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Multidimensional Well-being and Regional Disparities in Europe*

Abstract

Using data from the OECD Regional Well-Being Index – a set of quality-of-life indicators measured at the sub-national level, we construct a set of composite well-being indices. We analyse the extent to which the choice of five alternative aggregation methods affects the well-being ranking of regions. We find that regional inequality in these composite measures is lower than regional inequality in gross-domestic product (GDP) per capita. For most aggregation methods, the rank correlation across regions appears to be quite high. It is also shown that using alternative indicators instead of GDP per capita would only have a small effect on the set of regions eligible for aid from EU Structural Funds. The exception appears to be an aggregation based on how individual dimensions of welfare relate to average life satisfaction across regions, which would substantially change both the ranking of regions and which regions would receive EU funds.

Keywords: well-being, regional economic policy, EU structural funds, composite index

JEL Classification: C31 ,I31, R10

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1 Introduction

The discussion of whether Gross Domestic Product (GDP) per capita is an adequate measure of human well-being is an evergreen topic. Its roots can be traced back at least to the nineteenth century, when social scientists were already discussing how comprehensive statistical analyses (to the extent that they were available at the time) could be used to measure social progress and inform policy-makers (for a survey of this early literature, see e.g., aus dem Moore and Schmidt, 2013). Even the creators of the GDP concept aimed to develop an overall measure of social well-being and long-term social progress beyond providing a concise measure of short-term economic fluctuations and business cycles (see Kuznets, 1934). Indeed, the debate over how social well-being and progress should be measured also went through its own cycles. Phases in which well-being indices were intensively discussed, for example at the end of the 1960s and the early 1970s (see aus dem Moore and Schmidt (2013) and Coyle (2014) for an overview of the discussion), were followed by periods in which policy-makers and the public showed little interest in looking "beyond GDP".

The development of comprehensive measures of social progress in recent years, including much broader information on various aspects of social and individual well-being beyond the purely economic dimension, has received increased attention both in academic research and in the political sphere (Fleurbaey, 2009). In 2008, the so-called Stiglitz-Sen-Fitoussi-Commission thoroughly described the limits of GDP as a measure of social progress and proposed how currently available information should be used to develop alternative and more adequate measures (Stiglitz et al., 2009). The German *Bundestag* established a related commission of inquiry that also worked on the topic for two-and-a-half years and eventually proposed an indicator set to better monitor aspects of "growth, prosperity and quality of life" (as the commission was named, Deutscher Bundestag, 2013). For the UK, the National Statistical Office publishes a so-called Well-Being Wheel to illustrate changes in numerous quality of life indicators (Evans et al., 2015). This list of examples is by no means exhaustive (see Garcia Diez, 2015, for an overview of recent contributions).

It seems uncontroversial to claim that solely looking at economic indicators allows only a narrow view of what constitutes well-being, and that considering additional indicators from other dimensions (social, environmental, etc.) may broaden our perspective considerably. It is less clear to what extent providing additional indicators to policy-makers will lead to changes in actual policy-making.[1] This is still an empirically unresolved question. Kassenböhmer and Schmidt (2011) argue that most variation in social indicators proposed by the Stiglitz-Sen-Fitoussi-Commission coincides with that of GDP and the unemployment rate such that there is only little additional information in these indicators. The opposite view is taken, for example, by Jones and Klenow (forthcoming), who argue that while a welfare measure "beyond GDP" is highly correlated with GDP per capita, deviations between both figures are often sizeable.

In this study, we conduct an exploratory analysis of whether, and if so how, the evaluation of regional inequalities in Europe differs depending on which well-being indices are examined. We use data from the OECD Regional Well-Being Index (OECD, 2014b) for the year 2013. This index contains data on nine separate dimensions of well-being. The data are regionally disaggregated at the OECD's TL2-level, which corresponds to the EU's NUTS-1 level in some countries, and to the NUTS-2 level in others.[2] Aside from examining the nine dimensions separately, we construct alternative composite indices of well-being by applying different aggregation techniques.

We study the following problems:

1. How can the well-being dimensions proposed by the OECD be aggregated to a composite index?

2. To what extent does the disparity between European regions change if an alternative composite well-being index is used?

3. Does the welfare ranking of regions in general and the selection of regions that may receive support from EU Structural Funds change if a composite well-being index is used as a benchmark instead of GDP per capita?

The paper is organized as follows: In Section 2, we survey some relevant aspects of the related literature concerning the measurement of welfare, particularly at the regional level. In Section 3, we describe the data. In Section 4, we present the different aggregation methods used to obtain composite well-being indices. Section 5 discusses empirical results regarding regional disparities and ranking across regions as well as some implications for economic policy. The final section provides some conclusions.

[1] Only if alternative indicators have the potential to change policy-making, they will attract persistent attention from policy-makers and the general public (see Jochimsen and Raffer, 2014; Huschka and Wagner, 2010).

[2] Estonia and Luxembourg do not define regions at the NUTS-1 and -2 levels such that these two countries are represented at the NUTS-0 level.

2 Related Literature

In this section, we briefly discuss some of the issues brought forward against using GDP as a measure of welfare, present classifications of alternative welfare measures and give a short overview of the literature on regional wellbeing.

2.1 Critique of GDP

Objections against an exclusive assessment of welfare by GDP are numerous (see e.g. Costanza et al., 2009; van den Bergh, 2007, 2009; Stiglitz et al., 2009). First, GDP has conceptual limits: It only accounts for potential welfare-changing activities that take place on markets (e.g., housework activities, voluntary work or activities in the shadow economy). As a gross indicator it also does not consider any depreciation. Second, GDP as a flow figure generally does not measure any changes in stock variables, such as wealth. This also implies that resource consumption and environmental damage are not included in the index (Wahl et al., 2010). In contrast, so-called "defensive costs" (Nordhaus and Tobin, 1972), for example, repair costs of environmental damages, raise GDP accordingly. Third, a criticism can also be levelled that income distribution is ignored (Wahl et al., 2010). Fourth, GDP also insufficiently records quality changes of products with a high degree of innovation (Landefeld and Grimm, 2000). Aside from conceptual limitations, measurement problems also matter, since GDP is, at least partly, based on results of surveys all with related problems (Coyle, 2014).

2.2 Classification of Alternative Welfare Measures

Due to objections against GDP as a welfare indicator, a number of alternatives and complements have been proposed. These proposals can be grouped into indicator dashboards and single number indicators (van Suntum and Lerbs, 2011, see Figure 1).

An indicator dashboard (or indicator set) is a bundle of indicators that represent certain welfare dimensions (e.g., health or education) (Wesselink et al., 2007). Most creators of dashboards refrain from further aggregating indicators, as this implies personal judgments. Therefore, dashboards use the "pure" information as given directly by the indicators. Examples for indicator dashboards include the Environmental Accounting of the Federal Statistical Office of Germany (2014) or the OECD Better Life Index (OECD, 2015a).

The group of single number indicators can be further divided into two subgroups: (i) adjusted economic indices that are expressed in monetary value,

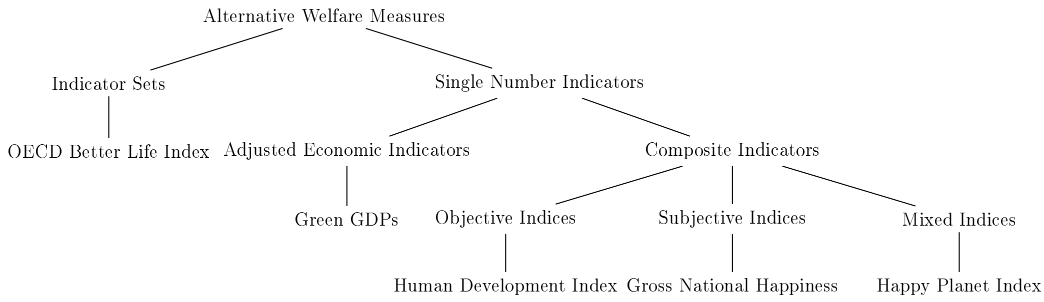


Figure 1: Classification of Alternative Welfare Measures
Source: Based on van Suntum and Lerbs (2011).

and (ii) composite well-being indices having no value dimension (van Suntum and Lerbs, 2011). Adjusted economic indicators are based on economic measures, which are then extended by monetarized values of public “goods” or “ bads” (pollution, crime, leisure etc.). An example for these kinds of indicators is the Genuine Progress Indicator of Talberth et al. (2007). Single-number composite indices, on the other hand, are aggregates of a selection of normalized indicators. They can be further differentiated into three types depending on the kind of data used. First, those exclusively using “objective” data from statistical sources (e.g., life expectancy rates). An example is the Human Development Index provided by the United Nations Development Programme (UNDP, 2014). Second, measures that exclusively use “subjective” data from life satisfaction or happiness surveys measuring the cognitive or affective evaluation of individuals’ lives. For example the rankings contained in the World Happiness Report (Helliwell et al., 2015). Third, those measures that combine both social and subjective well-being indicators (Diener and Suh, 1997). The Happy Planet Index (Abdallah et al., 2012) represents this kind of composite index, which relates subjective well-being and health to the resource use of each nation.

2.3 Literature on Regional Well-Being

There are studies that measure well-being at the *regional* level. A study by Stewart (2005) examines whether traditional economic indicators, such as GDP and the unemployment rate, also reflect regional well-being in a broader sense. Correlations between alternative well-being indicators, representing five different social spheres (material well-being, productive activity, education, health, and social interaction), and GDP confirm that the latter is a good proxy for measuring well-being. In a further step, both measures are regressed on the alternative well-being indicators. Again, GDP performs better (explaining three out of four dimensions) in a model without country dummies. The author concludes that EU regional policy is right to use GDP as a proxy for regional well-being to allocate structural funds.

Another study by Okulicz-Kozaryn (2012) tries to support the so-called "livability theory" on the regional level, which proposes that living conditions have a significant effect on life satisfaction. The author estimates the influence of living conditions measured by GDP per capita on life satisfaction. He finds that regional income does matter for life satisfaction, even when controlling for personal and national income. Furthermore, the life satisfaction gap between the rich and poor is smaller in rich than in poor regions.

Lawless and Lucas (2011) try to predict well-being at the county level in the United States. They find that life satisfaction correlates positively with objective indicators at community level (including poverty rates, rates of marriage or average education). The authors emphasize that well-being analyses at the regional level give interesting new insights, for example on how people choose certain regions to live or work in.

On the whole, the literature shows that it is possible to obtain a more detailed, regionally differentiated picture of well-being by examining the regional variation of indicators typically used at the national level as well as using measures that are only suited for regional analyses. However, there is generally less data available at the regional level than at the national level.

3 Data and Methods

The following analysis concentrates on European regions that are covered by the OECD Regional Well-Being Index (OECD, 2014b). For the geographical base of the index, the OECD uses their own regional classification, the so-called TL-2 level[3]. The analysis covers 176 regions.

3.1 The OECD Regional Well-Being Index

We are measuring welfare in a region with the OECD Regional Well-Being Index (Figure 2; for an overview, see OECD, 2014b). It is part of the OECD's Better Life Initiative and conceptually based on its Better Life Index calculated for the national level (OECD, 2015a). The regional index offers users a broader view of social well-being based on a wide range of welfare dimensions.

[3] This level comprises larger regions within countries and corresponds to the EU NUTS-0 level (nation states) in two countries, the NUTS-1 level (approx. 3-7 million inhabitants) in 5 countries and the NUTS-2 level (approx. 800,000 - 3 million inhabitants) in 14 countries.

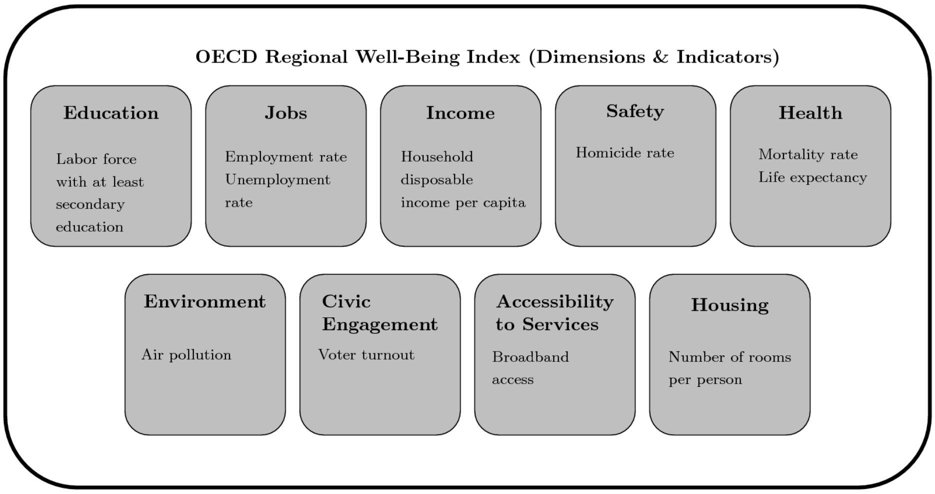


Figure 2: The OECD Regional Well-Being Index
Source: OECD (2014b).

The OECD measures welfare at the regional level using a dashboard index based on nine different dimensions (see Figure 2). Each dimension represents the well-being of individuals as well as local living conditions, where both are assumed to affect people's personal situation (OECD, 2014c). The nine dimensions consist of eleven internationally comparable indicators, representing material conditions (income, housing and jobs) as well as quality of life (health, education, environment, security, civil engagement and access to services). Table 1 provides details on each of the dimensions and the indicators they are built on. The underlying data is available at the OECD Regional Statistics Database (2015b).

3.2 Subjective Well-Being

The OECD Regional Well-Being Index contains only objective aspects of well-being. In some of our aggregation schemes, we evaluate how these objective variables relate to subjectively perceived well-being. Our data source for subjective well-being is the European Social Survey (ESS, 2015). Carried out every second year since 2002 and covering all individuals older than 15 years, this survey of private households in 36 countries asks how people think, feel and behave. The achieved sample size is about 1,500 respondents per country (or 800 if the country has less than two million inhabitants according to the ESS sample specification). Subjective well-being is measured by asking people: "How satisfied are you with your life as a whole?" Respondents can answer on a scale from 0 ("extremely dissatisfied") to 10 ("extremely sat-

Table 1: Dimensions and Indicators of the OECD Regional Well-Being Index

Dimension	Indicator	Unit/Calculation	Justification for inclusion mentioned by OECD
		Material Conditions	
Income	Household disposable income per capita	US dollar in PPP of 2005	Allows people to satisfy their basic needs and meet other purposes important for their lives.
Jobs	Employment rate	Ratio between employed persons to working age population (15-64)	Impact on material conditions of people. It gives them the possibility to maintain and develop their skills.
	Unemployment rate	Ratio between unemployed persons and overall labor force	
Housing	Rooms per person	Average number of rooms per person in dwellings	Housing costs represent large share of household expenditures. Appropriate shelter is a basic human need.
		Quality of Life	
Access to Services	Broadband access	Share of households with internet broadband access in percent	Reflects the opportunities available to people in different regions. Allows to measure inequality in communities.
Civic Engagement	Voter turnout	Ratio between the number of voters to the number of persons with voting rights in national elections	OECD assumes this to be a good indicator for public trust in political processes.
Environment	Air pollution level	Weighted average value of particulate matter (PM) with a diameter of 2.5 micrometers or less	This dimension is closest to represent sustainability as local environment quality also affects future generations
Health	Life expectancy at birth	Number of years a new born can expect to live given constant death rates	Important part of people's quality of life. It is a good measure for unequal access to health services.
	Age-adjusted mortality rate	Share of age-specific death rates of one region to the age distribution of a standard population	
Safety	Homicide rate	Number of reported intentional murder per 100,000 inhabitants	The local crime situation influences the quality of life of people. People's well-being not feeling safe or are in fear of crime is affected negatively.

Source: OECD (2014c).

isfied"). The ESS provides data for 156 of the 176 regions in our sample, see Appendix Table 1.

3.3 GDP per capita

GDP per capita is often used to rank the well-being of nations. To evaluate the extent to which using alternative indicators affects these rankings, we will compare the results obtained from composite indices with those corresponding to GDP per capita. We use GDP at current market prices from the Eurostat Regional Statistics Database (2015). The GDP data is available for the NUTS-0, NUTS-1 and NUTS-2 level.

3.4 Normalization

The OECD normalizes the data of each dimension to ease comparison. This is done in two steps. First, variables are censored at a lower (4^{th} percentile) and upper (96^{th} percentile) limit to achieve a more even distribution and to avoid undue influence of strong outliers.[4] Second, a min-max formula (Equation 1) is applied to transform all variables on a 0-10 scale (OECD, 2014c)[5]:

$$\text{Normalized Indicator}_i = \left(\frac{IN_i - min(IN)}{max(IN) - min(IN)}\right) * 10 \qquad (1)$$

with N different regions, $IN = (IN_1, ..., IN_N)$. Indicators for which a low value is assumed to correspond to higher welfare, i.e., unemployment rate, homicide rate, air pollution and the mortality rate, are inversely coded.

The dimensions *Jobs* and *Health* are based on two indicators. In these cases, the arithmetic means of the two normalized indicators are calculated.

4 Determining Composite Well-Being Indices

The OECD proposes to use its indicator as a dashboard. Nevertheless, economic policy often needs directly comparable information that demands a high level of information aggregation. In other words, for the purposes of economic policy-making, it might be important to have a *single* number representing the alternative welfare measure. For example, to compare well-being

[4] For the homicide rate, the OECD uses the 10^{th} and 90^{th} percentiles.

[5] Since we restrict our analysis to regions of European OECD member states, we have conducted the normalization process for welfare dimensions only for this subset of OECD regions.

across time and countries, the OECD has also occasionally used composite indices (OECD, 2014a).

The main problem when constructing aggregate welfare indices is the determination of how to weight the different welfare dimensions. In the following, we describe a selection of methods to construct composite indices discussed in the social indicators literature and apply them to the welfare dimensions suggested by the OECD.

4.1 Aggregation

We apply five different weighting methods:

- Method 1: Assign equal weights to all welfare dimensions.
- Method 2: Determine weights using factor analysis, following Nardo et al. (2008).
- Method 3: Determine weights using factor analysis, following Berlage and Terweduwe (1988).
- Method 4: Obtain weights from a regression of life satisfaction on the different OECD welfare dimensions.
- Method 5: Obtain weights from a regression of life satisfaction on the factors obtained from factor analysis.

Method 1: Equal Weights

In the first method, we calculate a composite index (I) with equal weights for each dimension:

$$I_i = \frac{1}{9}\sum_{j=1}^{9} x_{ij} \tag{2}$$

where x_{ij} is the j-th (of nine) well-being dimensions of region i.

Method 2: Factor Analysis I (Nardo et al., 2008)

In its "Handbook on Constructing Composite Indicators", the OECD proposes, *inter alia*, to use factor analysis or principal component analysis (PCA) to determine the necessary weights (Nardo et al., 2008). This method is regularly applied in the generation of composite indices because it allows simplifying the data structure without sacrificing too much information. The

PCA identifies principal components or factors (i.e., transformed composites of the observed variables) that contain independent (i.e., uncorrelated) information capturing as much of the original variation in the data as possible. Intuitively, more correlation in the original indicators leads to a smaller number of factors that suffice to represent the relevant informational content of the original data. Nardo et al. (2008) recommend as "standard practice" to extract factors based on the following criteria: (i) choose those with an eigenvalue >1, (ii) choose those which contribute individually to overall variance by more than 10 per cent, (iii) choose the number of factors such that the cumulative explanation of overall variance is larger than 60 per cent. We follow this rule in our study and extract three factors that cumulatively explain 78 per cent of the variance in the data (Table 2).

Table 2: Eigenvalues and Variances

Number of factors	Eigenvalue	Variance (%)	Cumulative Variance (%)
1	3.904	43.4	43.4
2	2.158	24.0	67.4
3	1.007	11.2	78.6
4	0.575	6.4	84.9
5	0.425	4.7	89.7
6	0.344	3.8	93.5
7	0.276	3.1	96.6
8	0.205	2.3	98.8
9	0.105	1.2	100.0

Source: Own calculations.

To ease the interpretation of the factors, we use a Varimax rotation to ensure that individual indicators load on as few factors as possible. The results are shown in Table 3.

Nardo et al. (2008) propose to determine the intermediate components by assigning each original dimension to the retained factor on which it has the highest squared loading. In our case, component 1 comprises civic engagement, income, safety and health, while education, jobs and accessibility to services enter component 2, and environment and housing make up component 3. The values of the intermediate components are then calculated as the weighted average values of the welfare dimensions assigned to that component.[6] The overall composite index is then calculated as the weighted average

[6]Where the weights are given by the squared factor loadings of all dimensions assigned to this factor, rescaled to unity sum (see also Nicoletti et al., 2000).

Table 3: Loadings and Variances for Factor Analysis I

Dimension	Factor Loading			Squared Factor Loading		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Civic Engagement	0.793	0.202	0.076	0.200	0.017	0.004
Education	−0.382	0.751	−0.377	0.046	0.240	0.091
Jobs	0.259	0.853	−0.102	0.021	0.310	0.007
Income	0.789	0.358	0.177	0.197	0.055	0.020
Safety	0.765	−0.011	0.042	0.186	0.000	0.001
Health	0.879	−0.117	0.267	0.245	0.006	0.045
Enviroment	0.120	−0.072	0.931	0.005	0.002	0.552
Accessiblity to Services	0.168	0.853	0.312	0.009	0.310	0.062
Housing	0.537	0.374	0.586	0.092	0.060	0.219
Explained Variance	3.153	2.348	1.569			
Expl. Var. / Total	0.446	0.332	0.222			

Source: Own calculations.

Notes: Squared factor loadings are rescaled to unity-sum.

of the intermediate components' values. Here, the weights correspond to the proportion of the overall variance explained by this factor (bottom line in Table 3). Formally, the composite index for region i is thus calculated as

$$I_i = \sum_{j=1}^{9} \omega_j x_{ij} \tag{3}$$

with

$$\omega_j = \sum_{m=1}^{M} \left[\frac{\text{ExplainedVariance}_m}{\sum_{l=1}^{M} \text{ExplainedVariance}_l} \frac{(\text{loading}_{j,m})^2}{\sum_{n=1}^{9} (\text{loading}_{n,m})^2} \right] \tag{4}$$

where M is the number of retained components, and where the loading of indicator j in component m is set to zero when it has not been assigned to this component. The calculated weights are presented in Table 4, Column 2.

The method proposed by Nardo et al. (2008) provides a technically consistent, data-driven approach to construct a composite welfare index. It makes use of factor analysis to simplify the data structure based on the correlation of individual indicators. It determines the weights assigned to each indicator on the basis of proportions of explained variances. An important caveat to this method is that there is no reason to suppose that a statistical property, such as the correlation between indicators, captures meaningful trade-offs between these indicators with respect to well-being. This is also conceded by Nardo et al. (2008, p. 89) when they write that "weighting intervenes only to correct for overlapping information between two or more correlated indi-

Table 4: Weights for each Dimension of Method 1 to 5

Dimension	Method 1	Method 2	Method 3	Method 4	Method 5	Range
Civic Engagement	0.111	0.108	0.120	−0.054	0.105	0.174
Education	0.111	0.097	−0.009	0.462	0.170	0.471
Jobs	0.111	0.125	0.106	0.098	0.232	0.134
Income	0.111	0.107	0.147	−0.424	0.139	0.571
Safety	0.111	0.100	0.091	0.047	0.052	0.064
Health	0.111	0.132	0.119	0.626	0.026	0.600
Environment	0.111	0.148	0.114	0.014	−0.045	0.193
Accessibility to Services	0.111	0.125	0.144	0.095	0.210	0.115
Housing	0.111	0.059	0.168	0.135	0.109	0.109
Standard deviation	0.000	0.024	0.048	0.282	0.084	0.202

Source: Own calculations.

cators and is not a measure of the theoretical importance of the associated indicator".

Method 3: Factor Analysis II (Berlage and Terweduwe, 1988)

A related, but slightly different way of using factor analysis in the construction of composite indices has been proposed by Berlage and Terweduwe (1988). The main differences to the method of Nardo et al. (2008) are a) that the intermediate composites are a weighted combination of all indicators (instead of each indicator being assigned to only one intermediate component) and b) that the weights with which the indicators enter each intermediate component are given by the simple factor loadings (instead of their squares). Effectively, Berlage and Terweduwe (1988) use the values of the factors, as determined in the factor analysis, as intermediate components. Like Nardo et al. (2008), Berlage and Terweduwe (1988) propose to weight the intermediate components with the proportion of the total variance explained by each factor. The effective weight of each welfare dimension in the final composite index, presented in Column 3 of Table 4, is thus given by[7]

$$\omega_j = \sum_{m=1}^{M} \left[\frac{\text{ExplainedVariance}_m}{\sum_{l=1}^{M} \text{ExplainedVariance}_l} \frac{\text{loading}_{j,m}}{\sum_{l=1}^{9} \text{loading}_{l,m}} \right] \tag{5}$$

This method is quite similar to the method proposed by Nardo et al.

[7]Instead of standardizing the dimensions, as proposed by Berlage and Terweduwe (1988), we rescale factor loadings to unity-sum for each factor. This procedure ensures values between 0 and 10 for the composite index, and makes this version of the OECD Index comparable to the other versions we have calculated.

(2008), with the exception that all variables loading on each factor are considered and the factor loadings are not squared. The latter implies that negative factor loadings can also enter the weighting process (see Table 5). However, the derivation of weights from proportions of explained variance still has no obvious connection to an underlying theoretical concept of well-being.

Table 5: Loadings for Factor Analysis II

Dimension	Factor Loading		
	Factor 1	Factor 2	Factor 3
Civic Engagement	0.202	0.063	0.040
Education	−0.097	0.235	−0.197
Jobs	0.066	0.267	−0.053
Income	0.201	0.112	0.093
Safety	0.195	−0.003	0.022
Health	0.224	−0.037	0.140
Environment	0.030	−0.023	0.487
Accessibility to Services	0.043	0.267	0.163
Housing	0.137	0.117	0.306

Source: Own calculations.

Notes: Factor loadings are rescaled to unity-sum.

Method 4: Life Satisfaction Regression on Welfare Dimensions

The fourth method to aggregate welfare dimensions to an overall index builds on the possibility to directly use subjective well-being data to infer how people value the different welfare dimensions. In this "hedonic" approach (Decancq and Lugo, 2013), the weights of different dimensions are obtained from a regression of some measure of subjective well-being (in our case self-reported life satisfaction) on these dimensions.

We estimate a linear cross-sectional regression model. The regression is estimated without an intercept and constraining the sum of coefficients to 1:

$$LS_i = \sum_{j=1}^{9} \beta_j x_{ij} + \epsilon_i \text{ with } \sum_{j=1}^{9} \beta_j = 1 \tag{6}$$

In Equation 6, the dependent variable LS_i represents the life satisfaction in region i, the predictor variables x_{ij} are the values of the nine welfare dimensions j of the OECD Index in region i and ϵ is the error term. The regression results are given in Table 6. In the first column of Panel A, we present unrestricted estimations, in the second column the restricted ones. The regression coefficients directly give the weights to calculate the composite index I for each region i as follows (reported in Table 4, Column 4):

$$I_i = \sum_{j=1}^{9} \beta_j x_{ij} \tag{7}$$

Table 6: Regression Estimates for Methods 4 and 5

Dependent Variable: Life Satisfaction				
Panel A: Regression for Method 4				
Dimension/Factor	Unrestricted regression	With restriction $\sum_{j=1}^{9} \beta_j = 1$	Unrestricted regression	With restriction $\sum_{j=1}^{3} \beta_j = 1$
Civic Engagement	−0.038	−0.054		
	(0.045)	(0.044)		
Education	0.474***	0.462***		
	(0.040)	(0.040)		
Jobs	0.079	0.098*		
	(0.059)	(0.058)		
Income	−0.370***	−0.424***		
	(0.069)	(0.059)		
Safety	0.057	0.047		
	(0.037)	(0.037)		
Health	0.572***	0.626***		
	(0.066)	(0.056)		
Environment	0.049	0.014		
	(0.041)	(0.034)		
Accessibility to Services	0.084	0.095*		
	(0.055)	(0.055)		
Housing	0.124***	0.135***		
	(0.047)	(0.046)		
Panel B: Regression for Method 5				
Factor 1			0.209**	0.291***
			(0.086)	(0.091)
Factor 2			0.828***	0.783***
			(0.068)	(0.076)
Factor 3			0.045	−0.074
			(0.073)	(0.066)
Observations	156	156	156	156
R^2	0.977		0.937	

Source: Own calculations.

Notes: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. The coefficients have been estimated by weighted OLS using the number of observations of survey data available in each region as weights (see Appendix Table 1).

Method 5: Life Satisfaction Regression on Intermediate Components

One of the problems in obtaining weights from a life satisfaction regression on all indicators is that the coefficients are estimated with a high degree of imprecision when the indicators are highly correlated (Decancq and Lugo, 2013). In the fifth method examined in our study, we analyze a potential way to circumvent this problem. Instead of regressing life satisfaction on all indicators, we use the three principal components obtained in Method 3 and regress life satisfaction on them. As in Method 4, our preferred specification has no constant and restricts the sum of all coefficients to 1:

$$LS_i = \beta_1 F_{1,i} + \beta_2 F_{2,i} + \beta_3 F_{3,i} + \epsilon_i \tag{8}$$

where the dependent variable LS_i represents life satisfaction in region i, $F_{1,i}, F_{2,i}, F_{3,i}$ denote the values of the intermediate components and ϵ is the error term. Panel B of Table 6 shows the regression results obtained by this method. The composite index I for region i is given by:

$$I_i = \sum_{j=1}^{3} \beta_j F_{ij} \tag{9}$$

The effective weights ω_j are given by the weighted average of factor loadings of welfare dimension j in the three different factors, where the weights are the β's from Equation 9. The weights are reported in Table 4, Column 5. Comparing the weights obtained by Method 4 and 5 shows that, in Method 4, the income coefficient appears to be negative, large and statistically significant. This finding, however, might be a statistical artefact, since some welfare dimensions are at least strongly correlated with each other such that these estimations suffer from a strong multicollinearity problem. In fact, reducing this problem is a strong motive to apply factor analysis, which reduces the number of independent variables on the right-hand side of the equation, as is done in Method 5. The effective weight attached to income in Method 5 is then positive.

5 Regional Well-Being Disparities and Implications for EU Regional Policy

In this section, we compare the well-being in European regions based on composite indices examine the corresponding differences in regional disparities. Ahead from that, we analyse to what extent funding decisions in EU regional policy, which is supposed to support deprived regions, might be affected by the choice of composite well-being indices.

5.1 Well-Being Disparities Across Regions

In Table 7, some descriptive statistics on the welfare dimensions of the OECD Regional Well-Being Index and of the composite indices calculated using Methods 1 to 5 are presented. It is noteworthy that all composite indices, regardless of the aggregation method applied, show a substantially lower degree of inequality compared to GDP per capita or the individual welfare dimensions. Apparently, extreme values of certain welfare dimensions partially offset each other when being aggregated.

Table 7: Inequality Measures among European Regions

Variable	N	Mean	Inter-quartil Range	Range	Varia-tion Coeffi-cient	Gini-Coeffi-cient
Jobs	176	6.5	3.8	10	0.38	0.21
Income	176	5.6	3.9	10	0.52	0.29
Safety	176	6.1	4.4	10	0.53	0.29
Health	176	6.4	3.1	10	0.44	0.24
Environment	176	4.7	4.8	10	0.61	0.35
Education	176	6.5	3.6	10	0.42	0.23
Civic Engagement	176	5.8	4.3	10	0.49	0.28
Accessibility to Services	176	5.6	4.4	10	0.49	0.28
Housing	176	5.5	5.2	10	0.56	0.32
Method 1	176	6.1	2.2	4.4	0.30	0.17
Method 2	176	5.8	2.8	6.3	0.29	0.16
Method 3	176	5.7	3.3	6.9	0.35	0.20
Method 4	176	6.6	1.8	8.1	0.21	0.11
Method 5	176	6.1	3.4	7.0	0.32	0.18
GDP per capita	176	5.6	4.0	10	0.49	0.23

Sources: OECD (2015b) and own calculations.

This also becomes apparent when looking at the correlation of welfare dimensions across regions (Table 8). While there are mostly high correlations between welfare dimensions, there are also cases in which the correlation coefficient is only small. This is reassuring because if all dimensions were to have a high positive correlation, a composite well-being index could hardly provide any additional information. The imperfect correlation also explains why inequality among regions on the basis of composite indices must appear lower than on the basis of GDP per capita.

Table 8: Correlation Coefficients of Selected Variables Across European Regions

	Jobs	Income	Safety	Health	Environ-ment	Edu-cation	Civic En-gage-ment	Acces-siblity to Ser-vices	Housing	GDP per capita	Method 1	Method 2	Method 3	Method 4	Method 5
Jobs	1	0.51***	0.27***	0.04	−0.07	0.38***	0.32***	0.66***	0.40***	0.66***	0.69***	0.67***	0.64***	0.59***	0.86***
Income	0.46***	1	0.38***	0.62***	0.11	−0.16*	0.55***	0.48***	0.53***	0.77***	0.73***	0.73***	0.74***	0.32***	0.72***
Safety	0.22**	0.44***	1	0.55***	0.20**	−0.34***	0.42***	0.11	0.38***	0.40***	0.56***	0.55***	0.54***	0.35***	0.35***
Health	0.09	0.75***	0.59***	1	0.31***	−0.59***	0.57***	0.04	0.27***	0.49***	0.47***	0.50***	0.49***	0.30***	0.22**
Environment	−0.07	0.20**	0.20**	0.38***	1	−0.40***	0.16*	0.21**	0.44***	0.19*	0.42***	0.46***	0.46***	0.25***	0.06
Education	0.51***	−0.11	−0.26***	−0.48***	−0.38***	1	−0.30***	0.31***	−0.21**	−0.11	−0.02	−0.04	−0.10	0.33***	0.29***
Civic Engagement	0.31***	0.62***	0.48***	0.64***	0.19*	−0.16*	1	0.37***	0.41***	0.68***	0.67***	0.67***	0.67***	0.35***	0.56***
Accessiblity to Services	0.65***	0.47***	0.15	0.14	0.21**	0.42***	0.35***	1	0.52***	0.65***	0.76***	0.75***	0.75***	0.65***	0.85***
Housing	0.37***	0.65***	0.44***	0.52***	0.47***	−0.17*	0.50***	0.54***	1	0.53***	0.73***	0.69***	0.77***	0.44***	0.63***
GDP per capita	0.59***	0.79***	0.39***	0.59***	0.21**	0.03	0.67***	0.64***	0.58***	1	0.81***	0.81***	0.80***	0.49***	0.80***
Method 1	0.62***	0.82***	0.62***	0.69***	0.42***	0.03	0.73***	0.70***	0.80***	0.82***	1	0.99***	0.99***	0.72***	0.89***
Method 2	0.61***	0.82***	0.61***	0.70***	0.46***	0.01	0.73***	0.70***	0.78***	0.82***	1***	1	0.98***	0.72***	0.87***
Method 3	0.53***	0.85***	0.62***	0.75***	0.48***	−0.14	0.74***	0.64***	0.85***	0.81***	0.98***	0.98***	1	0.68***	0.86***
Method 4	0.57***	0.32***	0.40***	0.39***	0.16*	0.49***	0.35***	0.59***	0.40***	0.45***	0.66***	0.66***	0.56***	1	0.69***
Method 5	0.85***	0.72***	0.39***	0.37***	0.06	0.42***	0.58***	0.84***	0.64***	0.79***	0.88***	0.86***	0.81***	0.69***	1

Sources: OECD (2014b) and own calculations.

Notes: Lower triangle: Pearson correlation coefficient. Upper triangle: Spearman rank correlation coefficient. * (**, ***) denotes rejection of the hypothesis of a zero correlation coefficient at the 0.05 (0.01, 0.001) level.

The composite indices are positively and statistically significantly correlated with GDP per capita ($r \approx 0.8$). Furthermore, pairwise correlation coefficients of the composite indices also appear to be large ($r > 0.8$). Thus, despite the conceptual differences among the aggregation methods used, the composite indices show a broadly similar picture of the welfare distribution among European regions. Only Method 4 appears to be somewhat of an exception, since its correlation with the other composite indices is substantially smaller ($r \approx 0.6$) than the pairwise correlations among the other composites, and it is only weakly correlated with GDP per capita ($r = 0.45$).

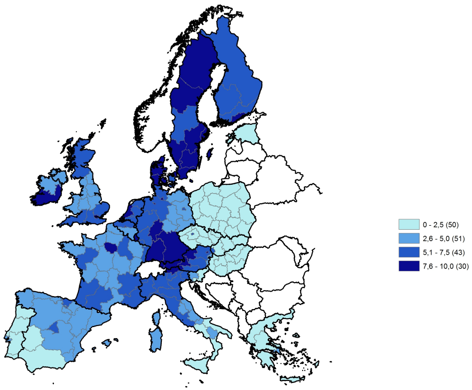
Figure 3 shows how welfare distribution across Europe would change geographically when using the different composite indices instead of GDP per capita. At first glance, the localization of regions with low and high welfare appears to be similar regardless of the indicator used. Closer inspection, reveals some noteworthy exceptions: for example, the eastern European regions are closer to western European ones when looking at alternative composite welfare measures as compared to GDP per capita. Thus, the geographical pattern mirrors the findings regarding the dispersion across regions: the disparities across regions appear to be somewhat smaller for a multidimensional measure of welfare.

5.2 Implications for EU Regional Policy

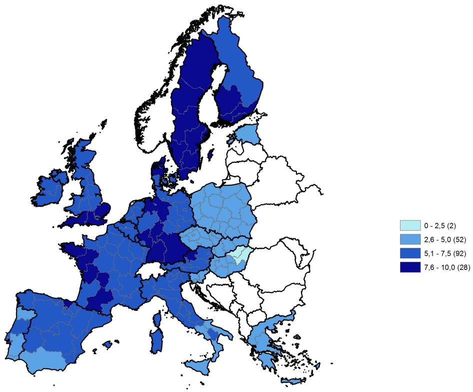
In this section, we examine how the allocation of EU Structural Funds might be affected if a multidimensional measure of well-being was used to determine "neediness" of a region instead of GDP per capita. For this purpose, it does not suffice to know that the composite well-being indices are highly correlated with GDP per capita. Instead, it is necessary to identify exactly which regions would be eligible for EU funds according to each of the different indices.

EU regional policy targets "most of the funds [...] where they are most needed: in regions with a GDP per capita under 75 per cent of the EU average" (for more details on this issue see European Commission, 2014; European Council, 2006).[8] Of course, it would be straightforward to also apply the 75 per cent threshold to the alternative indices. As we have shown in Table 7, however, the alternative indices are generally more equally distributed. Consequently, the number of regions falling below a "75 per cent of the average"-threshold is substantially lower than for GDP per capita. This

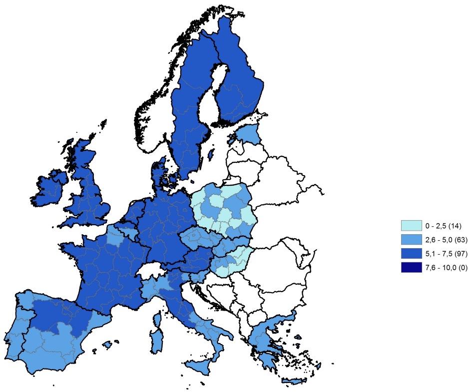
[8]By applying this threshold, we implicitly assume that the need for funding determines the budget allocation in Europe. This perspective contrasts with the power "view", which states that the voting power of the member countries drives the budget decision (Bouvet and Dall'Erba, 2010; Groot and Zonneveld, 2013).



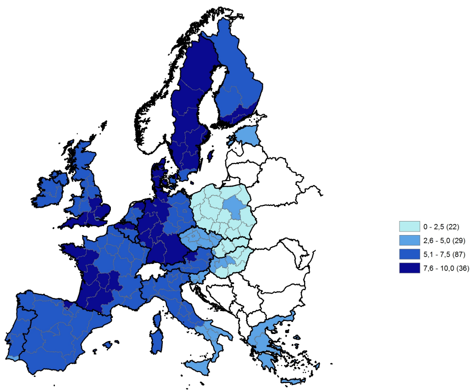
GDP per capita



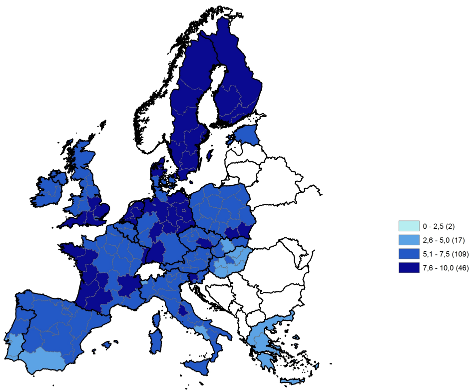
Composite Index, Method 1



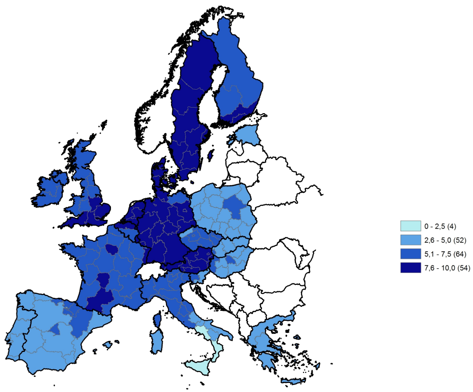
Composite Index, Method 2



Composite Index, Method 3



Composite Index, Method 4



Composite Index, Method 5

Figure 3: Welfare across European Regions According to Alternative Welfare Measures

Source: Own calculations.

Notes: For the definition of the aggregation methods see Section 4.1. For a list of all regions used in the figure see Appendix Table 1.

could be seen as directly implying that the EU needs to spend much less on its regional policy. The more policy-relevant research question, however, seems to be how a budget-neutral policy change would affect the allocation of regional funds. We approximate budget neutrality by determining threshold values for the different composite indices such that the population share living in "needy" regions is the same for the alternative measure as it is for GDP per capita.[9] In our sample of countries that are both EU and OECD members, about 24 per cent of the overall population lives in regions with a GDP per capita below 75 per cent of the average. The cut-off values for each composite well-being index are shown in Table 9. Regions below these cut-off values are treated as "needy".

Table 9: Regions and Cut-offs for EU Funding

		Number of regions...			
	(Cutoff value corresponding to 24 % of population)	..in beneficiary group according to GDP and the composite indicator	..that drop out of the beneficiary group under the composite indicator	..that enter the beneficiary group under the composite indicator	..that do not receive funding according to either criterion
Method 1	4.93	52	6	4	114
Method 2	5.02	52	6	5	113
Method 3	5.29	53	5	4	114
Method 4	5.78	29	29	16	102
Method 5	4.76	46	12	7	111

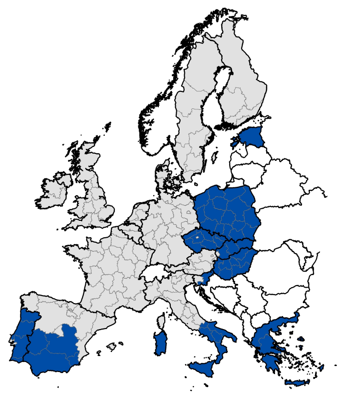
Source: Own calculations.

Columns 2 to 5 of Table 9 illustrate the implications for EU regions if funding policy was to be based on the composite indices. The table shows how many regions would switch from receiving to not receiving EU funds, and *vice versa*, if a composite well-being index was used instead of GDP per capita. The results in Table 9 (see also Figure 4) elicit two groups of aggregation methods with similar effects on the allocation of EU regional funds. The first group consists of Method 1 (the simple average of the welfare dimensions) as well as both aggregation method versions using factor analysis (Method 2 and 3). The number of funded regions does not differ much from the number of regions funded according to GDP per capita, and the composition of drop-outs and newcomers between these three indices does not differ heavily (for a detailed list of the regions, see Appendix Table 2). For example, of the 58 regions that are eligible for financial support under the GDP per capita criterion (see Appendix Table 3), only six (located in Italy, Portugal and Spain) would not be regarded as "needy" according to the indi-

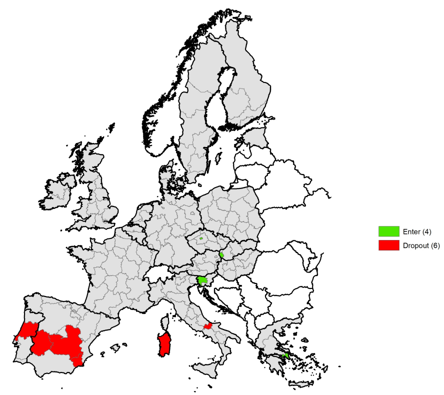
[9]We obtain similar results if we instead choose thresholds such that the same number of regions receive EU funding under alternative different indices.

cator constructed following Method 1. Switching to this alternative indicator would add only four regions to the group eligible for support that were not already eligible according to the GDP criterion. This group is comprised of some of the capital regions in eastern and southern European countries. Dramatically stronger differences are found for Method 4. Here, only 29 regions, i.e., half of the GDP group, are eligible under both GDP and the composite index. Switching to the alternative indicator would drive the other half out of the beneficiary group (eastern and southeastern Europe, southern Italy, central Spain).[10] 16 otherwise unsupported regions are pulled into this group (eastern and southern European capitals, Scotland, northern France, Belgium, Luxemburg, northern Italy, eastern Spain). The large differences between the GDP criterion and the composite index reflect the substantially different weights that Method 4 assigns to some of the welfare dimensions, in particular income, education and health. Method 5 produces more switches than Methods 1 to 3, but less than Method 4. However, the selection of regions that are only eligible according to the alternative index is quite different from Method 4 (it coincides only for three regions). On the whole, the issue of whether using composite well-being indices change the selection of regions that benefit from EU regional policy depends on how the various welfare dimensions are aggregated. While some aggregation methods would cause only little change in the allocation of regional funds, other methods would have substantial effects on the allocation of funds in EU regional policy.

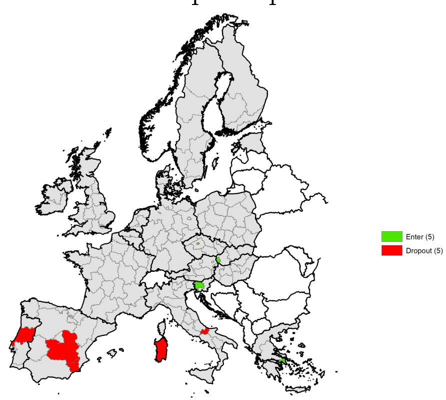
[10]For some eastern European countries, switching to the alternative index would mean a strong change concerning EU funds, for example, only one region out of seven in the Czech Republic and only two out of 16 regions in Poland would still be eligible for funding.



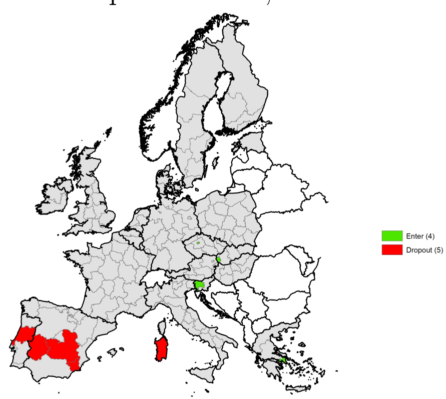
GDP per capita



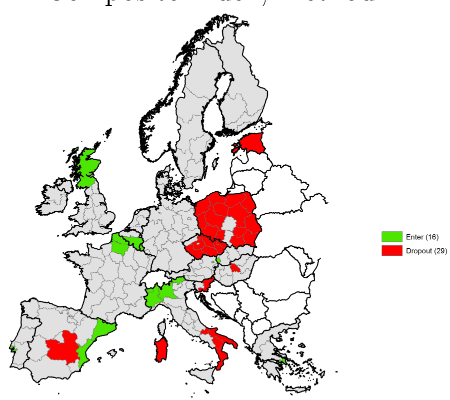
Composite Index, Method 1



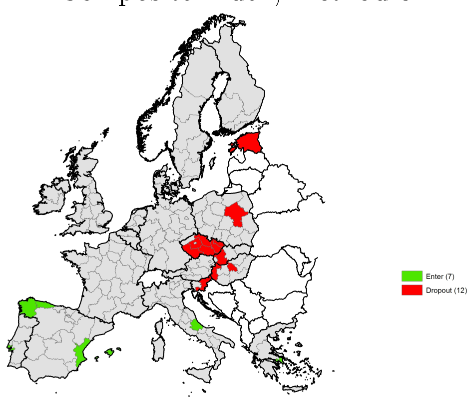
Composite Index, Method 2



Composite Index, Method 3



Composite Index, Method 4



Composite Index, Method 5

Figure 4: Regions with a GDP per capita below 75 % of the EU Average and Regions that enter or drop out of the Beneficiary Group under Composite Index

Source: Own calculations. Notes: For the definition of the aggregation methods see Section 4.1. For a list of the regions shown in the figure see Appendix Table 2 and 3.

6 Conclusion

We analyse a recently proposed alternative to GDP per capita - the regional variant of the OECD Better Life Index (OECD, 2015a) - as a measure of welfare in 176 European regions.

We use five different approaches to aggregate the nine welfare dimensions of the OECD Regional Well-Being Index (OECD, 2014b) to a composite index of regional welfare. We find that regional inequality lessens considerably compared to GDP per capita if the analysis is based on composite alternative welfare measures. This suggests that the living conditions in Europe are more equal than income or productivity differences seem to suggest.

We address some implications for regional policy. In particular, we discuss whether switching to multidimensional well-being indices would alter the allocation of EU regional funds. Our results show that this depends heavily on the chosen aggregation method. While some methods tend to produce relatively equal weights for all welfare dimensions and result in regional rankings that are very much in line with those generated by GDP per capita, other methods produce weighting schemes that emphasize only a few dimensions and might cause substantial changes in regional "neediness". Since there is no *a priori* reason to favour one method over the other, our results suggest that it is unlikely that multidimensional well-being indices will be able to provide unambiguous, consistent and reliable rankings of regions.

The discussion of the aggregation techniques and the results we receive using OECD data raise doubts about the usefulness of such composite well-being indices. On the one hand, we find that the correlation of many alternative composite measures with GDP per capita is quite high. This suggests that the broad picture regarding the welfare distribution across European regions is rather similar to the impression obtained by the traditional measure of GDP per capita. However, some of the aggregation methods proposed in the literature seem to be purely data-driven and lack a sufficient connection to theoretical concepts of well-being. Other methods might be better related to an underlying concept of well-being, but their empirical implications are, in some cases, hard to reconcile with economic intuition. A telling example is the strong negative effect of income found in Method 4, which implies that, for example, Luxembourg should become eligible for EU regional aid. Due to these ambiguities and inconsistencies, it seems recommendable to use the OECD Regional Well-Being Index as a well-being dashboard, and to abstain from further aggregation. Examining welfare dimensions individually has the potential to give much richer insights than comparing rather arbitrary composite well-being measures.

In our view, further research should concentrate on discussing the explicit and implicit assumptions underlying alternative welfare measures and critically discuss their theoretical foundations. This will be helpful in constructing better and more plausible alternatives and complements to GDP as a measure of welfare.

References

Abdallah, S. / *Michaelson,* J. / *Shah,* S. / *Stoll,* L. / *Marks,* N. (2012): "The Happy Planet Index: 2012 Report. A Global Index of Sustainable Well-Being", New Economics Foundation, London, available at: «http://www.happyplanetindex.org/assets/happy-planet-index-report.pdf».

aus dem Moore, N. / *Schmidt,* C. M. (2013): "On the Shoulders of Giants: Tracing Back the Intellectual Sources of the Current Debate on 'GDP and Beyond' to the 19th Century", Journal of Economics and Statistics 233(3), 266–290.

Berlage, L. / *Terweduwe,* D. (1988): "The Classification of Countries by Cluster and by Factor Analysis", World Development 16(12), 1527–1545.

Bouvet, F. / *Dall'Erba,* S. (2010): "European Regional Structural Funds: How Large is the Influence of Politics on the Allocation Process?", JCMS 48(3), 501–528.

Costanza, R. / *Hart,* M. / *Posner,* S. / *Thalbert,* J. (2009): "Beyond GDP: The Need for New Measures of Progress", Pardee Paper No. 4, Pardee Center for the Study of the Longer-Range Future, Boston, available at: «http://archives.pdx.edu/ds/psu/8349».

Coyle, D. (2014): "GDP: A Brief but Affectionate History", Princeton University Press, Princeton.

Decancq, K. / *Lugo,* M. A. (2013): "Weights in Multidimensional Indices of Wellbeing: An Overview", Econometric Reviews 32(1), 7–34.

Deutscher Bundestag (2013): "Enquete-Kommission Wachstum, Wohlstand, Lebensqualität - Wege zu nachhaltigem Wirtschaften und gesellschaftlichem Fortschritt in der Sozialen Marktwirtschaft", Drucksache 17/13300, Deutscher Bundestag, Berlin.

Diener, E. / *Suh,* E. (1997): "Measuring Quality of Life: Economic, Social, and Subjective Indicators", Social Indicators Research 40(1-2), 189–216.

ESS (2015): “European Social Survey Round 6. Online Database”. Available at: «http://www.europeansocialsurvey.org/».

European Commission (2014): “Regional Policy - Is my Region Covered?”. Available at: «http://ec.europa.eu/regional_policy/en/policy/how/is-my-region-covered».

European Council (2006): “Council Regulation (EC) No. 1083/2006 of 11 July 2006”, Official Journal of the European Union, Brussels.

Eurostat (2015): “Gross Domestic Product (GDP) at Current Market Prices by Regions [Table: nama_10r_2gdp]”. Available at: «http://ec.europa.eu/eurostat/data/database?node_code=nama_10r_2gdp».

Evans, J. / *Macrory,* I. / *Randall,* C. *et al.* (2015): “Measuring National Well-being: Life in the UK, 2015”, Office for National Statistics, London, available at: «http://www.ons.gov.uk/ons/dcp171766_398059.pdf».

Federal Statistical Office of Germany (2014): “Sustainable Development in Germany Indicator Report 2014”. Wiesbaden.

Fleurbaey, M. (2009): “Beyond GDP: The Quest for a Measure of Social Welfare”, Journal of Economic Literature 47, 1029–1075.

Garcia Diez, S. (2015): “Indikatoren zur Lebensqualität - Vorschläge der europäischen Expertengruppe und ausgewählte nationale Initiativen”, Wirtschaft und Statistik 66(6), 11–21.

Groot, L. / *Zonneveld,* E. (2013): “European Union Budget Contributions and Expenditures: A Lorenz Curve Approach”, JCMS 51(4), 649–666.

Helliwell, J. F. / *Layard,* R. / *Sachs,* J. (2015): “World Happiness Report 2015”, Sustainable Development Solutions Network, New York, available at: http://worldhappiness.report/wp-content/uploads/sites/2/2015/04/WHR15_Sep15.pdf».

Huschka, D. / *Wagner,* G. G. (2010): “Sind Indikatoren zur Lebensqualität und zur Lebenszufriedenheit als politische Zielgrößen sinnvoll?”, Research Note No. 43, RatSWD, Berlin, available at: «http://www.ratswd.de/download/RatSWD_RN_2010/RatSWD_RN_43.pdf».

Jochimsen, B. / *Raffer,* C. (2014): “Wie schafft es die Zahl in die Politik? Indikatorensätze im Spannungsfeld zwischen politisch Gewünschtem und statistisch Machbarem”, Working Paper Series No. 235, RatSWD, Berlin, available at: «http://www.ratswd.de/dl/RatSWD_WP_235.pdf».

Jones, C. / *Klenow,* P. (forthcoming): "Beyond GDP? Welfare Across Countries and Time", American Economic Review.

Kassenböhmer, S. C. / *Schmidt,* C. M. (2011): "Beyond GDP and Back: What is the Value-Added by Additional Components of Welfare Measurement?", Ruhr Economic Papers No. 239, Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Essen, available at: «http://www.rwi-essen.de/media/content/pages/publikationen/ruhr-economic-papers/REP_11_239.pdf».

Kuznets, S. (1934): "National Income, 1929-1932", NBER, New York.

Landefeld, J. S. / *Grimm,* B. T. (2000): "A Note on the Impact of Hedonics and Computers on Real GDP", Survey of Current Business 80(12), 17–22.

Lawless, N. M. / *Lucas,* R. E. (2011): "Predictors of Regional Well-Being: A County Level Analysis", Social Indicators Research 101(3), 341–357.

Nardo, M. / *Saisana,* M. / *Saltelli,* A. / *Tarantola,* S. / *Hoffmann,* A. / *Giovannini,* E. (2008): "Handbook on Constructing Composite Indicators. Methodology and User Guide", OECD Publishing, Paris, available at: «http://www.oecd.org/std/42495745.pdf».

Nicoletti, G. / *Scarpetta,* S. / *Boylaud,* O. (2000): "Summary Indicators of Product Market Regulation With an Extension to Employment Protection Legislation", Economics Department Working Papers No. 226, OECD, Paris, available at: «http://dx.doi.org/10.2139/ssrn.201668».

Nordhaus, W. D. / *Tobin,* J. (1972): "Is Growth Obsolete?", in: Economic Research: Retrospect and Prospect, Volume 5, Economic Growth, ed. by NBER, 1–80, NBER, New York.

OECD (2014a): "How Was Life? Global Well-Being Since 1820", OECD Publishing, Paris.

– (2014b): "How's Life in Your Region? Measuring Regional and Local Well-Being for Policy Making", OECD Publishing, Paris.

– (2014c): "OECD Regional Well-Being: A User's Guide. Using Data to Build Better Communities", OECD Publishing, Paris, available at: «http://www.oecdregionalwellbeing.org/assets/downloads/Regional-Well-Being-User-Guide.pdf».

– (2015a): "How's Life? 2015. Measuring Well-Being", OECD Publishing, Paris.

– (2015b): OECD Regional Statistics Database. Available at: «http://dx.doi.org/10.1787/data-00707-en».

Okulicz-Kozaryn, A. (2012): "Income and Well-being Across European Provinces", Social Indicators Research 106(2), 371–392.

Stewart, K. (2005): "Dimensions of Well-Being in EU Regions: Do GDP and Unemployment Tell us All We Need to Know?", Social Indicators Research 73(2), 221–246.

Stiglitz, J. E. / *Sen,* A. / *Fitoussi,* J.-P. (2009): "Report by the Commission on the Measurement of Economic Performance and Social Progress", INSEE, Paris, available at: «http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf».

Talberth, J. / *Cobb,* C. / *Slattery,* N. (2007): "The Genuine Progress Indicator 2006: A Tool for Sustainable Development", Redefining Progress, Oakland, available at: «http://rprogress.org/publications/2007/GPI%202006.pdf».

UNDP (2014): "Human Development Report 2014", United Nations Publications, New York.

van den Bergh, J. C. (2007): "Abolishing GDP", Discussion Paper No. 19/3, Tinbergen Institute, available at: «http://papers.tinbergen.nl/07019.pdf».

– (2009): "The GDP Paradox", Journal of Economic Psychology 30(2), 117–135.

van Suntum, U. / *Lerbs,* O. (2011): "Theoretische Fundierung und Bewertung alternativer Methoden der Wohlfahrtsmessung: Studie im Auftrag der KfW Bankengruppe", Centrum für angewandte Wirtschaftsforschung, Münster.

Wahl, S. / *Schulte,* M. / *Butzmann,* E. (2010): "The Prosperity Quintett - Measuring Prosperity in Germany and Other Early Industrialised Countries", Denkwerk Zukunft, Bonn, available at: «http://www.denkwerkzukunft.de/downloads/PQ2014.pdf».

Wesselink, B. / *Bakkes,* J. / *Best,* A. / *Hinterberger,* F. / *ten Brink,* P. (2007): "Measurement Beyond GDP: Background Paper for the Conference 'Beyond GDP: Measuring Progress, True Wealth, and Well-Being of Nations'", European Commission, Brussels.

Appendix

Appendix Table 1: Regions Included in the Study

Country	Region	OECD-Code (TL2)	EU NUTS-Level	N (Happiness)	N (Life-Satisfaction)
Austria	Burgenland	AT11	2		
Austria	Carinthia	AT21	2		
Austria	Lower Austria	AT12	2		
Austria	Salzburg	AT32	2		
Austria	Styria	AT22	2		
Austria	Tyrol	AT33	2		
Austria	Upper Austria	AT31	2		
Austria	Vienna	AT13	2		
Austria	Vorarlberg	AT34	2		
Belgium	Brussels-Capital Region	BE1	1	166	165
Belgium	Flemish Region (Vlaams Gewest)	BE2	1	1105	1105
Belgium	Wallonia (Région wallonne)	BE3	1	598	598
Czech Republic	Central Bohemian Region	CZ02	2	207	209
Czech Republic	Central Moravia	CZ07	2	246	242
Czech Republic	Moravia-Silesia	CZ08	2	226	232
Czech Republic	Northeast	CZ05	2	276	279
Czech Republic	Northwest	CZ04	2	215	214
Czech Republic	Prague	CZ01	2	244	248
Czech Republic	Southeast	CZ06	2	312	316
Czech Republic	Southwest	CZ03	2	237	239
Denmark	Capital (DK)	DK01	2	452	455
Denmark	Central Jutland	DK04	2	429	430
Denmark	Northern Jutland	DK05	2	190	190
Denmark	Southern Denmark	DK03	2	355	354
Denmark	Zealand	DK02	2	219	219
Estonia	Estonia	EE	0	2369	2373
Finland	Eastern and Northern Finland	FI1D	2	546	545
Finland	Helsinki-Uusimaa	FI1B	2	580	581
Finland	Southern Finland	FI1C	2	481	481
Finland	Western Finland	FI19	2	572	573
Finland	Aland	FI20	2	14	14
France	Alsace	FR42	2	70	70
France	Aquitaine	FR61	2	97	97
France	Auvergne	FR72	2	41	40
France	Brittany	FR52	2	100	100
France	Burgundy	FR26	2	60	60
France	Centre (FR)	FR24	2	97	97
France	Champagne-Ardenne	FR21	2	44	44
France	Corsica	FR83	2		
France	Franche-Comté	FR43	2	33	33
France	Languedoc-Roussillon	FR81	2	58	58
France	Limousin	FR63	2	25	25
France	Lorraine	FR41	2	109	109
France	Lower Normandy	FR25	2	47	47
France	Midi-Pyrénées	FR62	2	109	109
France	Nord-Pas-de-Calais	FR30	2	116	116
France	Pays de la Loire	FR51	2	100	100
France	Picardy	FR22	2	64	64
France	Poitou-Charentes	FR53	2	66	66
France	Provence-Alpes-Côte d'Azur	FR82	2	131	131
France	Rhône-Alpes	FR71	2	237	237
France	Upper Normandy	FR23	2	63	63

Appendix Table 1: Regions Included in the Study

Country	Region	OECD-Code (TL2)	EU NUTS-Level	N (Happiness)	N (Life-Satisfaction)
France	Île-de-France	FR10	2	301	301
Germany	Baden-Württemberg	DE1	1	311	311
Germany	Bavaria	DE2	1	397	397
Germany	Berlin	DE3	1	117	118
Germany	Brandenburg	DE4	1	176	176
Germany	Bremen	DE5	1	15	15
Germany	Hamburg	DE6	1	40	40
Germany	Hesse	DE7	1	166	166
Germany	Lower Saxony	DE9	1	272	272
Germany	Mecklenburg-West Pomerania	DE8	1	129	129
Germany	North Rhine-Westphalia	DEA	1	473	473
Germany	Rhineland-Palatinate	DEB	1	133	132
Germany	Saarland	DEC	1	11	11
Germany	Saxony	DED	1	304	305
Germany	Saxony-Anhalt	DEE	1	176	176
Germany	Schleswig-Holstein	DEF	1	98	98
Germany	Thuringia	DEG	1	137	137
Greece	Aegean Islands and Crete	GR4	1		
Greece	Athens	GR3	1		
Greece	Central Greece	GR2	1		
Greece	Northern Greece	GR1	1		
Hungary	Central Hungary	HU10	2	566	563
Hungary	Central Transdanubia	HU21	2	195	194
Hungary	Northern Great Plain	HU32	2	299	298
Hungary	Northern Hungary	HU31	2	255	256
Hungary	Southern Great Plain	HU33	2	291	287
Hungary	Southern Transdanubia	HU23	2	208	207
Hungary	Western Transdanubia	HU22	2	193	191
Ireland	Border, Midland and Western	IE01	2	908	905
Ireland	Southern and Eastern	IE02	2	1713	1713
Italy	Abruzzo	ITF1	2	38	38
Italy	Aosta Valley	ITC2	2		
Italy	Apulia	ITF4	2	24	24
Italy	Basilicata	ITF5	2	44	44
Italy	Calabria	ITF6	2	73	72
Italy	Campania	ITF3	2	81	81
Italy	Emilia-Romagna	ITH5	2	63	63
Italy	Friuli-Venezia Giulia	ITH4	2	5	5
Italy	Lazio	ITI4	2	80	81
Italy	Liguria	ITC3	2	26	26
Italy	Lombardy	ITC4	2	85	82
Italy	Marche	ITI3	2	19	17
Italy	Molise	ITF2	2		
Italy	Piedmont	ITC1	2	65	66
Italy	Province of Bolzano-Bozen	ITH1	2	16	15
Italy	Province of Trento	ITH2	2	12	13
Italy	Sardinia	ITG2	2	34	35
Italy	Sicily	ITG1	2	132	132
Italy	Tuscany	ITI1	2	70	72
Italy	Umbria	ITI2	2	14	14
Italy	Veneto	ITH3	2	66	68
Luxembourg	Luxembourg	LU	0		
Netherlands	East Netherlands	NL2	1	378	379
Netherlands	North Netherlands	NL1	1	202	202
Netherlands	South Netherlands	NL4	1	411	411
Netherlands	West Netherlands	NL3	1	851	853

Appendix Table 1: Regions Included in the Study

Country	Region	OECD-Code (TL2)	EU NUTS-Level	N (Happiness)	N (Life-Satis-faction)
Poland	Dolnoslaskie	PL51	2	123	124
Poland	Kujawsko-Pomorskie	PL61	2	109	110
Poland	Lubelskie	PL31	2	102	102
Poland	Lubuskie	PL43	2	53	53
Poland	Lódzkie	PL11	2	127	127
Poland	Malopolskie	PL21	2	168	169
Poland	Mazowieckie	PL12	2	266	269
Poland	Opolskie	PL52	2	50	51
Poland	Podkarpackie	PL32	2	106	107
Poland	Podlaskie	PL34	2	55	56
Poland	Pomorskie	PL63	2	96	99
Poland	Slaskie	PL22	2	237	236
Poland	Swietokrzyskie	PL33	2	70	72
Poland	Warminsko-Mazurskie	PL62	2	67	68
Poland	Wielkopolskie	PL41	2	156	154
Poland	Zachodniopomorskie	PL42	2	90	90
Portugal	Alentejo	PT18	2	86	86
Portugal	Algarve	PT15	2	70	70
Portugal	Azores	PT20	2		
Portugal	Central Portugal	PT16	2	410	410
Portugal	Lisbon	PT17	2	865	857
Portugal	Madeira	PT30	2		
Portugal	North (PT)	PT11	2	711	713
Slovak Republic	Bratislava Region	SK01	2	243	243
Slovak Republic	Central Slovakia	SK03	2	434	435
Slovak Republic	East Slovakia	SK04	2	504	515
Slovak Republic	West Slovakia	SK02	2	647	641
Slovenia	Eastern Slovenia	SI01	2	711	710
Slovenia	Western Slovenia	SI02	2	543	543
Spain	Andalusia	ES61	2	405	404
Spain	Aragon	ES24	2	58	59
Spain	Asturias	ES12	2	40	40
Spain	Balearic Islands	ES53	2	34	34
Spain	Basque Country	ES21	2	78	78
Spain	Canary Islands	ES70	2	65	65
Spain	Cantabria	ES13	2	26	26
Spain	Castile and Leén	ES41	2	102	102
Spain	Castile-La Mancha	ES42	2	91	91
Spain	Catalonia	ES51	2	265	264
Spain	Ceuta	ES63	2	6	6
Spain	Extremadura	ES43	2	43	44
Spain	Galicia	ES11	2	111	111
Spain	La Rioja	ES23	2	10	10
Spain	Madrid	ES30	2	300	300
Spain	Melilla	ES64	2		
Spain	Murcia	ES62	2	54	53
Spain	Navarra	ES22	2	22	22
Spain	Valencia	ES52	2	175	175
Sweden	Central Norrland	SE32	2	97	96
Sweden	East Middle Sweden	SE12	2	274	274
Sweden	North Middle Sweden	SE31	2	144	144
Sweden	Smaland with Islands	SE21	2	171	171
Sweden	South Sweden	SE22	2	292	293
Sweden	Stockholm	SE11	2	432	432
Sweden	Upper Norrland	SE33	2	93	91
Sweden	West Sweden	SE23	2	343	343

Appendix Table 1: Regions Included in the Study

Country	Region	OECD-Code (TL2)	EU NUTS-Level	N (Happiness)	N (Life-Satisfaction)
United Kingdom	East Midlands	UKF	1	172	171
United Kingdom	East of England	UKH	1	193	193
United Kingdom	Greater London	UKI	1	228	225
United Kingdom	North East England	UKC	1	117	116
United Kingdom	North West England	UKD	1	241	243
United Kingdom	Northern Ireland (UK)	UKN	1	82	81
United Kingdom	Scotland	UKM	1	215	213
United Kingdom	South East England	UKJ	1	303	302
United Kingdom	South West England	UKK	1	212	211
United Kingdom	Wales	UKL	1	115	115
United Kingdom	West Midlands	UKG	1	208	208
United Kingdom	Yorkshire and The Humber	UKE	1	191	190

Sources: OECD (2015b); ESS (2015).

Appendix Table 2: Regions Entering or Leaving Beneficiary Group

Country	Region	OECD-Code (TL2)	Regions dropping out of beneficiary group under composite index	Regions entering beneficiary group under composite index
			Method 1	
Czech Republic	Prague	CZ01		X
Greece	Athens	GR3		X
Italy	Molise	ITF2	X	
Italy	Sardinia	ITG2	X	
Portugal	Central Portugal	PT16	X	
Slovak Republic	Bratislava Region	SK01		X
Slovenia	Western Slovenia	SI02		X
Spain	Castile-La Mancha	ES42	X	
Spain	Extremadura	ES43	X	
Spain	Murcia	ES62	X	
			Method 2	
Belgium	Brussels-Capital Region	BE1		X
Czech Republic	Prague	CZ01		X
Greece	Athens	GR3		X
Italy	Molise	ITF2	X	
Italy	Sardinia	ITG2	X	
Portugal	Central Portugal	PT16	X	
Slovak Republic	Bratislava Region	SK01		X
Slovenia	Western Slovenia	SI02		X
Spain	Canary Islands	ES70	X	
Spain	Castile-La Mancha	ES42	X	
Spain	Murcia	ES62	X	
			Method 3	
Czech Republic	Prague	CZ01		X
Greece	Athens	GR3		X
Italy	Sardinia	ITG2	X	
Portugal	Central Portugal	PT16	X	
Slovak Republic	Bratislava Region	SK01		X
Slovenia	Western Slovenia	SI02		X
Spain	Castile-La Mancha	ES42	X	
Spain	Extremadura	ES43	X	
Spain	Murcia	ES62	X	
			Method 4	
Austria	Vienna	AT13		X
Belgium	Brussels-Capital Region	BE1		X
Belgium	Wallonia (Région wallonne)	BE3		X
Czech Republic	Central Bohemian Region	CZ02	X	
Czech Republic	Central Moravia	CZ07	X	
Czech Republic	Moravia-Silesia	CZ08	X	
Czech Republic	Northeast	CZ05	X	
Czech Republic	Southeast	CZ06	X	
Czech Republic	Southwest	CZ03	X	
Estonia	Estonia	EE	X	
France	Nord-Pas-de-Calais	FR30		X
France	Picardy	FR22		X
Greece	Athens	GR3		X
Hungary	Central Hungary	HU10	X	
Italy	Aosta Valley	ITC2		X
Italy	Apulia	ITF4	X	
Italy	Basilicata	ITF5	X	

Appendix Table 2: Regions Entering or Leaving Beneficiary Group

Country	Region	OECD-Code (TL2)	Regions dropping out of beneficiary group under composite index	Regions entering beneficiary group under composite index
Italy	Calabria	ITF6	X	
Italy	Lombardy	ITC4		X
Italy	Molise	ITF2	X	
Italy	Piedmont	ITC1		X
Italy	Province of Bolzano-Bozen	ITH1		X
Italy	Sardinia	ITG2	X	
Luxembourg	Luxembourg	LU		X
Poland	Dolnoslaskie	PL51	X	
Poland	Kujawsko-Pomorskie	PL61	X	
Poland	Lubelskie	PL31	X	
Poland	Lubuskie	PL43	X	
Poland	Malopolskie	PL21	X	
Poland	Mazowieckie	PL12	X	
Poland	Opolskie	PL52	X	
Poland	Podkarpackie	PL32	X	
Poland	Podlaskie	PL34	X	
Poland	Pomorskie	PL63	X	
Poland	Swietokrzyskie	PL33	X	
Poland	Warminsko-Mazurskie	PL62	X	
Poland	Wielkopolskie	PL41	X	
Poland	Zachodniopomorskie	PL42	X	
Portugal	Lisbon	PT17		X
Slovak Republic	Bratislava Region	SK01		X
Slovenia	Eastern Slovenia	SI01	X	
Spain	Castile-La Mancha	ES42	X	
Spain	Catalonia	ES51		X
Spain	Valencia	ES52		X
United Kingdom	Scotland	UKM		X
			Method 5	
Czech Republic	Central Bohemian Region	CZ02	X	
Czech Republic	Central Moravia	CZ07	X	
Czech Republic	Moravia-Silesia	CZ08	X	
Czech Republic	Northeast	CZ05	X	
Czech Republic	Southeast	CZ06	X	
Czech Republic	Southwest	CZ03	X	
Estonia	Estonia	EE	X	
Greece	Athens	GR3		X
Hungary	Central Hungary	HU10	X	
Hungary	Western Transdanubia	HU22	X	
Italy	Abruzzo	ITF1		X
Poland	Mazowieckie	PL12	X	
Portugal	Lisbon	PT17		X
Slovak Republic	West Slovakia	SK02	X	
Slovenia	Eastern Slovenia	SI01	X	
Spain	Asturias	ES12		X
Spain	Balearic Islands	ES53		X
Spain	Galicia	ES11		X
Spain	Valencia	ES52		X

Source: Own calculations.

Appendix Table 3: Regions Funded under GDP per capita Criterion

Country	Region	OECD-Code (TL2)
Czech Republic	Central Bohemian Region	CZ02
Czech Republic	Central Moravia	CZ07
Czech Republic	Moravia-Silesia	CZ08
Czech Republic	Northeast	CZ05
Czech Republic	Northwest	CZ04
Czech Republic	Southeast	CZ06
Czech Republic	Southwest	CZ03
Estonia	Estonia	EE
Greece	Aegean Islands and Crete	GR4
Greece	Central Greece	GR2
Greece	Northern Greece	GR1
Hungary	Central Hungary	HU10
Hungary	Central Transdanubia	HU21
Hungary	Northern Great Plain	HU32
Hungary	Northern Hungary	HU31
Hungary	Southern Great Plain	HU33
Hungary	Southern Transdanubia	HU23
Hungary	Western Transdanubia	HU22
Italy	Apulia	ITF4
Italy	Basilicata	ITF5
Italy	Calabria	ITF6
Italy	Campania	ITF3
Italy	Molise	ITF2
Italy	Sardinia	ITG2
Italy	Sicily	ITG1
Poland	Dolnoslaskie	PL51
Poland	Kujawsko-Pomorskie	PL61
Poland	Lubelskie	PL31
Poland	Lubuskie	PL43
Poland	Lódzkie	PL11
Poland	Malopolskie	PL21
Poland	Mazowieckie	PL12
Poland	Opolskie	PL52
Poland	Podkarpackie	PL32
Poland	Podlaskie	PL34
Poland	Pomorskie	PL63
Poland	Slaskie	PL22
Poland	Swietokrzyskie	PL33
Poland	Warminsko-Mazurskie	PL62
Poland	Wielkopolskie	PL41
Poland	Zachodniopomorskie	PL42
Portugal	Alentejo	PT18
Portugal	Algarve	PT15
Portugal	Azores	PT20
Portugal	Central Portugal	PT16
Portugal	Madeira	PT30
Portugal	North (PT)	PT11
Slovak Republic	Central Slovakia	SK03
Slovak Republic	East Slovakia	SK04
Slovak Republic	West Slovakia	SK02
Slovenia	Eastern Slovenia	SI01
Spain	Andalusia	ES61
Spain	Canary Islands	ES70
Spain	Castile-La Mancha	ES42
Spain	Ceuta	ES63
Spain	Extremadura	ES43
Spain	Melilla	ES64
Spain	Murcia	ES62

Source: Own calculations.

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