motivation comes from the Eurostat-OECD study (2006, pp. 32, 33), that notes: "the rates of relative growth derived from the PPS indices are not consistent with those obtained from the constant price estimates of GDP of countries" and concludes that "the use of PPS as a means of constructing national growth rates is not recommended". We then choose as the alternative treatment period year n rather than year n+2. This means that the pre-treatment year is moved from 2001 to 1999 and from 2008 to 2006, respectively. This allows testing whether the anticipated exit of Abruzzi with respect to the other treated countries affects the estimates. We also check whether the remaining imbalance in per capita EUF in the main analysis might affect our estimates. Hence, we reduce the number of control variables, controlling only for pre-treatment values of GDP per capita, EUF per capita and country dummies. This way, the algorithm must match on fewer variables, and the imbalance in the matching variables is much reduced, if not nullified. We then verify the sensitivity of our estimates when adding a dummy for each country and when controlling for the average value of each pre-treatment variable over a 6-year period. Lastly, we adopt as estimator the non-parametric generalization of the difference-in-differences estimator (GDiD) recently developed by Imai et al. (2020)[18] with two different matching algorithms, i.e. propensity score matching and Mahalanobis matching, and 5 or 10 neighbours. We controlled for 11 pre-treatment years in each matching analysis.

Overall, these checks back the robustness of our analysis. Nevertheless, it is worth noting that using n as treatment year we find a more negative (-7.54%) impact on the regions exiting in the second PP. By contrast, the Mahalanobis matching specification of the GDiD suggests a more positive impact on both programming periods.

INSERT TABLE 3

[18] It uses matching algorithms and weighting methods to make each treated observation as similar as possible to its matched control observations in terms of the outcome variable and covariate histories (11 years in our case). It then accounts for the potential presence of a time trend by the difference-in-differences estimator for estimating the average treatment effect.

5.2 The heterogeneity of the impact

The use of mean balancing allows estimating the economic impact of convergence status loss for each treated region. All 37 individual treatment effects are graphically reported in Figures A2 and A3 in the Appendix.[19] For every single estimate, we have controlled for the same set of covariates as in the main analysis. This approach allows gauging individual treatment effects, which might help understand how the impact of a policy intervention varies with the features of the regions and the economic context (see Smith et al. 2020). It also enables taking into account the substantial heterogeneity in the exiting conditions, mainly due to the political bargaining process, which is crucial to respond to our main research question.

In this Section, we exploit the individual treatment effects on GDP per capita to investigate the heterogeneity of the impact. The estimates are presented in Figure 3. In each heterogeneity analysis, we included all the regions which lost the convergence status (even if they did not experience a significant reduction in EUF) except for the three regions for which we could not find a good pre-treatment trend in terms of GDP per capita, i.e. Berlin (DE30), Highlands and Islands (UKM6), and Sterea Ellada (EL64).[20] For each heterogeneity analysis, we plot the GDP per capita in PPS change after seven years from the loss of convergence status with respect to a variable which could theoretically affect the impact of the convergence status loss. The graphs are reported for all treated regions (34) and the 25 treated regions belonging to the second programming period. We have selected three potential sources of heterogeneity:

i) The EUF reduction. The obvious starting point is to check whether and to what extent the impact depends on the EUF reduction. We have computed EUF per capita change over programming periods to take account of the remaining pre-treatment differences in EUF per capita between treated regions and their counterfactuals (see Table A2 in the Appendix).[21]

[19] In each figure, the counterfactual estimate in the case we do not control for pre-treatment EUF is also reported. These estimates show that when controlling for the pre-treatment value of the EU expenditure per capita, the extent and the sign of the estimates change in several instances. In particular, there is a significant change for the Portuguese region of Lisboa (PT17), Southern and Eastern Ireland (IE02), the Italian region of Basilicata (ITF5), the Spanish region of Ciudad Autónoma de Melilla (ES64) and the Swedish region of Övre Norrland (SE33). This analysis confirms the importance of controlling for pre-treatment EUF in this strand of literature.

[20] For these regions, it was not possible to build a valid counterfactual scenario as shown in Figures A2 and A3 in the Appendix.

[21] EUF per capita change over programming periods is defined as the average change over time in EUF per capita for each treatment region, compared to the average change over time for the relative synthetic region. The pre-treatment differences in EUF per capita between treated regions and their counterfactuals are more prominent in the most subsidised convergence regions (e.g. the Portuguese region of Madeira, and the Spanish regions of Ciudad Autónoma de Ceuta and de Melilla). Indeed, for such regions, there were no untreated regions with similar pre-treatment EUF per capita.

ii) The European Quality of Government Index (EQI). This index might be an important determinant of heterogeneity as many studies have highlighted the positive relationship between good institutions and the effectiveness of the Cohesion Policy (Becker et al. 2013; Rodríguez-Pose and Garcilazo 2015).

iii) The initial level of GDP per capita. The role played by GDP per capita in the assignment process of EUF, primarily through the 75% assignment rule which determines the convergence region status, underlines the hypothesis that the initial level of GDP per capita matters for economic growth and it should be positively associated with it.

INSERT FIGURE 3

These analyses suggest that, on average, regions which experienced a considerable reduction in EUF per capita grew less than regions which experienced a smaller reduction in EUF per capita. Furthermore, it appears that the region which underwent the most drastic reduction in EUF, i.e. the Spanish region of Ciudad Autónoma de Melilla (ES64), was also the region which performed the worst in terms of economic growth. At the same time, there is a positive relationship between the quality of institutions and growth, while pre-treatment GDP per capita seems to have no impact on growth. However, we should consider all these aspects together to assess which of them matter the most for economic growth. To this end, we ran a regression on GDP per capita in PPS change after seven years from the loss of the convergence status using as explanatory variables the three variables considered in this section. Table A3 in the Appendix reports the estimates. Mainly due to the small number of observations (34), none of the estimates results in statistically significant coefficients. We observe the theoretically expected sign for the change in EUF per capita and EQI, while the sign is negative for pre-treatment GDP per capita.

6. Discussion and Conclusions

The effectiveness of place-based policies, and especially of the EU regional policy, has often been questioned. Even if there is a common view on the presence of positive effects on growth and employment in the short term, these effects are often considered temporary and non-permanent and seem to vanish when transfers fade out. In particular, it has been argued that in a more extended period, the benefits of transfers to the economies of the previously subsidised regions are undone after losing convergence status. This evidence is analysed in detail in this paper, using new data and a recent research methodology that allows to accurately estimate the counterfactual scenario of all regions that lost the convergence status by taking into account country-specific effects as well as the differences in intensity of funding. We evaluate whether regions which increased their relative GDP per capita thanks to substantial public investments in infrastructures and local businesses, managed to continue their growth path after a substantial reduction in public transfers.

To better frame our results, some theoretical considerations are required compared to what is expected from the estimates. First, if we isolate two similar regions, and subsidise one of them much more than the other, it will be difficult for the less supported region to follow the growth path of the more subsidised one. Even in the implausible absence of effects on public or private investments, the simple effect of demand generated by EU funds, and in particular on consumer demand, assuming an incomplete leakage outside the region, would lead to a divergence of the two growth paths. If instead, we hypothesise that the region exiting the program has reached a significantly higher level of GDP per capita than those still highly subsidised (and this is the reason in fact for the end of the support), we expect that the growth rate compared to the subsidised is lower, based on a simple neoclassical growth model. These considerations suggest that a modest downturn of the regions exiting the program compared to the synthetic counterpart should be expected, especially in the early period of exit, and it is not conclusive about the ineffectiveness of the regional policy. Becker et al. (2018) hypothesised three possible scenarios for regions which exit from convergence status: "(i) the earlier funding might have put them on a permanently higher growth trajectory; (ii) the loss of funding status might make them return more or less rapidly to a growth trajectory corresponding to their economic fundamentals without funding; or (iii) they might suffer from the 'sudden stop' of losing significant amounts of EU funding and face a growth of even less than the one corresponding to their economic fundamentals without funding". Thus presented, the second and third scenarios correspond to a failure of the EU regional policy. Our considerations instead point to a different scenario, which is between the first and second scenario hypothesised by Becker et al. (2018), and which indicates how the policy was effective even if there is a modest decrease in growth compared to the control group of regions that remained subsidised, with such a gap tending to be absorbed over time. This pattern is evident in our estimates, where regions which lost convergence status caught-up with the other regions after an initial drop in growth.

There are, in our opinion, two important reasons that complicate the analysis. The first is linked to the heterogeneity of the policy effects among regions, driven by, as previously indicated/noted/highlighted, substantial heterogeneity in the intensity of treatment in the treated and untreated regions. The second one, partly related to the first, concerns the presence of specific shocks for individual regions or groups of regions, which cannot always be captured in the model and which could confuse the results achieved. This problem appears even more severe when results from single treated cases are generalised.

Based on this discussion, our empirical results indicate that the EU regional policy has proved effective. From a statistical point of view, there is no difference between the growth rate of GDP and employment of the regions that have exited compared to their counterfactual. However, in the second period under analysis, we observe a reduction in growth compared to the counterfactual scenario, which tends to decrease over time. Regions exiting from convergence status had weaker economic fundamentals than the European average and had to tackle the crisis with a reduction in EUF. It is, therefore, no wonder that in the second period, we observe that the distance from the control sample (that also includes a few more developed regions) in terms of growth has widened. Furthermore, the competitive context also changed in the second period: competition within the European common market had increased, especially for the weaker areas, due to the entrance of accession countries, which often competed in the same product markets and this probably decreased the productivity on the new investments for the phasing-out regions. As has been argued, this result is compatible with a positive evaluation of policy effectiveness, unlike what was argued in the previous literature.

The paper also explores the causes of the heterogeneity of the effects. The relationship between the size of the reduction of the EU funds and GDP growth appears weak. The analysis indicates that country-specific factors seem to matter the most. This includes the possibility that some countries tackled the fall in EUF to exiting regions by adapting other national policies, especially fiscal ones, which may have had positive or negative effects compared to the remaining regions. Besides, heterogeneity is also linked to the presence of external shocks, which influence the impact of the exit. We find that regions which experienced a considerable reduction in funding in a period of economic expansion did not suffer from the loss of such funding. On the other hand, we find that the sharp reduction in funding during the crisis, coupled with some strong country-specific effects (e.g. the Greek crisis) led to an average negative effect of the treated. Our findings call for a deeper reflection on the need to adapt the exit strategy of the regions to local and contextual conditions and also to the economic phase, allowing greater flexibility in the availability and use of EUF.

Overall, the regions that left the convergence status appear to have survived this shock quite well. The sharp reduction in funds alone does not appear to be a reason for reducing the growth trend of the areas, while it is if coupled by the crisis or other country-specific shocks. These results are consistent with the hypothesis that the EU regional policy is effective not only in the short term but also in the long term, creating the conditions for long-lasting economic growth even in weak areas of the European Union.

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Table 1 - Average yearly per capita EU expenditure across programming periods for the NUTS-2 regions no longer in convergence status

Loss of the convergence status in 2000-2006				Loss of the convergence status in 2007-2013			
NUTS-2	**Average yearly EU expenditure per capita in 1996-2001 (€)**	**Average yearly EU expenditure per capita in 2002-2008 (€)**	**Change between periods**	**NUTS-2**	**Average yearly EU expenditure per capita in 2002-2008 (€)**	**Average yearly EU expenditure per capita in 2009-2015 (€)**	**Change between periods**
Prov. Hainaut (BE32)	86.16	80.82	-6.2%	Burgenland (AT11)	180.34	199.88	10.8%
Berlin (DE30)	48.10	62.38	29.7%	Leipzig (DED5)	174.26	178.44	2.4%
Cantabria (ES13)	255.46	237.16	-7.2%	Attiki (EL30)	159.23	103.36	-35.1%
Corse (FR83)	155.46	115.45	-25.7%	Notio Aigaio (EL42)	322.04	201.17	-37.5%
Southern and Eastern Ireland (IE02)	255.25	138.60	-45.7%	Kentriki Makedonia (EL52)	185.13	90.58	-51.1%
Abruzzi (ITF1)	82.07	46.86	-42.9%	Dytiki Makedonia (EL53)	451.44	257.83	-42.9%
Molise (ITF2)	274.21	144.25	-47.4%	Sterea Ellada (EL64)	409.74	273.92	-33.1%
Flevoland (NL23)	60.91	56.69	-6.9%	Principado de Asturias (ES12)	278.92	141.66	-49.2%
Lisboa (PT17)	171.47	128.51	-25.1%	Castilla y León (ES41)	260.28	105.20	-59.6%
Highlands and Islands (UKM6)	159.15	169.77	6.7%	Comunidad Valenciana (ES52)	133.84	78.42	-41.4%
Northern Ireland (UKN0)	110.87	95.87	-13.5%	Región de Murcia (ES62)	171.67	151.52	-11.7%
				Ciudad Autónoma de Ceuta (ES63)	795.37	484.72	-39.1%
				Ciudad Autónoma de Melilla (ES64)	691.31	353.05	-48.9%
				Canarias (ES70)	173.92	89.46	-48.6%
				Länsi-Suomi (FI19)	57.76	88.68	53.5%
				Pohjois- ja Itä-Suomi (FI1D)	147.34	174.37	18.3%
				Border, Midland and Western Ireland (IE01)	221.66	128.08	-42.2%
				Basilicata (ITF5)	329.72	153.03	-53.6%
				Sardinia (ITG2)	216.53	95.53	-55.9%
				Algarve (PT15)	347.31	239.29	-31.1%
				Madeira (PT30)	489.98	250.07	-49.0%
				Norra Mellansverige (SE31)	73.32	76.51	4.4%
				Mellersta Norrland (SE32)	101.61	139.73	37.5%
				Övre Norrland (SE33)	134.60	113.80	-15.5%
				Merseyside (UKD7)	140.48	72.15	-48.6%
				South Yorkshire (UKE3)	145.88	60.82	-58.3%
Average of all convergence regions (in 1994-1999 as well as in 2000-2006)	196.84	299.98	52.4%	Average of all convergence regions (in 2000-2006 as well as in 2007-2013)	296.87	319.62	7.7%

Notes: We consider the period 1996-2001 for the expenditure relative to the 1994-1999 programming period to take into account the n+2 rule. EU funds expenditures are expressed at constant prices in 2010.

Table 2 – Covariate balancing

	No longer convergence region in 2000-06			**No longer convergence region in 2007-13**		
	Treated	Balanced controls	Without mean balancing	Treated	Balanced controls	Without mean balancing
Average yearly number of hours worked (t-1)	1834.85	1759.79	1696.52	1865.52	1887.84	1641.52
Average yearly compensation (t-1)	€23302.86	€22634.49	€24904.23	€22987.66	€23795.69	€29459.32
Workplace employment rate (t-1)	41.82%	40.86%	43.69%	42.51%	43.15%	45.74%
Population density (t-1)	246.04	315.60	334.23	817.54	892.82	286.02
Share of GVA in the tertiary sector (t-1)	73.78%	72.91%	68.90%	73.20%	73.80%	70.05%
Share of GVA in agriculture (t-1)	2.29%	2.95%	2.76%	2.95%	3.53%	2.34%
Activity rate (t-1)	40.17%	42.76%	47.81%	47.29%	47.27%	50.05%
European Quality of Government Index (t-1)	-0.01	0.13	0.63	-0.15	-0.16	0.49
Labour productivity (t-1)	29.01	29.20	29.41	23.17	24.38	33.15
EUF per capita (t-6, t-1)	€187.69	€150.18	€74.00	€319.60	€239.72	€79.08
Country share						
Greece	0.00%	2.99%	7.18%	27.78%	25.91%	5.16%
Iberian Peninsula	20.00%	17.78%	13.26%	44.44%	43.31%	9.68%
Italy	40.00%	35.38%	9.39%	11.11%	6.09%	10.97%
Scandinavia	0.00%	0.27%	8.29%	0.00%	0.00%	5.16%
The UK and Ireland	20.00%	22.96%	19.34%	16.67%	23.08%	20.00%
‘core’ countries	20.00%	20.61%	42.54%	0.00%	1.60%	49.03%

Notes: Labor productivity is defined as the real gross value added (GVA) per hour worked. In our sample, the European Quality of Government Index ranges from -1.6 to +2.5.

Table 3 – Robustness checks

	No longer convergence region in 2000-06		No longer convergence region in 2007-13	
	Average impact (€)	Average impact (%)	Average impact (€)	Average impact (%)
Main estimates	**+€48.05**	**0.18%**	**-€687.97**	**-3.18%**
(1) GDP per capita as dependent variable	-€441.71	-1.62%	-€876.12	-4.04%
(2) Treatment period: year n	+€67.14	0.25%	-€1632.41	-7.54%
(3) Pre-treatment per capita EUF as main control variable	-€84.57	-0.31%	-€774.14	-3.57%
(4) Adding a dummy for each single country	+€595.57	2.24%	-€793.79	-3.53%
(5) Controlling for the average value of all pre-treatment variables from t-6 to t-1	-€425.16	-1.54%	-€1012.55	-4.47%
(6) GDiD with Propensity score matching and 5 neighbours	-€31.01	-0.11%	-€637.92	-2.94%
(7) GDiD with Propensity score matching and 10 neighbours	+€26.14	0.10%	-€401.47	-1.85%
(8) GDiD with Mahalanobis matching and 5 neighbours	+€721.61	2.65%	-€199.81	-0.92%
(9) GDiD with Mahalanobis matching and 10 neighbours	+€572.48	2.11%	-€397.69	-1.84%

Notes: Concerning the robustness test (3), once we reduce the number of control variables the matching quality of pre-treatment per capita EUF results in a marked improvement in both programming periods. Indeed, pre-treatment per capita EUF for treated regions was €187.69 in PP1 and €319.60 in PP2, while in the counterfactual scenario it was €186.30 in PP1 and €316.01 in PP2.

Figure 1 – GDP per capita in PPS trend: treated versus synthetic regions

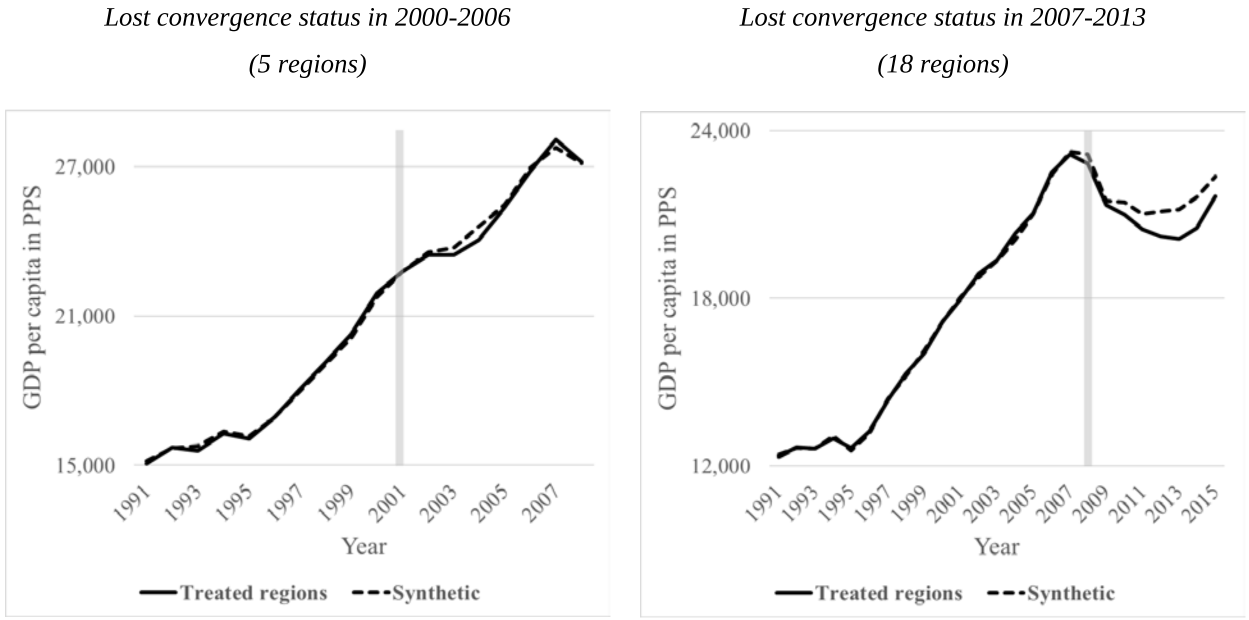


Figure 2 – Log of total employment trend: treated versus synthetic regions

Lost convergence status in 2000-2006
(5 regions)

Lost convergence status in 2007-2013
(18 regions)

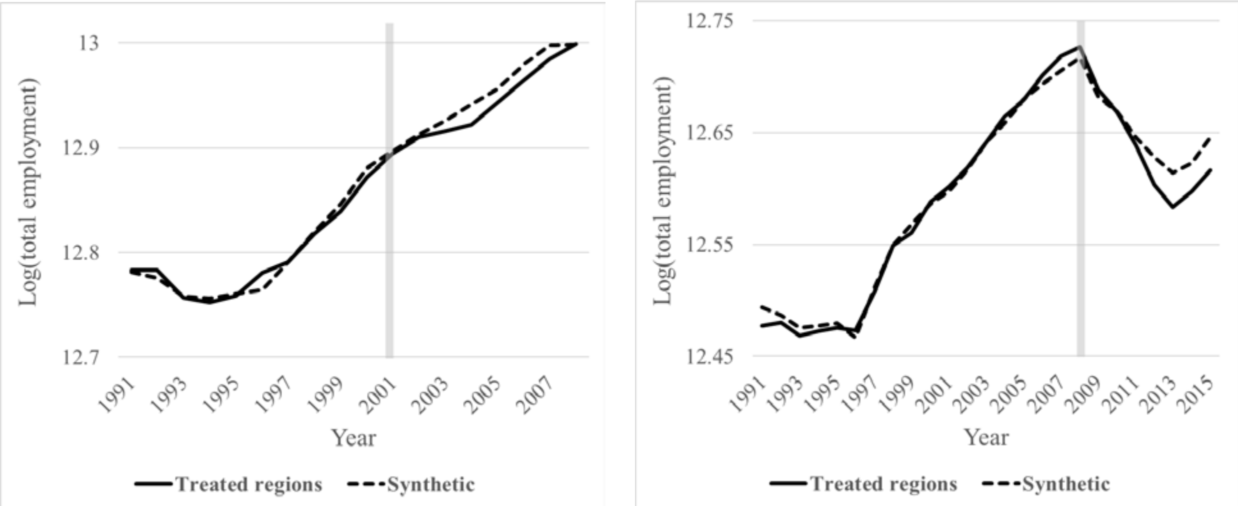
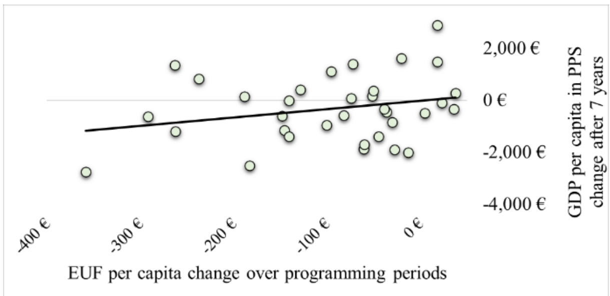


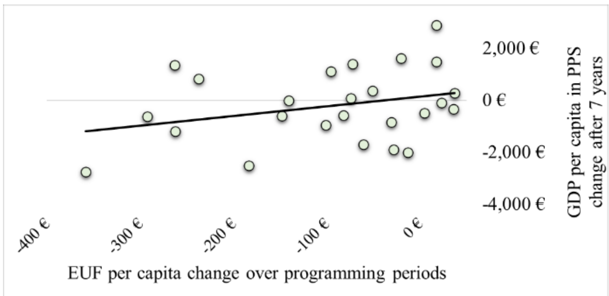
Figure 3 – Heterogeneity of the impact

Heterogeneity of the impact with respect to EUF reduction

All regions

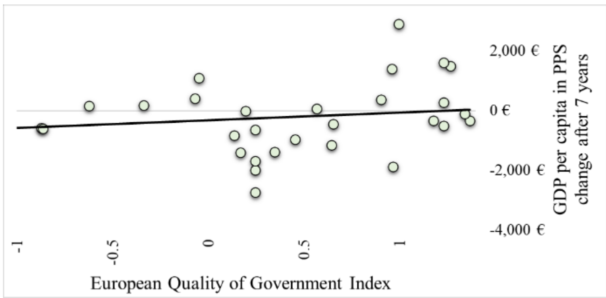


Only PP2 regions

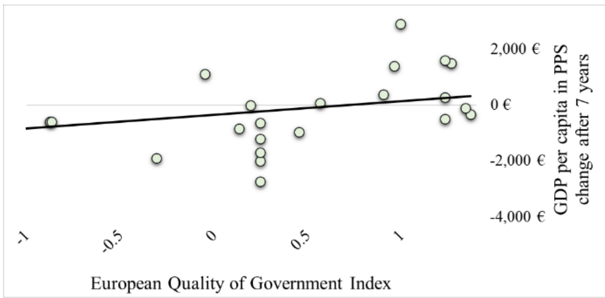


Heterogeneity of the impact with respect to the EQI

All regions

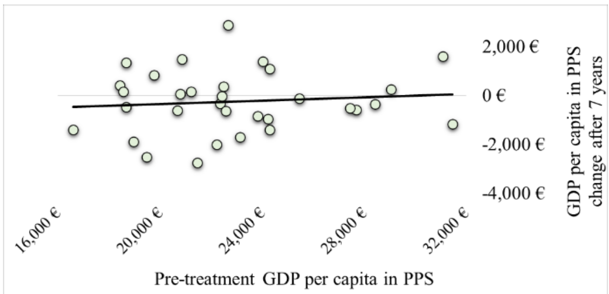


Only PP2 regions

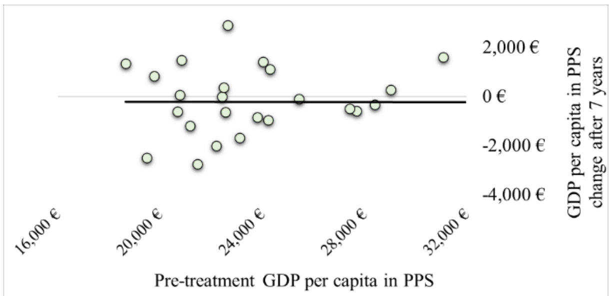


Heterogeneity of the impact with respect to the initial level of GDP per capita

All regions



Only PP2 regions



Notes: We have excluded from this analysis the regions for which we could not find a good pre-treatment trend in terms of GDP per capita, i.e. DE30, UKM6, and EL30. EUF per capita change over programming periods has been computed as the average change over time in EUF per capita for each treatment region, compared to the average change over time for the relative synthetic region.

Appendix

Table A1 – Region weights in the synthetic treated regions

Loss of the convergence status in 2000-2006		**Loss of the convergence status in 2007-2013**	
NUTS-2	**Weight**	**NUTS-2**	**Weight**
Provence-Alpes-Côte d'Azur (FR82)	18.8%	Voreio Aigaio (EL41)	18.3%
Border, Midland and Western Ireland (IE01)	17.5%	West Midlands (UKG3)	14.6%
Calabria (ITF6)	16.4%	East and North East London (UKI5)	8.5%
Valle d'Aosta (ITC2)	11.1%	Região Autónoma dos Açores (PT20)	8.0%
Comunidad de Madrid (ES30)	7.8%	Castilla-La Mancha (ES42)	7.8%
Basilicata (ITF5)	7.5%	Comunidad de Madrid (ES30)	7.4%
Cheshire (UKD6)	5.3%	Ipeiros (EL54)	6.7%
Ciudad Autónoma de Ceuta (ES63)	4.6%	Campania (ITF3)	5.7%
Voreio Aigaio (EL41)	3.0%	Cataluña (ES51)	5.5%
Canarias (ES70)	1.4%	Galicia (ES11)	4.9%
…		…	

Note: We report the 10 regions that received the most weight. Weights sum up to 1.

Table A2 - Average yearly EU expenditure per capita across programming periods for the NUTS-2 regions no longer in convergence status and their counterfactual scenarios

Loss of the convergence status in 2000-2006					**Loss of the convergence status in 2007-2013**				
NUTS-2 2013 code	**Average yearly EU expenditure per capita in 1996-2001 (€)**		**Average yearly EU expenditure per capita in 2002-2008 (€)**		**NUTS-2 2013 code**	**Average yearly EU expenditure per capita in 2002-2008 (€)**		**Average yearly EU expenditure per capita in 2009-2015 (€)**	
	Treated	Counterfactual	Treated	Counterfactual		Treated	Counterfactual	Treated	Counterfactual
BE32	86.16	32.85	80.82	72.36	AT11	180.34	132.03	199.88	133.68
DE30	48.10	93.11	62.38	184.82	DED5	174.26	161.27	178.44	147.53
ES13	255.46	181.65	237.16	199.43	EL30	159.23	214.38	103.36	186.40
FR83	155.46	104.45	115.45	192.94	EL42	322.04	364.92	201.17	326.14
IE02	255.25	26.33	138.60	55.63	EL52	185.13	302.37	90.58	391.01
ITF1	82.07	68.21	46.86	84.50	EL53	451.44	376.32	257.83	445.65
ITF2	274.21	145.09	144.25	203.52	EL64	409.74	195.90	273.92	240.82
NL23	60.91	77.84	56.69	112.18	ES12	278.92	181.89	141.66	145.38
PT17	171.47	187.35	128.51	284.95	ES41	260.28	203.98	105.20	144.40
UKM6	159.15	56.75	169.77	89.95	ES52	133.84	113.51	78.42	88.41
UKN0	110.87	97.74	95.87	143.58	ES62	171.67	197.73	151.52	190.36
					ES63	795.37	252.02	484.72	233.59
					ES64	691.31	231.59	353.05	251.96
					ES70	173.92	112.58	89.46	88.32
					FI19	57.76	104.25	88.68	98.94
					FI1D	147.34	127.12	174.37	130.88
					IE01	221.66	53.51	128.08	32.07
					ITF5	329.72	178.45	153.03	239.32
					ITG2	216.53	182.68	95.53	209.95
					PT15	347.31	266.40	239.29	298.98
					PT30	489.98	353.58	250.07	376.03
					SE31	73.32	71.34	76.51	69.88
					SE32	101.61	89.03	139.73	89.56
					SE33	134.60	98.27	113.80	97.77
					UKD7	140.48	46.96	72.15	29.20
					UKE3	145.88	88.67	60.82	77.59

Notes: We consider the period 1996-2001 for the expenditure relative to the 1994-1999 programming period to take into account the n+2 rule. EU funds expenditures are expressed at constant prices in 2010.

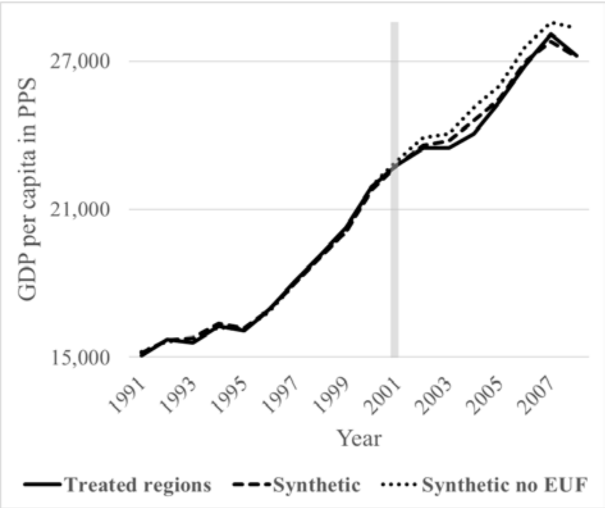
Table A3 – Determinants of heterogeneous impact

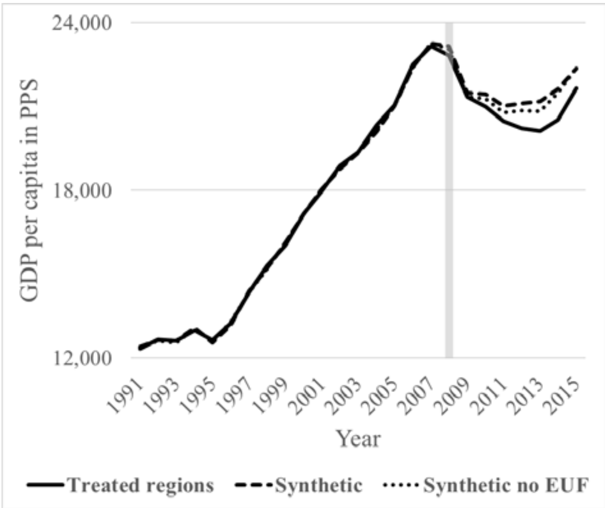
Dependent variable: GDP per capita in PPS change after 7 years from the loss of the convergence status		
	All treated regions	Only regions treated in the second PP
EUF per capita change	3.13	4.07
	(2.88)	(3.86)
EQI	129.35	346.73
	(371.74)	(410.29)
Pre-treatment GDP per capita	-0.04	-0.10
	(0.06)	(0.09)
Constant	730.87	730.87

Notes: Robust standard errors are reported in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Figure A1 – GDP per capita in PPS trend: treated versus synthetic regions without controlling for pre-treatment per capita EUF

Lost convergence status in 2000-2006	*Lost convergence status in 2007-2013*
(5 regions)	*(18 regions)*





Notes: pre-treatment per capita EUF for treated regions in PP1 (PP2) was €187.69 (€319.60), while in the counterfactual scenario it was €150.18 (€239.72) when controlling for pre-treatment EUF per capita and €114.42 (€198.25) without controlling for pre-treatment EUF per capita.

Figure A2 – Synthetic counterfactual results of all regions which lost convergence status in 2000

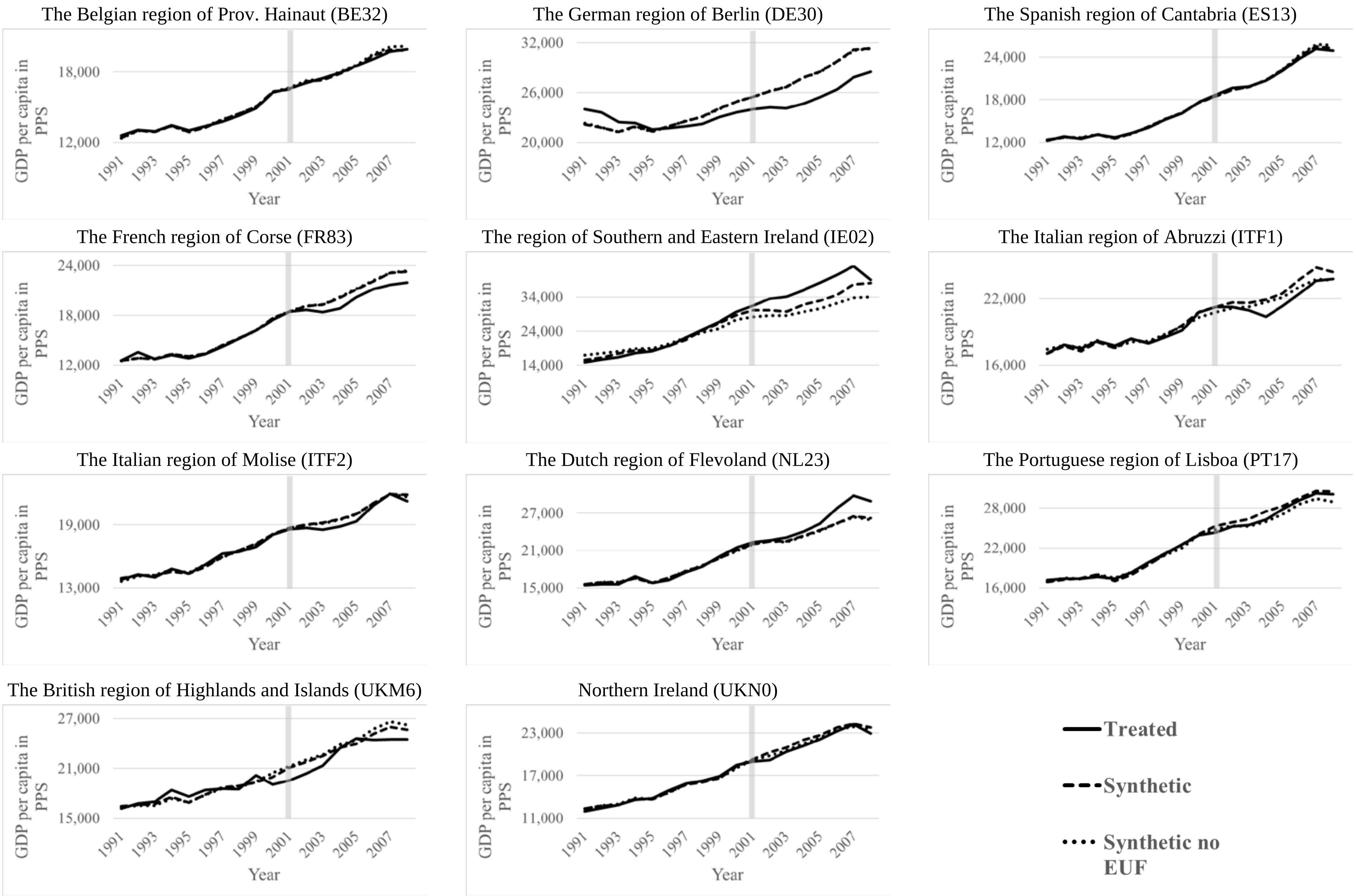


Figure A3 – Synthetic counterfactual results of all regions which lost convergence status in 2000 (Part 1)

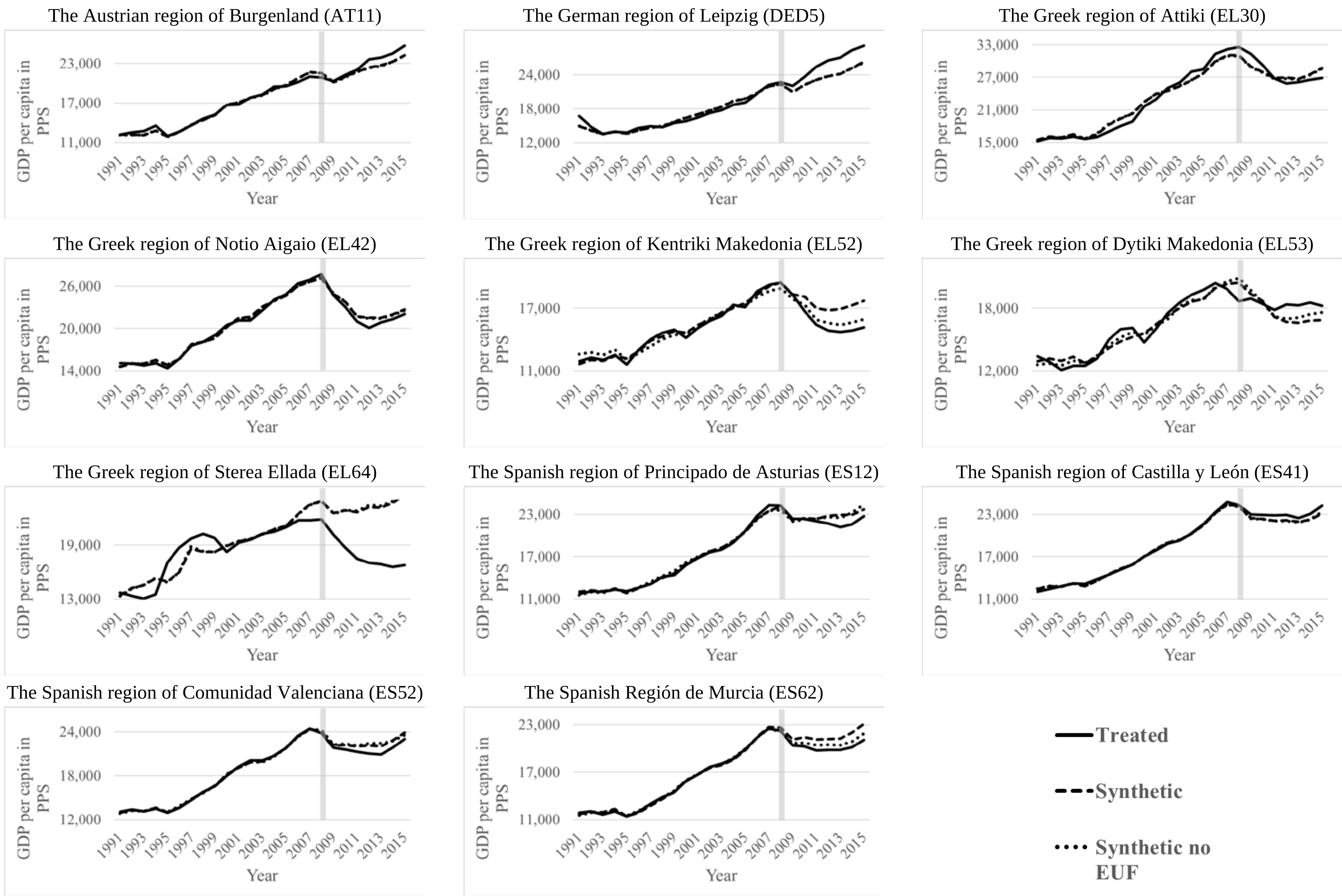


Figure A3 – Synthetic counterfactual results of all regions which lost convergence status in 2000 (Part 2)

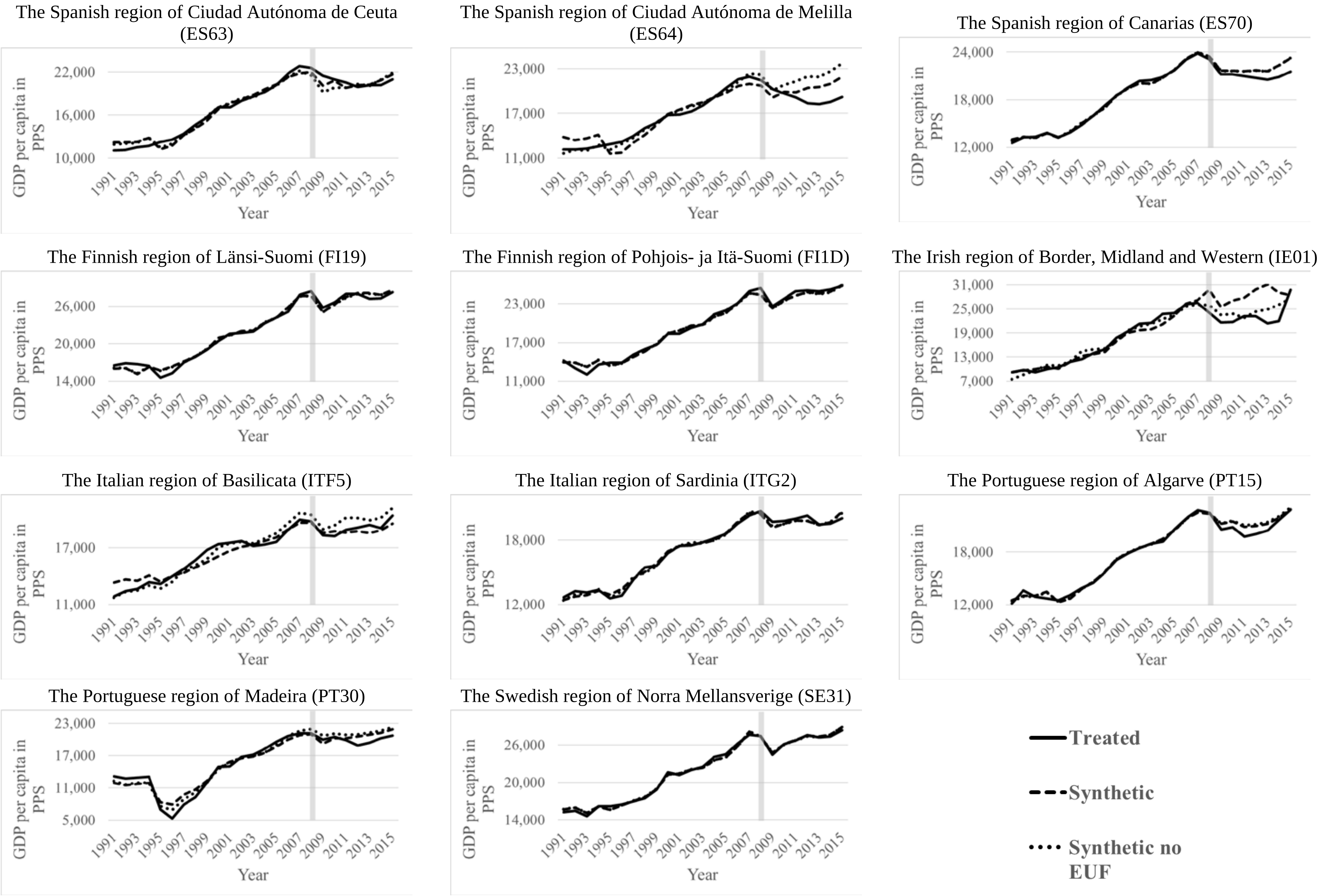


Figure A3 – Synthetic counterfactual results of all regions which lost convergence status in 2000 (Part 3)