UNIVERSITÀ CATTOLICA del Sacro Cuore

DIPARTIMENTO DI SCIENZE ECONOMICHE E SOCIALI

Regional Policies and Well-Being: an evaluation approach

Elena Calegari

Quaderno n. 153/ottobre 2021

VP VITA E PENSIERO

Università Cattolica del Sacro Cuore

DIPARTIMENTO DI SCIENZE ECONOMICHE E SOCIALI

Regional Policies and Well-Being: an evaluation approach

Elena Calegari

Quaderno n. 153/ottobre 2021

VP VITA E PENSIERO

Elena Calegari, Dipartimento di Scienze Economiche e Sociali, Università Cattolica del Sacro Cuore, Piacenza.

✉ elena.calegari@unicatt.it

I quaderni possono essere richiesti a:
Dipartimento di Scienze Economiche e Sociali,
Università Cattolica del Sacro Cuore
Via Emilia Parmense 84 - 29122 Piacenza - Tel. 0523 599.111
http://dipartimenti.unicatt.it/dises

✉ dises-pc@unicatt.it

www.vitaepensiero.it

ISBN 978-88-343-5035-5

Abstract: In recent years, the considerable debate about the issue "Beyond the GDP", has led scholars to orient their research towards a wider and multidimensional concept, such as well-being (WB). In this perspective, given the relevance of the European Union's (EU) Cohesion Policy (CP), which aims to strengthen economic and social cohesion between regions, it seems worth studying the impact of CP on regional WB and its possible heterogeneity. Relying on the counterfactual inference proposed by Chernozhukov et al. (2013), I estimate the impact of CP financings for the programming period 2007-2013 on a WB indicator in 2014 and 2015. The results show that CP affects the regional WB, unveiling, however, heterogeneity across regions.

Keywords: Regional Well-being, Human Development Index, Counterfactual Methods, Cohesion Policy.

***J.E.L.* classification: C21, R1, R11, I31**

1. Introduction

The inadequacy of the Gross Domestic Product (GDP) as a measure for countries' level of development has been pointed out since the 1970s, when both policy makers and academics drew attention to the fact that the simple economic growth, even if essential to achieve important objectives, covers only one aspect of the broader, multidimensional human development (Nordhaus and Tobin, 1973; Sen, 1985; World Bank, 2005; Stiglitz et al., 2009). At present, the Sustainable Development Goals (SDGs) proposed by the United Nations (UN, 2015), the Better Life Initiative proposed by Organisation for Economic Cooperation and Development's (OECD, 2011) and other projects at the European level at different spatial scales – international, national, and subnational – all reflect the effort spent during these decades to promote actions targeted to a multifaceted development (Andreoni, 2015; SDSN and IEEP, 2019).

The first definitions of well-being (WB) date back in time, for example, Aristotele refers to WB in terms of the idea of eudaimonia, as "doing well". In the modern world, the seminal works by Sen (1989) and Stiglitz et al. (2009) emphasized the necessity for a concept that goes beyond the usual GDP measures, and, on that basis, the international institutions embraced a vision based on the wider concept of WB. The above-mentioned policy actions thus aim to reduce the overall socio-economic disparities by identifying multidimensional features essential to people's lives and their capabilities – from the satisfaction of their basic material needs to their quality of life and the sustainability of the socio-economic and environmental systems, over time.

Given the multidimensional character of WB, several dimensions/domains have been identified in the literature, such as the health status, the level of education, the quality of the environment, the social connections, the quality of policy institutions, as well as the subjective perception of WB, according to different societal and policy objectives.

Concerning the measurement of WB, the indicators adopted in the scientific literature vary according to three main features: a) the choice of type and number of the included domains, as well as the variables used to measure them; b) the methodologies for aggregating these variables into composite indicators; c) the different spatial scales.

Concerning the policy perspective, the studies mainly focus on the kind of policies able to affect the overall WB, as well as each WB dimension. In this field of research, a stream of literature concentrates on how the public policies affect WB, highlighting two main findings: i) public spending has a positive effect on WB, even if this effect is different for each WB dimension (Anand and Ravallion, 1993; Paliova et al., 2019); and ii) the relationship between public spending and WB depends on the level of countries' WB (Gomanee et al., 2005). In this context, the majority of the studies analyze the public spending as a whole, whereas only a few investigate the role played by specific types of policies on WB, such as those concerning investment. Moreover, the above-mentioned insights emerge from studies at the national level, often neglecting analyzes at a lower geographical scale (regional or provincial).

To fill this gap, the present paper aims to analyze the impact of an investment policy on regional performance by studying the Cohesion Policy (CP) of the European Union (EU) that, as its declared objective, aims to strengthen economic and social cohesion by reducing disparities in the level of development between regions. In this perspective, we intend to go beyond pure economic growth and look at the effects of the CP on the overall regional WB and on its dimensions, also taking into account the possible heterogeneity of the effect among regions.

It is worth noting that, since the Treaty of Amsterdam (1997), the CP is the main regional policy of the EU and represents a considerable source of public investment targeted at overcoming EU regional economic disparities, on the basis of the GDP criterion (European Union, 1997). However, with the Europe 2020 Strategy, the EU regional cohesion objectives have become explicitly multidimensional, paying increasing attention to the idea of WB (European Commission, 2010; Palumbo, 2013).

The literature on the evaluation of the effectiveness of the CP is wide: in the main, the studies on the relationship between the CP and the European regional performance are still focused on the effect that the CP has on regional economic growth, based on GDP. In particular, the most recent studies confirm a positive effect of the CP on the GDP per capita, while highlighting a strong territorial heterogeneity (Crescenzi and Giua, 2020, 2016) (for an extensive review see, among others, Dall'Erba and Fang (2017) and Fratesi and Wishlade (2017)). However, a recent stream of literature is exploring the effect of CP also on other types of non-economic outcomes (Ferrara et al., 2020; Albanese et al., 2021).

Starting from the above considerations, we intend to explore the impact of the CP, not only on the GDP per capita, but also on the WB, at the regional level. On the basis of a review on the main pros and cons of WB indicators available at the regional level, the WB measure implemented here is a modified version of the well-known Human Development Index (UNDP, 2019), adapted to the EU regional context, as suggested in Parente (2019) and Silva and Ferreira-Lopes (2014). This novel measure seems to be an appropriate index for exploring WB at a regional level, given the available data.

Concerning the applied methodology, the present paper shows the results of a methodology for impact evaluation, along the lines of previous studies on the impact of the CP. The CP is handled as a binary treatment because of the funding scheme of the policy itself, which allocates the highest amount of funds to the poorest regions of the EU, allowing the regions to be divided between "Treated" (those that are heavily funded by the CP) and "Untreated" regions (those that receive a lower amount of funds from the CP) (Becker et al., 2018; European Commission, 2006; European Commission, 2013). Here, the effect in 2014 and 2015 of the CP 2007-2013 is evaluated referring to the counterfactual inference proposed by Chernozhukov et al. (2013), which allows us to study the distribution of the impact of the CP in specified quantiles, thus capturing the heterogeneity of the CP effect across the treated regions.

The paper is structured as follows: in Section 2 we describe the CP and its effectiveness on regional economic growth, while Section 3 is concerned with the debate about the measurement of WB and discusses the availability of WB indicators at the regional scale. In Section 4 we illustrate the methodology for counterfactual estimation and the empirical choices applied to the analysis. Finally, Section 5 shows the main results and Section 6 draws the conclusions indicating possibilities for further developments to more accurate policy recommendations.

2. Cohesion Policy and Regional Economic Growth

The Cohesion Policy (CP) represents the main EU regional investment policy and, to better address the general goal of the reduction of regional disparities, its specific objectives, as well as its regulations and financing tools, called Structural Funds (SFs), are managed in mid-term programming periods. The main beneficiaries of the allocations of the CP are the European regions at NUTS 2 level and the highest amount of the SFs is allocated to the lagging regions of the EU (known as "Objective Convergence" regions), defined as those regions whose per capita GDP is lower than 75% of the European average.

The economic relevance of the CP has stimulated many scholars to evaluate its effectiveness. Analyses on the impact of the CP on European regional performance mostly focus on its economic impact, mainly measured by the GDP per capita and occasionally by the employment rate (Becker et al., 2010; Rodríguez Pose and Novak, 2013; Giua, 2017; Fiaschi et al., 2018; Crescenzi and Giua, 2020). The main finding is that the CP has an overall positive effect on regional economic growth, but with marked heterogeneity among regions due to regional territorial and social characteristics, as well as to the level of regional economic performance (Becker et al., 2010, 2013; Bouayad-Agha et al., 2013; Pellegrini et al., 2013; Gagliardi and Percoco, 2017; Medeiros, 2017; Percoco, 2017; Crescenzi and Giua, 2020). In particular, the effect of the CP on regional economic growth is shown to be higher in regions with higher GDP (Crescenzi and Giua, 2016; Calegari et al., 2020). Possible explanations are, on the one hand, that the lagging regions have less negotiation abilities to attract more funds (Charron, 2016; Fratesi and Wishlade, 2017) and, on the other hand, that they show poor regional absorptive capacity of the allocated funds, leading to the paradoxical situation of regions which are entitled to receive high amounts of SFs are not actually able to spend them (Becker et al., 2013; Surubaru, 2017; Cerqua and Pellegrini, 2018). Further findings concern the impact of CP on the regional infrastructure network and innovation, which has been found to be positive (Ferrara et al., 2017; Arbolino et al., 2019).

The choice of these previous studies to focus on the impact of the CP on regional economic growth is in line with the rationale of the allocation mechanism of the policy, which is based on the level of regional per capita GDP, i.e. of regional performance in a strict economic sense. On the other hand, EU institutions, in recent times, have stressed the idea of European multidimensional regional development (Palumbo, 2013). The overall impression is that there is room to investigate whether the CP is also stimulating a multidimensional convergence, by focusing on the effect that CP has on indicators beyond the GDP, with specific attention for regional indicators of WB. The next section thus reports a review of the recent applied studies concerning indicators proposed to analyze WB at sub-national level in the EU context.

3. The Well-Being Indicator: Conceptual and Empirical Aspects

3.1. Well-Being Indicators: A Concise Review

After Robert Kennedy's famous 1968 speech, in which he complained that GDP 'measures everything in short, except that which is worthwhile', both institutions and scholars have pointed out that economic welfare is just one part of overall societal development and progress (Nordhaus and Tobin, 1973; Sen, 1985).

As a consequence, the "beyond the GDP" debate arose, leading to the concept of WB, recognized as a multifaceted phenomenon (Nussbaum et al., 1993; Dasgupta et al., 2001; Fleurbaey, 2009; Stiglitz et al., 2009; Sirgy, 2011; Fleurbaey and Blanchet, 2013). The multidimensional nature of WB is reflected in the difficulties of developing a "universal definition", and, therefore, in a number of different approaches. One of them, known as the "capabilities approach", has been proposed by Amartya Sen and starts from the consideration that the WB is related to the freedom (capabilities) people have to promote or achieve the goals they value in their society (Sen, 1985). In this context, 'the well-being has to do with being well, which in the most elementary terms is about being able to live long, being well-nourished, being healthy, being literate, and so on' (Anand and Ravallion, 1993, p. 134).

The variety of definitions of WB is followed by the empirical debate on its measurement and, in particular, whether WB should be synthesized in a single measure rather than analyzed through a dashboard of indicators (Stiglitz et al., 2009; Bertin et al., 2018).

The first attempts to measure the WB with composite indicators were made at the national level. Without claim to completeness, some of the most widely known WB indicators at the country level are: the Better Life Index (BLI) (OECD, 2011), the Genuine Progress Indicator (GPI) (Hamilton, 1999), the Happy Planet Index (HPI) (Abdallah et al., 2009), and the Human Development Index (HDI) (UNDP, 1990; Desai, 1991). For a review see, among the others, Calcagnini and Perugini (2019).

In recent years, the awareness that the WB indicators at the national level do not provide a complete picture of WB in specific territories – together with the emerging relevance of socio-economic regional disparities – has led to the issue of measuring WB at a lower spatial scale (such as the regional scale), especially in the EU (for a review, see Tomaney (2017)).

The composite territorial indicators of WB proposed in the literature differ in several aspects. First of all, the type of dimensions, as well as the number of variables used to measure them, widely vary among the indicators. The largest majority of the multidimensional indicators include, as dimensions, the economic resources and the level of education, as well as the health conditions (Ferrara and Nisticò, 2015; Bertin et al., 2018; Tomaselli et al., 2020). With some exceptions, as Perrons and Dunford (2013), most of the proposed indicators also include the environmental conditions (Davino, 2018; Pinar, 2019). With respect to the number of domains, Perrons and Dunford (2013), for instance, propose an indicator built on four domains, whereas Davino et al. (2018), as well as Pinar (2019), consider 11 domains. Another relevant difference among composite indicators of WB is their spatial scale. Indeed, some of them are calculated at the regional level, and others at the provincial or municipal level. The choice for analyses at a territorial level lower than regional is motivated by the necessity to highlight the local heterogeneity that would remain hidden if considered just at the regional level, but this type of analysis is discouraged by the poor reliability of the data at such a disaggregated spatial level (Calcagnini and Perugini, 2019; Bonardo and Quondamstefano, 2020).

The primary scope of the studies on the regional WB indicators concerns the comparisons between regional WB rankings and GDP rankings (Perrons and Dunford, 2013; Silva and Ferreira-Lopes, 2014; Tomaselli et al., 2020), but some consideration has also been given to the analysis of the territorial heterogeneity and of the convergence process in terms of WB (Ferrara and Nisticò, 2015; Calcagnini and Perugini, 2019). What emerges from the literature is that the rankings according to WB are somewhat different with respect to the rankings based on the GDP and that the relationship between WB and GDP is weaker for a high level of GDP (Segre et al., 2011). Moreover, Calcagnini and Perugini (2019) highlight that the heterogeneity in the level of WB is not strictly related to the geographical distance among territories.

Finally, a relevant feature that clearly emerges from the review is that most of the regional WB indicators are built for one single European country or for small groups of countries (Murias et al., 2012). Furthermore, also most of the indicators calculated for all EU countries either refer to country level data (Sánchez-Domínguez and Ruiz-Martos, 2014) or are calculated for only one year, due to the limited availability of internationally comparable

data (Bubbico and Dijkstra, 2011; Pinar, 2019; Dardha and Rogge, 2020).
Two notable exceptions of WB indicators calculated for all the EU regions across more than one year are provided by Hardeman and Dijkstra (2014) and Parente (2019) and Ferrara et al. (2020). Interestingly, these authors calculate a regionalized version of the HDI, as an interesting and feasible solution, worthy to be further investigated in studies on regional WB at the European level. This approach will be used in the present study, as illustrated in the subsequent sub-section.

3.2. The Adopted Regional Well-Being Indicator

As previously indicated, the HDI is a composite indicator of WB, expressed at the national level. In particular, the HDI has been formulated by the United Nation Development Programme (UNDP) in 1990 and is currently utilized by researchers and policy makers (UNDP, 2019). It takes into account three specific dimensions of WB measured by appropriate indicators, as follows: 1) 'a decent standard of living', measured by means of the logarithm of the Gross National Income per capita; 2) 'access to knowledge', measured with the expected years of schooling and with the mean years of schooling for adults aged 25 years and more; 3) 'a long and healthy life', measured by life expectancy at birth (UNDP, 1990, 2019). The final HDI is obtained as the geometric mean of the three afore mentioned indicators.

Providing useful insights about the countries' current level of development, the HDI is widely recognized as an index of WB and has been internationally adopted. Clearly, the positive aspect of HDI is its simplicity, since it takes into consideration only three dimensions (Ivanova et al., 1999).

The HDI (originally expressed at the national level) can also be implemented at the regional level (Bubbico and Dijkstra, 2011; Hardeman and Dijkstra, 2014; Parente, 2019). Indeed, the HDI includes dimensions that are included in most of the regional WB indicators and that can be considered as fundamental variables able to capture multiple domains. Moreover, these three dimensions/variables can be easily measured by means of available data and compared at regional level for a high number of European regions.

In the present paper, the WB is measured with an adaptation of the HDI at the regional level, named Regional Development Index (RDI). As shown in Eq. (1), the RDI for region *i* (*i*=1,…,*n*) is calculated as the geometric mean of the three indices included in the HDI: a decent standard of living, access to education, and a long and healthy life (Anand and Sen, 1994). The three dimensions have been adapted to the EU context, as follows: a) the Income Indicator (I_{Income}), calculated using the logarithm of the regional GDP per capita in PPS (in euros); b) the Education Indicator ($I_{Education}$), based on the percentage of the population aged between 25 and 64 years with a tertiary education degree; and c) the Health Indicator (I_{Health}), calculated using the life expectancy at birth measured in years.

$$RDI_t = (I_{Income,t} \cdot I_{Education,t} \cdot I_{Health,t})^{1/3} \,. \qquad (1)$$

Each Indicator (I), for region i, is calculated as follows:

$$I_{j,i} = \frac{Actual\ Value_i - Minimum\ Value_{2006}}{Maximum\ Value_{2006} - Minimum\ Value_{2006}}\ , \qquad (2)$$

with *j=Income*, *Education*, *Health*. $Actual\ Value_i$ represents the value of the variable in the considered year for region *i*. $Minimum\ Value_{2006}$ stands for the minimum value of the variable in the sample at the initial condition in our case study (2006). $Maximum\ Value_{2006}$ is the maximum value of the variable in the sample at the same initial condition. In this way, each indicator calculated according to Eq. (2) is normalized with respect to its values at the beginning of the analyzed period (2006). In accordance with the HDI calculated at country level, the choice to aggregate the three dimensional indicators through their geometric mean is based on the aim to penalize the inequality between dimensions of regional WB (Parente, 2019).

As illustrated in the subsequent sections, our study aims to evaluate the impact of the CP expenditures during the programming period 2007-2013 on European regional WB, measured with RDI.

4. The Evaluation Study

4.1. Methodology

The most recent studies on the effectiveness of the CP mainly exploit methods of treatment impact evaluation, such as matching estimators or Regression Discontinuity Design (RDD) (Bondonio, 2016; Becker et al., 2018; Cerqua and Pellegrini, 2018). In general, these methodologies estimate the effect of a given treatment on the outcome of interest and may vary according to the definition of the treatment.

In the context of binary treatments, that is the condition where the analyzed units can be divided between the group of units exposed to the treatment, i.e. the treated units, and the group of unexposed ones, i.e. the untreated units, both the matching methods and the RDD have the goal to compare the outcome observed over the treated units with the outcome they would have attained if they had not been exposed to the treatment, i.e. the counterfactual outcome. Concerning our study, this means comparing the regional performance in terms of WB observed for the regions that received CP funds in the analyzed programming period with the unobserved performance that those regions would have obtained without the CP financial support.

Clearly, the crucial methodological issue here is the estimation of the unobservable outcome of treated units in absence of treatment.

Matching methods propose to estimate the counterfactual outcome for a subsample of untreated units selected to be as similar as possible to treated ones. The similarity is established by minimizing the distance in terms of either a set of covariates or a synthesis of them, such as the propensity score (see Imbens and Rubin (2015) for a depth insight). These methods guarantee optimal properties under what is called the overlap support condition, defined as the circumstance where observations of both groups, treated and untreated, are present in some or a relevant part of the covariates' space.

In this context, it should be noted that the Regression Discontinuity Design (RDD) has been recently preferred to the matching methods in evaluating the CP impact on the EU regions (Cerqua and Pellegrini, 2018). The suitability of the RDD in this context is based on the fact that the level of regional per capita GDP that equals 75% of the EU average can be considered as a cut-off for the allocation of funds. Exploiting the presence of the cut-off, the RDD assumes that units on both sides of the cut-off, but close to it, are comparable even if they do share no or scant common support. According to this setting, first, units near the cut-off are identified, observations far from it are discarded, and then observations on both sides of the cut-off are approximated through either weighted least squares or kernel-based local polynomials, and the values of regression functions at the cut-off are extrapolated and compared. As a result, the RDD estimates the treatment effect locally, at the cut-off, providing estimates of the policy impact for the local subpopulation of units close to the cut-off but not necessarily for units far from it. Moreover, robust estimation of nonparametric regressions, like the RDD, requires many observations (in the order of at least a thousand), a number which is often not available in EU regional studies.

From our perspective, the main limitation of the approaches described above is that both provide only estimates of the average effects of the policy, without providing any information about the heterogeneity of the effect. Since our study aims at evaluating the distribution of the impact of CP, we make use of an alternative methodology, based on inference on counterfactual distribution (Chernozhukov et al., 2013). This method may be included in the class of imputation and projection methods, defined in the recent survey on the estimation of causal effects by Abadie and Cattaneo (2018).

Inference on counterfactual distribution allows us to decompose the difference between treated (*T*) and untreated (*U*) groups in the quantiles of the observable distributions of the outcome variable (*Y*) in two components, as follows:

$$Q_{Y(T)}(\tau) - Q_{Y(U)}(\tau) = \left[Q_{Y(T|T)}(\tau) - Q_{Y(U|T)}(\tau)\right] + \\ +\left[Q_{Y(U|T)}(\tau) - Q_{Y(U|U)}(\tau)\right], \tag{3}$$

where $Q_{Y(W)}(\tau)$ is the τ-*th* quantile of the observed outcome distribution function given the treatments status *W*, with *W*=*U*,*T*; and $Q_{Y(U|T)}(\tau)$ is the τ-*th* quantile of the counterfactual outcome distribution function of untreated regions, if they had received the treatment.

The component $\left[Q_{Y(U|T)}(\tau) - Q_{Y(U|U)}(\tau)\right]$ is explained by the differences in covariates between the groups, while the other component, $\left[Q_{Y(T|T)}(\tau) - Q_{Y(U|T)}(\tau)\right]$, is attributable to the treatment and estimates its effect at the specific quantile, i.e. the Quantile Treatment Effect on Treated (*QTET*).

The decomposition in Eq. (3) is made possible by estimating the counterfactual distribution function:

$$F_{Y(U|T)}(\tau) = \int_{\mathcal{X}_{\mathrm{T}}} F_{(Y_U|X_U)}(y|x) dF_{X_T}(x), \tag{4}$$

which results from mixing two components: the conditional distribution function of the outcome given the covariates for untreated observations, $F_{(Y_U|X_U)}$; and the distribution function of covariates over treated observations, $F_{X_T}(x)$. In its turn, the first component is attained by estimating quantile regressions conditional on a set of covariates. In this setting, the covariates are chosen to control the selection on observables. As noted by Chernozhukov et al. (2013), the integral in Eq. (4) is well-defined if a support condition, $\mathcal{X}_{\mathrm{T}} \subseteq \mathcal{X}_{\mathrm{U}}$, holds, which acts analogously to the overlap condition in the treatment effects framework. Indeed, it guaranties that each treated region can be matched with an untreated one, which has the same or similar characteristics.

The estimated counterfactual effects, $\left[Q_{Y(T|T)}(\tau) - Q_{Y(U|T)}(\tau)\right]$, can have a causal interpretation and be interpreted as the Quantile Treatment Effect on Treated (*QTET*) if the "conditional independence assumption" (Rosenbaum and Rubin, 1983) holds. This assumption requires that the treatment is randomly assigned conditional on the control variables X; in that case, the distribution of Y|X, T=1 and Y|X, T=0 agree. Furtherly it is useful noting that in this framework, the estimation of the treatment effects on the treated units is based on the regression-adjustments method, where the bias related to the extrapolation issue is mitigated by imposing the common support condition.

The following subsection describes the choices adopted in the present analysis concerning the three key features of any evaluation study: treatment, outcome, and control variables.

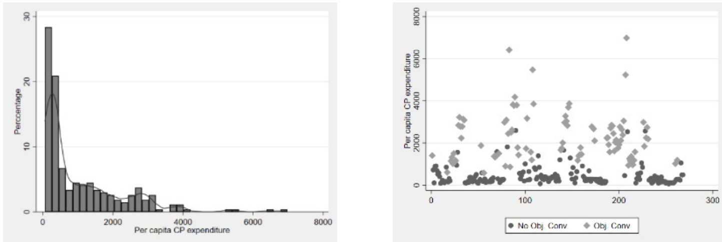
4.2. Treatment, outcomes, and control variables

Table 3 reports the average value of the estimated distance decay gradient for the whole sample of TTWAs. The estimates are obtained adopting both OLS and Poisson regression following Eq. 3, using travel distance. The results obtained for travel time as a measure of commuting costs are reported in the Appendix.

Since the CP is mainly addressed to EU regions at the NUTS 2 level, the present analysis refers to EU regions defined according to that classification and exploits the availability of the data on the regional CP expenditure for that studied period. In particular, the analysis includes regions belonging to 27 EU countries (Croatia has been excluded, since it joined the EU in 2013), with a final sample that includes 268 regions (NUTS 2013 classification). For the programming period 2007-2013 the data on CP expenditure cover the whole programming period (CP fund for that programming period have been spent till 2015). For details about the construction of the sample, see the Appendix. As previously described, even if all the EU regions are entitled to receive an amount of CP funds, the largest amount of resources is devoted to the lagging regions (which are also named Objective Convergence regions, defined as those regions with per capita GDP below 75% of the EU average). This allocation mechanism is empirically reflected in the bimodality of the distribution of per capita expenditure of CP funds during the whole programming period 2007-2013 by EU regions, as shown in Figure 1, Panel (a). At the same time, Figure 1, Panel (b) highlights that some Objective Convergence regions, which should have a high per capita expenditure of CP funds, show a per capita expenditure lower than that of non-Objective Convergence regions, suggesting that they have been unable to spend all the allocated funds. On the contrary, some regions outside the Objective Convergence regions have been able to reach a high level of CP expenditure. The low absorptive capacity of the lagging regions has already been observed in previous programming periods and the main reasons are attributable to the poor planning capacity of the local managerial authorities and, in general, to a low institutional quality that leads to the inability to produce credible projects to finance, causing the decommitment of the funds (Rodríguez Pose and Novak, 2013).

Since the impact of a policy, if any, is obviously related to the funds actually spent (Aiello and Pupo, 2012; Ferrara et al., 2017), we choose to update the definition of the treatment, not considering the GDP per capita condition officially stated, but employing the regional per capita CP expenditure. Using linear discriminant analysis, for the period 2007-2013 the threshold that best discriminates between regions which are beneficiaries of the CP and those which are not beneficiaries is estimated at 1063 euros. Hence, according to the updated treatment, regions that have spent more than the threshold during the programming period are defined as treated and, conversely, regions that have spent less are considered untreated.

Figure 1: The regional per capita expenditure of CP funds in the programming periods 2007-2013 in the EU regions



(a) Distribution of the regional per capita expenditure of CP funds 2007-2013

(b) Regional per capita expenditure 2007-2013 of CP funds in Obj. Conv. (dark-grey) and Non Obj. Conv. (light-grey) regions

As our outcome we focus on the regionalized version of the HDI, the Regional Development Index (RDI), and on its components, calculated as shown in Section 3. In particular, for the analysis of the programming period 2007-2013, we include the year 2006, one year before the start of the programming period, as initial conditions, whereas we analyze the policy effect for 2014 and 2015, for two main reasons. This is, firstly, because of the "n+2" rule, according to which regions have two additional years after the end of the period to spend the remaining allocations before their decommitment; and, secondly, because including data up to 2015 allows us to account for the delayed effect of the funds, as the policy requires longer time intervals than the programming period to be effective. Therefore, the resulting dataset covers data for the period 2006-2015.

The control covariates used in the analysis to account for the heterogeneity of initial conditions refer to regional characteristics that are expected to affect the regional WB and economic performance (Cerqua and Pellegrini, 2018), valued at the year before the start of the programming period. The control covariates included in the model are the regional population (in logarithms), which refers to regional economic size, the population density (in logarithms), which gives an indication of the degree of the region's rurality, and the share of population older than 65 years, which, together with the employment rate and the share of employment in the industry sector, describes the structural composition of the regional economy (Percoco, 2017). Moreover, since the previous literature shows the relevance of institutional quality as a determinant of regional performance (Rodríguez Pose and Novak, 2013), we include the Quality of Government Index calculated by the Quality of Government Institute of Gothenburg University (Quality of Government Institute, 2010). In addition, we control for lagged values of the three indicators.

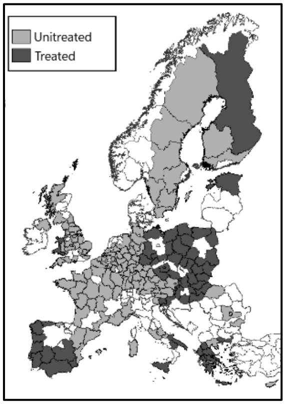
Table 1 shows the descriptive statistics for the group of untreated and treated regions for the analysis of the period 2007-2013 over the initial sample. Most of the control variables are, on average, higher for untreated than for treated regions, supporting the expectation that initial conditions are in favour of untreated regions. The exception is given by the share of employment in the industry sector, that is slightly higher in the untreated regions. This may be due to the fact that in more developed regions the manufacturing is reducing in favour of the service sector, whereas in lagging regions, where the cost of labour is lower, the manufacturing sector involves an increasing number of workers. Next, to obtain comparable groups, and following the requirement of Eq. (3), we reduce the support of the covariates' space, restricting the sample to those regions that satisfy the common support condition. The reduction of the support for untreated regions is, on average, of the 22%, while the reduction was higher, on average, for treated regions. As a whole, we obtain the result that, on average, initial conditions between untreated and treated regions became generally closer over the area of common support. With this operation, the sample was reduced to about the 70 per cent of EU regions, respectively 65 treated regions and 129 untreated regions (Fig. 2). Both for treated and untreated, the lower populated and younger ones, but also those with lower employment rate, cannot be included analysis anymore. In general, these characteristics mostly refer to Eastern, rural regions. On the other hand, for the untreated regions, also the best performing ones (in terms of education, health, GDP and quality of institutions) have been excluded from the final sample, thus excluding some German and Italian regions.

Figure 2, providing a spatial representation of the regions included the common support, highlights the regions and the countries covered by the study, after imposing the common support.

Table 1: Programming period 2007-2013. Control variables for the pre-treatment year (2006) and treatment variable. Descriptive statistics of the initial sample and of the region of Common Support

UNTREATED Year 2006	**Initial Sample** *Mean*	*Min*	*Max*	*Range*	**Common Support** *Mean*	*Min*	*Max*	*Range*	**Range Reduction Factor**
	N=174				*N=129*				
Log population	7.29	3.29	9.35	6.06	7.28	4.82	8.86	4.04	0.67
Log population density	5.26	1.19	9.16	7.97	5.17	1.19	8.34	7.15	0.90
Population over 65	17.22	1.14	26.80	25.66	17.66	8.80	26.80	18.00	0.70
Employment rate %	92.80	77.98	97.43	19.45	92.98	85.48	97.00	11.52	0.59
Industry employment %	18.54	6.87	34.49	27.62	19.34	7.04	34.49	27.45	0.99
Quality Govern. Index	73.94	20.95	100	79.05	73.42	20.95	92.09	71.14	0.90
Health Indicator	0.79	0.10	1.000	0.90	0.78	0.10	0.93	0.83	0.92
Education Indicator	0.46	0.02	1.000	0.98	0.41	0.02	0.66	0.64	0.65
Per capita GDP Indicator	0.57	0.10	1.000	0.90	0.54	0.10	0.72	0.62	0.69
Per capita CP expenditure (Euros)	351	60	1054	994	367	90	1051	961	0.97
TREATED Year 2006	**Initial Sample** *Mean*	*Min*	*Max*	*Range*	**Common Support** *Mean*	*Min*	*Max*	*Range*	**Range Reduction Factor**
	N=94				*N=65*				
Log population	7.16	4.21	8.97	4.76	7.15	5.29	8.97	3.68	0.77
Log population density	4.64	0.92	8.56	7.64	4.61	1.86	7.79	5.93	0.78
Population over 65	16.49	3.80	30.45	26.65	16.68	10.70	23.32	12.62	0.47
Employment rate %	88.77	68.30	97.14	28.84	89.03	80.65	97.14	16.49	0.57
Industry employment %	20.32	2.13	38.14	36.01	20.53	7.74	33.99	26.25	0.73
Quality Govern. Index	48.06	3.98	92.09	88.11	52.20	21.62	92.09	70.47	0.80
Health Indicator	0.54	0.00	0.94	0.94	0.59	0.13	0.94	0.81	0.86
Education Indicator	0.26	0.00	0.68	0.68	0.28	0.04	0.68	0.64	0.94
Per capita GDP Indicator	0.35	0.00	0.73	0.73	0.37	0.14	0.73	0.62	0.85
Per capita CP expenditure (Euros)	2360	1091	6983	5892	2403	1184	6417	5233	0.88

Figure 2: Treated and Untreated analyzed regions included in the Common Support by treatment status



5. *Empirical Results*

The four outcome variables analyzed in the estimated model are the RDI, taken as a measure of the overall societal WB, and the three components of the RDI, taken separately: the Education Indicator, the Income Indicator and the Health Indicator, calculated as shown in Section 3.1.

Table 2 shows the values of $Q_{Y(T)}(\tau) - Q_{Y(U)}(\tau)$: that is, the differences in terms of each of the considered outcomes between regions that were beneficiaries of the CP (treated) and regions that have not received CP funds (untreated); the comparison is limited to the 65 treated and 129 untreated regions which share the common support. Having as a goal to go beyond the estimation of the average effect of the CP by evaluating the impact for the whole distribution, the differences are computed at the quartiles of the distribution of the observed outcomes (Q=0.25,0.50,0.75), for the years 2014 and 2015.

The observed gap between treated and untreated regions is significantly negative on the three quantiles for each outcome. The results show that, for three of the four indicators, the treated regions show delays of the order of 12.5% to 18.3% compared with the untreated regions; the indicator that shows the highest delay is the Health Indicator, with percentage between 24.8% and 28.7%. In summary, the evidence supports that the regions taking advantages from CP funds are actually lagging compared with the untreated regions, in terms of per capita GDP (Income Indicator), Education Indicator, Health Indicator and WB measured by RDI.

Table 2: Difference between quantiles of the outcomes observable distribution for 2014 and 2015. Treated vs. Untreated regions.

		τ=0.25			τ=0.50			τ=0.75		
	Year	Diff.	se	p-value	Diff.	se	p-value	Diff.	se	p-value
RDI	2014	-0.183***	0.014	<0.001	-0.178***	0.017	<0.001	-0.138***	0.029	<0.001
	2015	-0.180***	0.014	<0.001	-0.170***	0.019	<0.001	-0.131***	0.028	<0.001
Income Index	2014	-0.168***	0.013	<0.001	-0.149***	0.018	<0.001	-0.134***	0.023	<0.001
	2015	-0.164***	0.013	<0.001	-0.144***	0.019	<0.001	-0.127***	0.023	<0.001
Health Index	2014	-0.287***	0.034	<0.001	-0.130**	0.052	0.011	-0.051**	0.021	0.017
	2015	-0.262***	0.035	<0.001	-0.135***	0.051	0.009	-0.051***	0.018	0.005
Education Index	2014	-0.135***	0.028	<0.001	-0.165***	0.03	<0.001	-0.207***	0.038	<0.001
	2015	-0.134***	0.029	<0.001	-0.172***	0.031	<0.001	-0.198***	0.037	<0.001

*p<0.1; **p<0.05; ***p<0.01.

According to the applied methodology, after controlling for the initial conditions, that is the influence of the covariates at the beginning of the analyzed period (2006), the differences in the outcomes between treated and untreated regions are attributable to the policy effect. Table 3 shows the estimates of the impact of the CP[1] − the Quantile Treatment effect on Treated (QTET) regions − on the considered outcomes for the three analyzed quartiles. To ease the interpretation of the results, it is possible to refer to regions in the first quartile of the considered outcome as “low-performing regions” in terms of that outcome, regions in the median as “intermediate-performing”, and regions in the third quartile as “high-performing”. What clearly emerges from Table 3 is a confirmation of the heterogeneity that characterises the effect of

[1] The estimates are obtained using the R package “Counterfactual” (Chen et al., 2020).

CP across the European regions which are beneficiaries of the CP funds. Indeed, for the analyzed indicators the policy impact is estimated significant only for subgroups of treated regions. The estimates suggest that the CP has significant impacts mainly for low-performing regions, whereas it shows only limited impacts on the intermediate-performing ones.

In particular, the results highlight a positive effect of the CP on the overall WB in low-performing regions, with magnitude that slightly decreases over time. More specifically, in 2014, an increment of 5.1% in the RDI in low-performing regions is attributable to the CP financing, whereas the increment is reduced to 4.2% in 2015. On the contrary, looking at the GDP, the estimates do not show any impact.

Looking at the other indicators, the effect of CP on WB seems mainly due to the impact that the policy displays on the Education Indicator, that is significant not only for the low-performing regions but also for the intermediate-performing ones.

Concerning the Health Indicator, that is the one for which the treated regions display the higher delay compared to untreated regions (Tab. 2), the estimated treatment effect is only occasionally significant for the intermediate-performing regions. However, this lack of effect could be due to the variable used to measure the indicator in the sample. Indeed, the life expectancy, especially for developed countries, might display very slow dynamics in time.

In conclusions, our results suggest that the impact of the CP on regional WB is different with respect to the impact of the policy on the regional economic growth and that the effect is heterogeneous across regions. Indeed, the CP displays an overall positive impact on the regional WB in the EU, especially in low performing regions, as invoked by Europe 2020. This convergence process seems to be particularly relevant in the field of education. On the contrary, the estimates do not suggest for an effect of the policy on the regional GDP.

Table 3: Programming period 2007-2013. Quantile Treatment Effects on Treated Regions for 2014 and 2015

	Year	τ=0.25			τ=0.50			τ=0.75		
		QTET	se	p-value	QTET	se	p-value	QTET	se	p-value
RDI	2014	0.051**	0.020	0.011	0.011	0.017	0.506	0.003	0.016	0.845
	2015	0.042***	0.013	0.002	0.018	0.014	0.191	0.006	0.010	0.545
Income	2014	0.020	0.019	0.304	-0.001	0.012	0.919	-0.003	0.012	0.797
Index	2015	0.031	0.021	0.139	0.006	0.013	0.644	0.009	0.012	0.475
Health	2014	-0.002	0.021	0.924	0.024	0.017	0.164	0.016	0.016	0.321
Index	2015	0.010	0.017	0.547	0.018	0.014	0.208	0.009	0.015	0.556
Education	2014	0.073**	0.031	0.020	0.081***	0.025	0.001	-0.021	0.030	0.488
Index	2015	0.058**	0.027	0.030	0.078***	0.023	0.001	-0.017	0.034	0.622

*p<0.1; **p<0.05; ***p<0.01.

6. Conclusion and Discussion

In the current era of increasing attention to the concept, measurement, and monitoring of the multidimensional WB from both the socio-economic and policy viewpoint, it is particularly relevant to study how public policies can affect WB at different spatial scales. The aim of the present paper was to evaluate the effect of a regional investment policy on regional WB by exploring the case study of the EU's Cohesion Policy. Given the strong heterogeneity in the impact of the CP on European regional economic growth highlighted by previous studies (Becker et al, 2018; Crescenzi and Giua, 2020), the analysis aimed to examine, for the programming period 2007-2013: (a) the CP effect on the overall WB and on its dimensions; and (b) the extent to which this effect is heterogeneous across the different EU regions. To highlight this possible heterogeneity, the analysis relied on the counterfactual inference proposed by Chernozhukov et al. (2013) that allows us to estimate the entire distribution of the CP's impact on each of the outcomes, that is WB and its components. In particular, the application focussed on the analysis of three quartiles, in order to identify low-performing, intermediate-performing and high-performing regions in terms of their WB (measured by the RDI). The CP impact is estimated by comparing the outcome of regions which are beneficiaries of the CP funds to the counterfactual outcome they would have reached without financial support, after controlling for the main sources of heterogeneity in the initial conditions.

Two main findings emerge from the results. The first is that the CP effect on the WB is different from the CP effect purely on regional economic growth. The second is that, among the treated regions, the CP displays its effects mostly in the low and intermediate -performing regions, and does not display any effect in the high-performing ones.

Indeed, the CP has been found to significantly boost the overall regional WB in low-performing regions, that seems to have exploited CP funds to improve the level of education.

In summary, the present study provides, as a novel result, an estimate of the effects of the CP on regional WB, by adopting the perspective of impact evaluation for the programming period 2007-2013. A further strength of the study is the possibility to estimate the quantiles of the CP impact. More specifically, our findings indicate that economic growth and WB react differently to the CP. Given the recognized relevance of WB, the results support the choice to monitor the CP effects not only in terms of economic growth, but also in terms of WB, in order to improve the effectiveness of the policy action in a multidimensional direction, as advocated by EU institutions. A limitation of our study is that, analogously to all the evaluation studies, the proposed evaluation approach restricts the evaluation of the CP impact only to the group of treated regions which satisfy the common support condition; this implies that the results hold only for those regions.

The analysis can be considered as a first step towards a more in-depth knowledge of the relationship between policy actions and WB, and it is suitable for further developments and improvements. For instance, subject to data availability at a low geographical scale, it could be relevant either to consider further dimensions of WB or to account for inequality adjustments. Moreover, an analysis of a more targeted policy could provide more precise insights, and therefore make more accurate policy recommendations.

Acknowledgements

I am grateful to Professors Aura Reggiani, full professor at the Department of Economics of the University of Bologna and to Marzia Freo, associate professor at the Department of Statistics of the University of Bologna for the general supervision and for the insightful comments.

References

Abadie, A. and Cattaneo, M. D. (2018), 'Econometric methods for program evaluation', *Annual Review of Economics* 10, 465–503.

Abdallah, S., Thompson, S., Michaelson, J., Marks, N. and Steuer, N. (2009), 'The happy planet index 2.0: Why good lives don't have to cost the earth'.

Aiello, F. and Pupo, V. (2012), 'Structural funds and the economic divide in Italy', *Journal of Policy Modeling* 34(3), 403–418.

Albanese, G., Carrieri, V., and Speziali, M. (2021). 'Looking for a Star: Evaluating the Effect of the Cohesion Policy on Regional Well-Being', IZA Discussion Paper No. 14521, Available at SSRN: https://ssrn.com/abstract=3883797.

Anand, S. and Ravallion, M. (1993), 'Human development in poor countries: on the role of private incomes and public services', *Journal of economic perspectives* 7(1), 133–150.

Anand, S. and Sen, A. (1994), 'Human development index: Methodology and measurement'.

Andreoni, V., and Galmarini, S. (2015), 'Mapping the distribution of Well-Being in Europe beyond national borders' *Science and Policy Report by the Joint Research Centre*.

Arbolino, R., Boffardi, R. and De Simone, L. (2019), 'Which are the factors influencing innovation performances? Evidence from Italian Cohesion Policy', *Social Indicators Research* 146(1-2), 221–247.

Becker, S. O., Egger, P. H. and Von Ehrlich, M. (2010), 'Going nuts: The effect of EU structural funds on regional performance', *Journal of Public Economics* 94(9-10), 578– 590.

Becker, S. O., Egger, P. H. and Von Ehrlich, M. (2013), 'Absorptive capacity and the growth and investment effects of regional transfers: A regression discontinuity design with heterogeneous treatment effects', *American Economic Journal: Economic Policy* 5(4), 29–77.

Becker, S. O., Egger, P. H. and von Ehrlich, M. (2018), 'Effects of EU regional policy: 1989-2013', *Regional Science and Urban Economics* 69, 143 – 152.

Bertin, G., Carrino, L. and Giove, S. (2018), ‘The Italian regional well-being in a multi- expert non-additive perspective’, *Social Indicators Research* 135(1), 15–51.

Bonardo, D. and Quondamstefano, V. (2020), ‘Measuring well-being in Italian (eco) regions’, *Social Indicators Research* pp. 1–24.

Bondonio, D. (2016), ‘The impact of varying per capita intensities of EU funds on regional growth: Estimating dose-response treatment effects through statistical matching’, *Ex post evaluation of Cohesion Policy programmes 2007–2013.*

Bouayad-Agha, S., Turpin, N. and Védrine, L. (2013), ‘Fostering the development of European regions: A spatial dynamic panel data analysis of the impact of Cohesion Policy’, *Regional Studies* 47(9), 1573–1593.

Bubbico, R., and Dijkstra, L. (2011). The European regional human development and human poverty indices. Regional Focus n. 02/2011, DG-REGIO Papers.

Calcagnini, G. and Perugini, F. (2019), ‘A well-being indicator for the Italian provinces’, *Social Indicators Research* 142(1), 149–177.

Calegari, E., Fabrizi, E., Guastella, G. and Timpano, F. (2021), ‘EU regional convergence in the agricultural sector: Are there synergies between agricultural and regional policies?’, *Papers in Regional Science* 100(1), 23–50.

Cerqua, A. and Pellegrini, G. (2018), ‘Are we spending too much to grow? the case of structural funds’, *Journal of Regional Science* 58(3), 535–563.

Charron, N. (2016), ‘Explaining the allocation of regional structural funds: The conditional effect of governance and self-rule’, *European Union Politics* 17(4), 638–659.

Chen, M., Chernozhukov, V. Fernandez-Val, I., and Melly B. (2020). ‘Counterfactual: Estimation and Inference Methods for Counterfactual Analysis’, details available at https://CRAN.R-project.org/package=Counterfactual.

Chernozhukov, V., Fernández-Val, I. and Melly, B. (2013), ‘Inference on counterfactual distributions’, *Econometrica* 81(6), 2205–2268.

Crescenzi, R. and Giua, M. (2016), 'The EU Cohesion Policy in context: Does a bottom- up approach work in all regions?', *Environment and Planning A: Economy and Space* 48(11), 2340–2357.

Crescenzi, R. and Giua, M. (2020), 'One or many Cohesion Policies of the European Union? On the differential economic impacts of Cohesion Policy across member states', *Regional Studies* 54(1), 10–20.

Dall'Erba, S. and Fang, F. (2017), 'Meta-analysis of the impact of European Union structural funds on regional growth', *Regional Studies* 51(6), 822–832.

Dardha, E. and Rogge, N. (2020), 'How's life in your region? Measuring regional material living conditions, quality of life and subjective well-being in OECD countries using a robust, conditional benefit-of-the-doubt model', *Social Indicators Research* 151(3), 1015– 1073.

Dasgupta, P. et al. (2001), *Human well-being and the natural environment*, Oxford University Press.

Davino, C., Dolce, P., Taralli, S. and Vinzi, V. E. (2018), 'A quantile composite-indicator approach for the measurement of equitable and sustainable well-being: A case study of the Italian provinces', *Social Indicators Research* 136(3), 999–1029.

Desai, M. (1991), 'Human development: concepts and measurement', *European Economic Review* 35(2-3), 350–357.

European Commission (2006), 'reg(EC) no. 1083/2006'.

European Commission (2010), 'Europe 2020, a European strategy for smart, sustainable and inclusive growth', *European Commission, Brussels* (COM(2010) 2020).

European Commission (2013), 'reg(EC) no. 1303/2013'.

European Commission (2014), 'Ex post evaluation of Cohesion Policy programmes 2007- 2013, focusing on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF)'.

European Union (1997), 'Treaty of Amsterdam amending the Treaty on European Union, the Treaties establishing the European Communities and related acts', (2007/C 306/01).

Ferrara, A. R., McCann, P., Pellegrini, G., Stelder, D. and Terribile,

F. (2017), 'Assessing the impacts of Cohesion Policy on EU regions: A non-parametric analysis on interventions promoting research and innovation and transport accessibility', *Papers in Regional Science* 96(4), 817–841.
Ferrara, A. R. and Nisticò, R. (2015), 'Regional well-being indicators and dispersion from a multidimensional perspective: evidence from Italy', *The Annals of Regional Science* 55(2-3), 373–420.
Ferrara, A., Dijkstra, L., McCann, P., and Nisticò, R. (2020). 'The Response of Regional Well-Being to EU Cohesion Policy Interventions', available at SSRN.
Fiaschi, D., Lavezzi, A. M. and Parenti, A. (2018), 'Does EU Cohesion Policy work? theory and evidence', *Journal of Regional Science* 58(2), 386–423.
Fleurbaey, M. (2009), 'Beyond GDP: The quest for a measure of social welfare', *Journal of Economic literature* 47(4), 1029–75.
Fleurbaey, M. and Blanchet, D. (2013), *Beyond GDP: Measuring welfare and assessing sustainability*, Oxford University Press.
Fratesi, U. and Wishlade, F. G. (2017), 'The impact of European Cohesion Policy in different contexts', *Regional Studies* 51(6), 817–821.
Gagliardi, L. and Percoco, M. (2017), 'The impact of European Cohesion Policy in urban and rural regions', *Regional Studies* 51(6), 857–868.
Giua, M. (2017), 'Spatial discontinuity for the impact assessment of the EU Regional Policy: The case of Italian Objective 1 regions', *Journal of Regional Science* 57(1).
Gomanee, K., Girma, S. and Morrissey, O. (2005), 'Aid, public spending and human welfare: evidence from quantile regressions', *Journal of International Development: The Journal of the Development Studies Association* 17(3), 299–309.
Hamilton, C. (1999), 'The genuine progress indicator methodological developments and results from Australia', *Ecological Economics* 30(1), 13–28.
Hardeman, S., and Dijkstra, L. (2014). The EU regional human development index. JRC Science and Policy Reports. Luxembourg: Publications Office of the European Union.

Imbens, G. W. and Rubin, D. B. (2015), *Causal inference in statistics, social, and biomedical sciences*, Cambridge University Press.

ISTAT (2019), *BES 2019: Il benessere equo e sostenibile in Italia*, Istituto Nazionale di Statistica.

Ivaldi, E., Bonatti, G. and Soliani, R. (2016), 'The construction of a synthetic index comparing multidimensional well-being in the European union', *Social Indicators Research* 125(2), 397–430.

Ivanova, I., Arcelus, F. J. and Srinivasan, G. (1999), 'An assessment of the measurement properties of the human development index', *Social Indicators Research* 46(2), 157–179.

Kovacevic, M. et al. (2010), 'Review of HDI critiques and potential improvements', *Human development research paper* 33, 1–44.

Mazziotta, M. and Pareto, A. (2019), 'Use and misuse of PCA for measuring well-being', *Social Indicators Research* 142(2), 451–476.

Medeiros, E. (2017), 'European Union Cohesion Policy and Spain: a territorial impact assessment', *Regional Studies* 51(8), 1259–1269.

Murias, P., Novello, S. and Martinez, F. (2012), 'The regions of economic well-being in Italy and Spain', *Regional Studies* 46(6), 793–816.

Nordhaus, W. D. and Tobin, J. (1973), Is growth obsolete?, *in* 'The measurement of economic and social performance', Nber, pp. 509–564.

Nussbaum, M., Sen, A., Sen, M. A. et al. (1993), *The quality of life*, Oxford University Press.

OECD (2011), *How's life?: Measuring well-being*, OECD Paris.

OECD (2011), 'Compendium of OECD well-being indicators', *Organization for Economic Cooperation and Development (OECD), Better Life Initiative, Paris. http://www. oecd. org/sdd/47917288.pdf* .

Paliova, I., McNown, R. and Nülle, G. (2019), *Multiple Dimensions of Human Development Index and Public Social Spending for Sustainable Development*, International Monetary Fund.

Palumbo, L. (2013), 'A post-GDP critique of the Europe 2020 strategy', *Procedia - Social and Behavioral Sciences* 72, 47–63.

Parente, F. (2019), 'A multidimensional analysis of the EU regional inequalities', *Social Indicators Research* 143(3), 1017–1044.

Pellegrini, G., Terribile, F., Tarola, O., Muccigrosso, T. and Busillo, F. (2013), 'Measuring the effects of European regional policy on economic growth: A regression discontinuity approach', *Papers in Regional Science* 92(1), 217–233.

Percoco, M. (2017), 'Impact of European Cohesion Policy on regional growth: does local economic structure matter?', *Regional Studies* 51(6), 833–843.

Perrons, D. and Dunford, R. (2013), 'Regional development, equality and gender: Moving towards more inclusive and socially sustainable measures', *Economic and Industrial Democracy* 34(3), 483–499.

Pinar, M. (2019), 'Multidimensional well-being and inequality across the European regions with alternative interactions between the well-being dimensions', *Social Indicators Research* 144(1), 31–72.

Quality of Government Institute (2010), Measuring The Quality of Government and Sub-national Variation, Report for the European Commission Directorate-General Regional Policy and Directorate Policy Development.

Rodríguez Pose, A. and Novak, K. (2013), 'Learning processes and economic returns in European Cohesion Policy', *Investigaciones regionales* (25), 7–26.

Sánchez-Domínguez, Á. and Ruiz-Martos, M. J. (2014), 'A progressive approach to the measurement of regional performance in the European union', *Journal for a Progressive Economy* 3(1), 62–104.

SDSN and IEEP, (2019), 'The 2019 Europe Sustainable Development Report', Sustainable Development Solutions Network and Institute for European Environmental Policy: Paris and Brussels.

Segre, E., Rondinella, T. and Mascherini, M. (2011), 'Well-being in Italian regions. Measures, civil society consultation and evidence', *Social Indicators Research* 102(1), 47–69.

Sen, A. (1985), *Commodities and Capabilities*, Amsterdam: North-Holland.

Sen, A. (1989), 'Development as capability expansion', *Journal of Development Planning* 19(1), 41–58.
Silva, R. and Ferreira-Lopes, A. (2014), 'A regional development index for Portugal', *Social Indicators Research* 118(3), 1055–1085.
Sirgy, M. J. (2011), 'Theoretical perspectives guiding qol indicator projects', *Social Indicators Research* 103(1), 1–22.
Stiglitz, J. E., Sen, A. and Fitoussi, J. P. (2009), 'Report by the commission on the measurement of economic performance and social progress', Paris, *Online at: www. stiglitz-senfitoussi. fr* .
Surubaru, N.-C. (2017), 'Administrative capacity or quality of political governance? EU Cohesion Policy in the new Europe, 2007–13', *Regional Studies* 51(6), 844–856.
Tomaney, J. (2017), 'Region and place III: Well-being', *Progress in Human Geography,* 41(1), 99–107.
Tomaselli, V., Fordellone, M. and Vichi, M. (2020), 'Building well-being composite indicator for micro-territorial areas through PLS-SEM and K-means approach', *Social Indicators Research* pp. 1–23.
UN (2015), 'Sustainable development goals', *SDGs, Transforming our world: the 2030 Agenda for Sustainable Development* 2030, 338–350.
UNDP, H. (1990), 'Human development report'.
UNDP, H. (2019), 'Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century', *Human Development Report 2019*.
World Bank (2005), *Where is the Wealth of Nations?: Measuring Capital for the 21st Century*, World Bank.

Appendix

Data Sources and Composition of the Analyzed Sample

The dataset for the present analysis has been built exploiting the availability of the data on the regional CP expenditure provided by the European Commission. The main source of data for the variables included in the estimated model is Eurostat but, in case of missing value in the Eurostat database for the selected variables, other sources of data have been employed. In particular, for the share of tertiary education, we recur to the ESPON database, for the GDP per capita, to the JRC regional database and, for the life expectancy at birth, to the OECD regional database and the ESPON.

To reconstruct the changes in the NUTS 2 classification the Eurostat guidelines have been followed. The result is a complete dataset of all but one NUTS 2013 regions; the region excluded from the analysis is FRY4, for which data on education were missing at the time of writing.

For the control variable of Quality of Government Index, since the Quality of Government Institute provided the calculation only for 2010, 2013 and 2017, we assign the value 2010 of the Index from 2008 to 2010, the value 2013 for years from 2011 to 2013 and the value 2017 from 2014 onwards. Moreover, since the Index is not calculated at NUTS 2 level for all the countries, the value of the Index at NUTS 1 level has been considered (the value has been assigned to all the NUTS 2 regions belonging to the NUTS 1).

Printed by
Gi&Gi srl - Triuggio (MB)
October 2021

9788834350355