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Europe 2020 strategy: a strategy for which type of growth?

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Abstract:

This paper constructs an index that synthesizes the eight targets of the EU 2020 Strategy into a one-dimensional target –EU 2020 synthetic target- and the situation of each EU28 Member States (the current 27 Members plus Croatia) in 2011 with respect to them –2011 synthetic situation-. Hence we can measure the distance of each EU Member State synthetic situation in 2011 to the EU 2020 synthetic target. We find that none of the Member States meets the EU 2020 synthetic target, Denmark is the closest and Malta is the furthest to it. In fact we could identify clusters of Member States in terms of the distances to the EU 2020 synthetic target: the North EU region is closer to and the Mediterranean region is further away from it.

We extent the distance analysis above by adding three inequality targets -income distribution, female employment and child poverty- and find that all of the Member States increase their distance between their 2011 synthetic inequality-extended situation and the 2020 inequality-extended targeted situation.

Finally, we want to analyse each Member State's relationship between its objective position regarding the EU 2020 synthetic target and its life satisfaction level, inhabitants' subjective position. Through a multivariate regression methodology, we analyse how much of the total effect of the synthetic index on life satisfaction is direct, and how much is mediated. The mediation analysis shows that a substantial part of the effect of the synthetic index on life satisfaction is mediated by the GDP per capita. These results are in line with recent views in human development and well-being

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research. That is, the GDP per capita is only a means to achieve socioeconomic progress, not the end.

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1. Introduction

The recent economic crisis has inflicted a huge shock on millions of citizens, exposing some fundamental weaknesses of the European Union economy. The EU27- the current EU Member States- Gross Domestic Product (GDP) fell by 4.3% in 2009, despite the partial recovery experienced in 2010 and 2011; the industrial production dropped back to the levels of the 1990s and 23 million people - or 10% of our active population - are now unemployed (Eurostat).

The crisis has exposed structural weaknesses in, among others, innovation, education, employment and demographical factors (Eurostat, information for 2011). Research and Development (R&D) spending in Europe is below 2%, compared to 2.6% in the United States (US) and 3.4% in Japan, mainly resulting from lower levels of private investment. A quarter of all pupils have poor reading competences and one in seven young people leave education and training too early. Around 50% of population reach a medium qualifications level but this often fails to match labour market needs. Less than a third of the population aged 25-34 has a university degree compared to 40% in the US and over 50% in Japan. Only 68.6% of EU working population is currently employed, compared to 70.4% in the US and 74.9% in Japan. The EU overall (less than 25 years old) unemployment rate is 9.6% (21.4%) in comparison with 8.9% (17.3%) in

the US and 4.6% (8.2%) in Japan. Moreover, the combination of an accelerating demographic ageing together with a shrinking EU's active population from 2013/2014 will place additional strains on the welfare systems.

In addition, the crisis has exacerbated inequalities in different areas (Eurostat information). There are considerable differences in the distribution of income between the Member States (EU27), the first quartile of population owns 10.8% of income -share of national equivalised income-, while the fourth quartile receives 45.1% in 2011. Despite the Lisbon strategy also requires the EU to promote equality between men and women in the labour market, only 62.3% of women work compared to 75% of men in 2011. In 2011, the 24.3% of the population of the EU28 were considered at-risk-of-poverty in 2011. All of these disequilibria are inflicting a great pressure on EU economic, social and territorial cohesion, which all of them are core EU objectives since its foundation.

To successfully overcome the economic crisis and achieve a sustainable future, on the 17th of June 2010 the European Council approved the Europe 2020 Strategy. The Europe 2020 Strategy aims to coordinate all of the Member States' efforts to collectively exit stronger from the crisis and turn the EU into a smart, sustainable and inclusive economy characterised for high levels of employment, productivity and social cohesion (European Commission 2010, preface).

The Europe 2020 Strategy pursues a very particular type of growth: smart, sustainable and inclusive. Smart growth is based on knowledge and innovation; sustainable growth on a more resource efficient, greener and competitive economy; and, inclusive growth requires high-employment, social and territorial cohesion.

To accomplish these priorities, the Commission establishes eight targets that the Member States should met by 2020 on unemployment, investment in R&D, CO_2 emission, renewable energy, energy consumption, early school leaving, tertiary education and

poverty. These targets are selected because they represent the theme of smart, sustainable and inclusive growth; they are capable of reflecting the diversity of Member States situations; and they are based on sufficiently reliable data for comparison purposes (European Commission 2010, p. 8).

Our paper analyses the situation of the 28 Member States in 2011 with respect to the Europe 2020 targets, and discuss the strengths and weaknesses of the set of indicators selected to monitoring Member States' degree of achievement of the Europe 2020 Strategy targets. Following the DP_2 methodology of Pena Trapero (1977), we construct a composite index that synthesises the position of each country with respect to the EU 2020 targets resulting from the priorities of smart, sustainable and inclusive growth. Hence, the DP_2 approach maps the nine-dimensional space resulting from the Europe 2020 Strategy into a bi-dimensional space. We extent the distance analysis above by adding three inequality targets -income distribution, women´s disadvantages in employment, and child poverty- and analyse each Member State position with respect to this inequality extended composite index. Finally, we want to analyse the relationship between the objective position of each Member State regarding the Europe 2020 synthetic target and the life satisfaction level, inhabitants' subjective position, in each Member State. Through a mediation analysis –a multivariate regression methodology-, we analyse how much of the total effect of the synthetic index on life satisfaction is direct, and how much of it is mediated.

The remainder of this paper is organised as follows. In Sect. 2 we describe the methodology applied to elaborate the composite index of Target Distance Europe 2020 Strategy (TDI). In Sect. 3 we present the statistical information used. Sect. 4 shows the empirical results and the strengths and weaknesses of the EU 2020 targets. Sect. 5 summarises the principal conclusions.

2. Methodology

The estimation of each Member State distance in 2011 to the Europe 2020 Strategy targets may be approached through two distinct methods: one that calculates the distance of each of the eight indicators separately, as a single table or a radar diagram; the other one provides an integrated measure of the distance in the eight indicators by generating a synthetic index or value of each Member distance. An index is a dimensionless measure resulting from a combination of several indicators through a mathematical function that synthesises them (European Environment Agency 2002). Indicator integration into a single index is, basically, a means by which individual and quite different indicators in a framework can somehow be viewed together to provide an holistic view (Bell and Morse 2003, p. 39).

The main pros of using synthetic or composite indexes are (OECD et al. 2008, pp. 13-14) that they summarise complex, multi-dimensional realities with a view to supporting decision-makers, are easier to interpret than a battery of many separate indicators, assess progress of territories over time, facilitate communication with general public and promote accountability. The most troubling issues concerning the elaboration of synthetic indexes (see Booysen 2002; Cherchye et al. 2008; Permanyer 2011; Ravallion 2010) are the treatment of measurement units (how to aggregate variables expressed in different units), and the allocation of weights among variables in the synthetic index (how to aggregate the variables into a single index).

The Distance P_2 method proposed by Pena Trapero (1977) solves problems such as the aggregation of variables expressed in different measures, arbitrary weights and duplicity of information -see below-, and verifies the properties that a composite index must fulfill to provide an acceptable measure: existence and determination, monotony, uniqueness, quantification, invariance, homogeneity, transitivity, exhaustiveness, additivity, and invariance compared to the base of reference (see Zarzosa Espina and

Somarriba Arechavala, 2013). So, in this paper we apply the Distance P_2 method to measure the distance of the EU28 Member States in 2011 to the Europe 2020 targets, synthesizing the position of each country by a composite index (Target Distance of Member State j or TDIj).

The synthetic index P_2 Distance is defined as follows:

$$DP_2 = \sum_{i=1}^{n} (d_i / \sigma_i)\left(1 - R^2_{i,i-1,\ldots 1}\right) \quad (1)$$

with $R_1^2=0$,

and where:

- n is the number of indicators.
- $d_i=d_i(j,*)=|x_{ji}-x_{*i}|$ is the difference between the value taken by the i-th indicator in the j-th Member State and the vector of reference $X_*=\{x_{*1}, x_{*2}, \ldots, x_{*n}\}$.
- σi is the standard deviation of the indicator i.
- $R^2_{i,i-1, \ldots 1}$ is the coefficient of determination in the multiple linear regression (Ordinary Least Squares, OLS) of x_i over x_{i-1}, x_{i-2}, ... x_1, and expresses the variance or variation of x_i linearly explained by the variables x_{i-1}, x_{i-2}, ... x_1.

In our case, the reference vector $X_*=\{x_{*1}, x_{*2}, \ldots, x_{*n}\}$ comprises the Europe 2020 targets for all the indicators (right column in Table 1). Thus, did a Member State meet every target it would be attributed a value of zero in the synthetic index (i.e., distance would be zero). A higher DP_2 value –in absolute value- therefore indicates a higher distance between the actual situation and the desirable theoretical situation (Europe 2020 targets). So constructed, the synthetic index measures the distance between each Member State and Europe 2020 targets.

The DP_2 synthetic index overcomes difficulties such as the treatment of measurement units, the weight attached to each observable variable and the duplicity of information. As distance is divided by σi, i.e., d_i/σ_i, the indicator is simultaneously

expressed in abstract units and weighted by the inverse of the standard deviation. That guarantees that the distances of those indicators with a higher dispersion to the mean are less important for determining the synthetic index[‡]. The coefficient of determination, $R^2_{i.i-1, \dots 1}$, measures the percentage of the variance of each indicator explained by the linear regression estimated using the preceding indicators (x_{i-1}, x_{i-2}, ... x_1). As a result, the correction factor ($1-R^2_{i.i-1, \dots 1}$) avoids the duplication of information by eliminating indicators whose information contained in the preceding indicators. That is, as ($1-R^2_{i,i-1, \dots 1}$) expresses the part of variance of x_i not explained by x_{i-1}, x_{i-2}, ... x_1, the part already explained by the preceding indicators is obtained by multiplying each partial indicator by the corresponding coefficient of determination $R^2_{i.i-1, \dots 1}$.

The DP_2 outcome varies with the entry order of the indicators. It is therefore necessary to rank the indicators on the amount of information that each one of them contributes to the synthetic index (from largest to smallest). That is, the first indicator included should be the component which provides the greatest amount of information concerning the underlying concept being measured, and so on and so forth. We follow the ranking method proposed by Pena Trapero (1977), which is an iterative method based on the Fréchet Distance (DF) where all the coefficients of determination R^2 are set to zero:

$$DF = \sum_{i=1}^{n} (d_i / \sigma_i) = \sum_{i=1}^{n} (| x_{ji} - x_{*i} | / \sigma_i) \; ; \qquad j = 1, 2, ..., m \tag{2}$$

DF is the maximum value DP_2 may reach. We then estimate the simple correlation coefficients r between each indicator and the Fréchet distance, and sort the indicators from highest to lowest according to the absolute values of the simple correlation coefficient. Next, we calculate the first P_2 distance for each Member State, incorporating the indicators in the resulting order. Hence, the classification of indicators

[‡] This weighting scheme, which is similar to those used in heteroscedastic models, concedes less importance to those distances with more variability, and vice versa (Montero et al. 2010, p. 444).

is performed by ordering them from highest to lowest in terms of the absolute value of the simple correlation coefficient between each indicator and the DP_2. The process continues iteratively until the difference between two adjacent DP_2s is zero.

For measuring the distance of the EU28 Member States in 2011 to the Europe 2020 targets, the applied aggregation method has to be a distance method, such as the Mahalanobis (1936) and Ivanovic's (1963) distance. However, Pena Trapero (1977, pp. 66-72) shows that the distance of Mahalanobis (1936) does not offer a unique solution and does not verify monotonicity; and that Ivanovic's (1963) distance does not verify the property of exhaustiveness. Hence, we follow the DP_2 as it has some advantages over the other two methods.

3. Data and indicators

We analyse the Member States degree of achievement of the Europe 2020 Strategy targets in 2011 based upon the eight headline indicators selected by Eurostat (Table 1). The first column in Table 1 contains the name of the indicator, the second column its description, and the last column displays the 2020 target for each one of the indicators.

Table 1. Indicators and targets of Europe 2020

Indicators	Description	2020 targets
+ employment	1 Employment rate (in %)	75
+ R&D	2 Investment on research and development in % of GDP	3
- greenhouse	3 Greenhouse gas emissions (index 1990=100)	80
+ renewable	4 Renewable energy (in %)	20
- energy	5 Primary energy consumption (index 2005=100)	86.5
- leavers	6 Early leavers from education and training (in %)	10
+ education	7 Tertiary educational attainment (in %)	40
- poverty	8 People at risk of poverty or social exclusion (Percentage of total population)	18.72

Source: European Commission (2010), Eurostat, and the authors.

The targets of the indicators 1, 2, 4, 6 and 7 were established by the European Commission (2010). For the indicators 3 and 5, Eurostat has estimated the targets by means of using the methodologies that permit comparisons across countries. We have

estimated the target for the indicator 8. Poverty measures differ between Member States and the EU 2020 target is set out as a reduction of the total number of people at risk of poverty by 20 million (European Commission 2010, p. 3). Hence, we have estimated the percentage of the population that should be at risk of poverty or social exclusion by 2020 as illustrated below. In 2010 116,300 thousand people were at risk of poverty the target is to reduce this number by 20 million people in 2020; thus, the target is that only (116,300-20,000) 96,300 thousand people should be at risk of poverty by 2020. Next, dividing 96,300 thousand people over the estimated population for 2020, we get 514,365 thousand people, i.e., the 2020 targeted percentage of population at risk of poverty is 18.72%.

The value of each Member State for each of the eight indicators is taken from Eurostat and, primarily, for the year 2011. However, in some cases there was no available or reliable data in 2011 and we take the last reliable data. Table 2 shows the descriptive statistics of indicators, including the Pearson coefficient of variation in percentage.

Table 2. Descriptive statistics (N=28)

Simple indicators	Mean	Standard deviation	Coefficient of variation(%)	Median	Maxim	Minimun
employment	67.79	5.51	8.12	67.85	75.00	57.00
R&D	1.59	0.87	54.50	1.47	3.00	0.48
greenhouse	97.43	22.09	22.67	91.50	168.00	80.00
renewable	12.41	6.64	53.47	11.95	20.00	0.40
energy	97.94	6.27	6.41	97.60	112.70	86.50
leavers	13.26	5.73	43.19	11.05	33.50	10.00
education	33.18	7.71	23.23	37.40	40.00	20.30
poverty	25.58	7.94	31.04	22.90	49.10	18.72

Source: Eurostat and the authors.

The P_2 Distance is worked out taking as the reference vector $X_*=\{x_{*1}, x_{*2}, \ldots, x_{*n}\}$ the Europe 2020 targets for all the indicators (Table 1 right column). Hence, had a Member State reached all of the Europe 2020 targets it would get a zero value in the composite index Target Distance (TDI) (i.e., distance would be zero). As we aim to quantify the distance of each Member State in 2011 to the Europe 2020 targets, some

data of the indicators need to be transformed before calculating the synthetic index Target Distance (TDI) to obtain sensible results:

If TDIj=0, the Member Estate j has already achieved all of the Europe 2020 targets.

If TDIj>0, the Member Estate j has not achieved all of the Europe 2020 targets yet.

The data transformation consists of assigning the value of the target i to the indicator i in the Member State j that has already met the 2020 target, formally:

if $x_{ji}>x_{ki}$, then we make $x_{ji}=x_{ki}$.

For instance, say that in 2011 a Member State has invested the 4.5% of GDP in R&D, which is larger than the 3% target set for 2020. Without any transformation, the distance $d_i = d_i\ (j,k) =|x_{ji} - x_{ki}|$ would be 1.5. Since the DP_2 index is calculated as the sum of the distances weighted by the correction factor and divided by the standard deviation, this result would be misleading. Specifically, this Member State would obtain in TDI a larger distance to the Europe 2020 targets than what it actually has. To overcome this problem, we propose to set it as the corresponding value of the target, i.e., $x_{ji}=3\%$, so that d_i would be zero (the target is met).

5. Results and discussion

5.1. Target Distance Europe 2020 Strategy

Based on the statistic information provided by the eight indicators for the EU28, and applying the methodology of the P_2 Distance, we calculate the composite index of Target Distance Europe 2020 Strategy (TDI). This index allows to rank the Member States on the degree of attainment of the Europe 2020 targets. Table 3 shows the results.

None of the Member States meets all of the Europe 2020 targets in 2011 (in fact, all of them Member States present a positive value in the TDI). As the reference vector is selected to measure distances, would a country have met all of the targets, its TDI would be equal to zero. Denmark has the best situation in terms of to the Europe 2020

targets, having the smallest distance (TDI = 1.39). In contrast, Malta is the Member State most distant to the Europe 2020 targets with a TDI = 13.93. The DP_2 property of additivity allows us to deduce that there are large disparities between Member States regarding the degree of achievement of the Europe 2020 targets (more than 10 times larger).

Table 3. Contrasting rank of EU28

	Europe 2020 targets		Inequalities-sensitive Europe 2020		Life satisfaction		Difference in rank relative TDI	
Member States	Rank	TDI (2011)	Rank	Extended TDI (2011)	Rank	LS Index (2009)	Extended TDI	LS Index
Denmark	1	1.39	2	2.28	1	8.3	-1	0
Sweden	2	1.63	1	2.04	3	7.8	1	-1
Finland	3	2.65	3	2.95	2	7.9	0	1
Germany	4	3.36	5	4.17	8	7.1	-1	-4
Slovenia	5	3.60	4	4.09	9	6.9	1	-4
France	6	3.90	8	5.08	11	6.6	-2	-5
Austria	7	3.98	7	5.00	5	7.6	0	2
Lithuania	8	4.11	6	4.45	17	5.5	2	-9
Estonia	9	4.24	10	5.27	14	6.0	-1	-5
United Kingdom	10	4.72	11	5.77	7	7.2	-1	3
Netherlands	11	4.77	9	5.18	5	7.6	2	6
Luxembourg	12	5.29	13	6.50	4	7.7	-1	8
Czech Republic	13	5.64	14	6.87	12	6.5	-1	1
Belgium	14	5.87	12	6.42	6	7.3	2	8
Ireland	15	6.73	16	7.55	5	7.6	-1	10
Latvia	16	7.08	15	7.49	18	5.4	1	-2
Slovakia	17	7.29	19	8.43	15	5.9	-2	2
Portugal	18	7.31	18	8.31	16	5.7	0	2
Hungary	19	7.32	17	8.01	17	5.5	2	2
Poland	20	7.91	21	9.27	13	6.4	-1	7
Croatia	21	8.21	22	9.37	14	6.0	-1	7
Spain	22	8.37	23	9.53	7	7.2	-1	15
Bulgaria	23	8.51	20	8.60	19	4.4	3	4
Greece	24	8.75	26	10.96	13	6.4	-2	11
Italy	25	9.01	27	11.00	10	6.7	-2	15
Romania	26	9.05	25	10.49	16	5.7	1	10
Cyprus	27	9.34	24	9.75	8	7.1	3	19
Malta	28	13.93	28	15.84	8	7.1	0	20

Source: Veenhoven (201?) and the authors.

Table 4 shows the eight indicators ranked by entry order in the DP_2 according to their absolute pairwise correlation with the TDI, and the correction factor ($1-R^2$). Since

R^2 captures the information of each indicator that has already been explained by the preceding indicators, an indicator's correction factor ($1-R^2$) represents the new information explained by this indicator. For example, R&D is the most closely correlated with the composite index TDI and contributes all of its information to the TDI; the correction factor of the indicator *employment* is 0.486, because, approximately, the 51.40% of this indicator's information has already been explained by the preceding indicator, etc. But we would like to gauge the impact of each indicator on the results in terms of TDI disparities in EU28. That is, we analyse the relevance of each indicator in determining the Europe 2020 targets distance. We first obtain the Ivanovic (1974) Discrimination Coefficient (DC):

$$DC_i = \frac{2}{m(m-1)} \sum_{j,l>j}^{ki} m_{ji} m_{li} \left| \frac{x_{ji} - x_{li}}{\overline{X_i}} \right| \quad (3)$$

where m is the number of regions, x_{ji} is the value of indicator x_i in the region j, m_{ji} is the absolute frequency of x_{ji}, X_i is the mean of x_i, and k_i is the number of different values taken by x_i.

This coefficient ranges between 0 and 2 (Zarzosa 1996). If an indicator takes the same value for all Member States, DC equals zero, indicating that this indicator holds zero discriminating power. By contrast, if an indicator only has a value other than zero for one Member State (and in the remainder, m - 1 is equal to zero), DC is equal to two and the indicator has full discriminating power. Table 4 shows the results. None of the indicators has a zero value, so that all of their values vary in all geographical areas studied and all of them contribute to the measurement of the distance to Europe 2020 targets distance (Ivanovic 1974). The indicators with the greatest discriminating power are R&D and renewable.

The impact of the indicators on the TDI results calculated with the P_2 Distance depends both on the new information explained by each indicator (correction factors)

and the discriminating power (DC). Specifically, the greater the amount of information provided by an indicator not contained in the global information and indicators already incorporated into the composite index, the better the indicator is (Ivanovic 1974). Thus, we must eliminate redundant information, weighting the discrimination coefficient (DC) by the correction factor ($1\text{-}R^2$). To do this, we use the Relative Individual Information Coefficient (α_i), developed by Zarzosa (1996). This measure aims to eliminate redundant information by weighting the Discrimination Coefficient (DC) by the correction factor ($1\text{-}R^2_{i.i\text{-}1,\ \ldots\ 1}$) resulting from the application of the P_2 Distance. It is calculated as follows:

$$\alpha_i = \frac{DC_i(1 - R^2_{i,i-1,\ldots,1})}{\sum_{i=1}^{n} DC_i(1 - R^2_{i,i-1,\ldots,1})} \tag{4}$$

This coefficient, which ranges from 0 to 1, merges useful information and the discriminating power of each indicator, and measures the amount of relative (merged) information that each indicator individually contributes when orderly forming part of the synthetic indicator DP_2. All the α_i values sum to the unit.

Table 4. Correction factors of indicators ranked in order of their absolute pairwise correlation with the TDI, discrimination coefficient and individual information coefficient

Position	Indicators	Correction factor ($1\text{-}R^2$)	Pairwise correlation |r|	Discrimination coefficient (DC)	Individual information coefficient (α_i)
1	R&D	1.000	0.835	0.632	0.334
2	employment	0.486	0.727	0.095	0.024
3	leavers	0.868	0.646	0.379	0.174
4	education	0.742	0.557	0.254	0.099
5	poverty	0.485	0.465	0.329	0.084
6	renewable	0.605	0.446	0.612	0.195
7	greenhouse	0.537	0.432	0.230	0.065
8	energy	0.631	0.248	0.073	0.024

The results show (Table 4) that R&D, renewable and leavers are the most influential indicators in determining the distance between Member States and the Europe 2020 targets. Member States disparities in the TDI are primarily determined by these dimensions.

5.2. Inequality extended TDI

Europe 2020 is conceived as a strategy to exit stronger from the crisis and turn the EU into a smart, sustainable and inclusive economy that delivers high levels of employment, productivity and social cohesion. However on the basis of the eight selected targets, one could say that the social cohesion target has been left to a secondary level. In particular, we consider that the absence of specific targets for the reduction of social and economic inequalities is the major deficiency of the Europe 2020 Strategy.

As noted in the Introduction, considerable differences persist in the distribution of income between the EU27 Member States, the first quartile of population owns 10.8% of income -share of national equivalised income-, while the fourth quartile receives 45.1% in 2011 (Eurostat). Development or progress programs should consider the distributive effects, especially in income (Anand and Sen, 1994; Herrero et al. 2012; Hicks 1997; Seth 2009) The economic inequality (independently of the absolute level of income) is associated with a wide range of social ills, including higher rates of crime, ill-health, mortality and drug abuse (Wilkinson and Picket 2009).

Besides income inequality, other kinds of inequality should be brought into the model, as “the extend of real inequality of opportunities that people face be readily deduced from the magnitude of inequality of incomes”, because the variety of physical and social characteristics also affect people’s life (Sen 1992, p. 28). In all of the Member States, female employment rate is lower than that for male. Furthermore, taking as territorial reference the European regions (NUTS 2), in all of them female employment rate is lower that male employment rate (in means: females = 46.53, standard deviation = 7.98; males = 59.84, standard deviation = 5.76, N = 269 regions of

28 Member States in 2009[§], Eurostat); and the difference is statistically significant (ANOVA test: F = 492.24, p = 0.0000). That is, what a person can do depends, to some extent, on her gender.

Poverty is seen as the deprivation of some minimum fulfilment of elementary capabilities (Sen 1992, p. 9), hence child poverty implies a clear reduction of opportunities. To take into account the capability handicap derived from income, the model EU 2020 includes the *poverty* indicator. For the whole EU27, the people at risk of poverty or social exclusion is 25.2 % of population and people at risk of poverty or social exclusion less than 16 years is 26.6 (Eurostat). Furthermore, when considering the 28 Member States, child poverty is statistically higher (Wilcoxon test: Z = -2.595, p = 0.009).

With the purpose of incorporating these three inequality concepts in our analysis, we apply the DP_2 methodology to the corresponding 11 indicators. That is, to the eight Europe 2020 targets we add: inequality in income distribution (Gini index) with a negative sign, penalizing those Member States with higher inequality in income distribution; inequality in gender employment [1-(female employment rate/male employment rate)][**] with a negative sign, reflecting females disadvantage in employment in the UNDP (2011) sense; and child poverty with a negative sign (people at risk of poverty or social exclusion less than 16 years). In the calculus of the extended DP_2, the reference vector regarding the three added indicators is the minimum value registered by a Member State. Table 3 shows the results of this inequalities-sensitive Europe 2020 DP_2 analysis (extended TDI) given the information supplied by Eurostat.

Including these three inequality targets in the Europe 2020 Strategy, none of the Member States would meet all of the targets in 2011. Moreover, the distance of all of

[§] The 269 regions analyzed correspond to the current 28 Member States, except four regions of Francia for wich information is not available for all analyzed variables (Guadeloupe, Martinique, Guyane and Réunion).

[**] This indicator is equal to zero when women have the same opportunities than men, and it is equal to 1 in the opposite scenario.

the countries would increase (the absolute value of the Extended TDI increases for all of the Member States, as shown in Table 3). The rankings of the Member States with both the TDI (Europe 2020 targets) and the extended TDI (inequalities-sensitive Europe 2020) are pretty similar, the maximum change is equal to three places for Cyprus (see difference in rank relative TDI in Table 3). To statistically test this observation, we have calculated Spearman's correlation coefficient (rho = 0.982, p = 0.000) that shows that the two classifications of the Member States resulting from the TDI and the inequalities extended TDI are pretty similar.

In addition and following the discussion on Perrons (2012), employment is not enough to tackle poverty. Nowadays the main source of poverty is the current wage inequality between high paid and low paid workers. Here again, though the Commission has stated good intentions regarding the need of reducing wage inequality (European Commission 2011), no target has been set to effectively address this problem. "So the social inequality inherent in the current model of the economy remains unaddressed in policies designed to promote cohesion" (Perrons 2012, p. 18).

Table 5 displays the results obtained via the P_2 Distance method when calculating a TDI that incorporates inequality factors. Independently on the criteria, it is reasonable to include the three inequality indicators (inequality in gender employment, infantile poverty, and Gini index). Now, R&D continues being the most closely correlated with extended TDI, but inequality in gender employment is the second indicator that supplies more new information to the composite index (81.8%). The results of the discrimination coefficient (DC) show that the indicators with the greatest discriminating power are R&D, inequality in gender employment and infantile poverty. The results of the individual information coefficient show that R&D, inequality in gender employment and leavers are the most determining indicators of the disparities between Member States in the extended TDI.

Table 5. Correction factors of indicators ranked in order of their absolute pairwise correlation with the TDI, discrimination coefficient and individual information coefficient

Position	Indicators	Correction factor ($1-R^2$)	Pairwise correlation |r|	Discrimination coefficient (DC)	Individual information coefficient (α_i)
1	R&D	1.000	0.806	0.632	0.301
2	genderemploy	0.818	0.798	0.637	0.248
3	employ	0.433	0.737	0.095	0.020
4	leavers	0.675	0.663	0.379	0.122
5	tertiary	0.617	0.591	0.254	0.075
6	ifantil poverty	0.229	0.494	0.393	0.043
7	renewable	0.297	0.451	0.612	0.087
8	greenhouse	0.485	0.416	0.230	0.053
9	poverty	0.062	0.408	0.329	0.010
10	Gini	0.317	0.370	0.142	0.021
11	energy	0.582	0.270	0.073	0.020

5.3. TDI, Inequality extended TDI and Life Satisfaction

Following the spirit of the report by Stiglitz *et al.*'s (2009), we have calculated the ranking of the Member States obtained from the subjective well-being approach (as starting point, Easterlin 1974, 1995; a more recent study, Pedersen and Schmidt 2011). The most recent data for all of the EU28 countries is provided by Veenhoven (201?) for the year 2009. Table 3 shows the results from the Life Satisfaction Index (LS Index). Even taking into account the more than likely decrease in life satisfaction for the majority of countries from 2009 to 2011, as a direct consequence of the crisis, we observe a wider variation in the ranking with respect to the rankings derived from both the TDI and the extended TDI.

The Spearman's correlation coefficient is equal to 0.471 ($p = 0.011$) between TDI and Life-satisfaction index and equal to 0.441 ($p = 0.010$) between extended TDI and Life-satisfaction index. Thus, there is a significant relationship between citizens' perceptions of their lives and the distance between the countries and the targets selected by the EU to exit stronger from the crisis. This result goes in line with subjective wellbeing and Sen's capabilities approaches, which claim that non-economic dimensions influence people's satisfaction with their lives and that social and individual dimensions should be included when analysing the development of societies.

5.4. Mediation Analysis: Life satisfaction, GDP per capita and TDI

Given the indicators included in the Europe 2020 targets distance index (TDI), one should expect correlation between the GDP per capita and the TDI. Furthermore, we know from above that correlation exists between the TDI and life satisfaction indexes. Table 6 shows the pairwise correlations between these three approaches to measuring socioeconomic progress.

Table 6. Pairwise correlations Life-satisfaction, GDPcapita and TD (N=28)

Pairwise Correlations (p values)	Life-satisfaction	GDPcapita
Life-satisfaction	1.0000	
GDPcapita	0.7091 (0.0000)	1.0000
TDI	-0.4110 (0.0298)	-0.3646 (0.0564)

Hence, two factors influence *life-satisfaction*: *GDPcapita* (positively) and the *TDI* (this one negatively because the larger the index the larger the distance to the targets set by the EU 2020 strategy). To evaluate the relative strength and significance of the *GDPcapita* and the *TDI*, we run a regression of *life-satisfaction* on both variables. We first make the size of the estimated coefficients comparable by normalizing all the variables to mean zero and unit standard deviation. The results of the regression of *life-satisfaction* on the normalized *GDPcapita* and *TDI* variables are reported in the last column of table 7.

Table 7. Results of regressions

	Regression (1) Coefficient (p value)	Regression (2) Coefficient (p value)	Regression (3) Coefficient (p value)
GDPcapita	-	dependent variable	b= 0.6450 (0.000)***
TDI	c= -0.4110 (0.030)**	a= -0.3646 (0.056)*	c'= -0.1758 (0.244)
Life-satisfaction	dependent variable	-	dependent variable
Constant	-1.02e-09 (1.000)	-2.76e-09 (1.000)	7.60e-10
Adjusted R squared	0.1369	0.0996	0.4920
N	28	28	28

This simple model does not consider the possibility that the effects of the *TDI*, i.e., of each country's distance with respect to the EU 2020 targets, on *life-satisfaction* may occur both directly on *life-satisfaction* and indirectly or mediated through its effects on *GDPcapita*. That hypothesis is tested via a statistical method named mediation analysis.

Yuan and MacKinnon (2009) describe the simple mediation method as a three-variable system in which an independent variable (*TDI*) causes a mediating variable (*GDPcapita*), which, in turn, causes a dependent variable (*life-satisfaction*). In our case, the analysis aims to determine whether the relation between the DP_2 *TD* index and *life-satisfaction* is due, wholly or in part, to the mediating *GDPcapita* variable. It is reasonable to take the *TDI* as the independent variable because it includes factors such as R&D and education that do determine the *GDPcapita* (Lucas 1988; Romer 1990). Figure 1 illustrates our application of the simple mediation model.

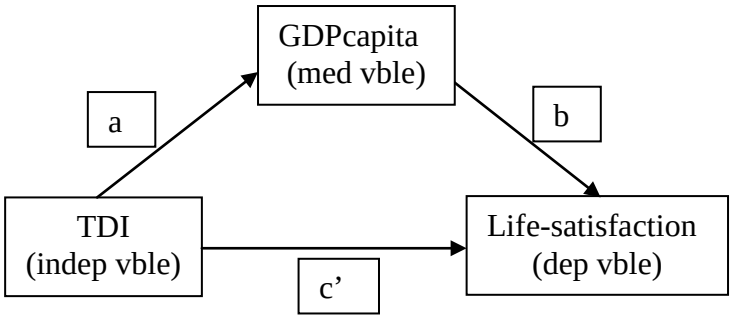

Figure 1. Diagram of the Mediation Analysis

The following three regressions equations capture the mediation model in Figure 1:

$$Life\text{-}satisfaction = \alpha_1 + cDP_2\,TD + e_1 \quad (5)$$

$$GDPcapita = \alpha_2 + aDP_2TD + e_2 \quad (6)$$

$$Life\text{-}satisfaction = \alpha_3 + bGDPcapita + c'DP_2TD + e_3 \quad (7)$$

where *c* quantifies the relation between the *DP_2 TD* and *life-satisfaction*, *a* measures the relation between the *DP_2 TD* and *GDPcapita*, *b* quantifies the relation between the *GDPcapita* and *life-satisfaction* after adjusting for the effects of the *DP_2 TD*, and *c'* quantifies the relation between the *TDI* and *life-satisfaction* after adjusting for the effect of the *GDPcapita*. It is assumed that residuals e_1, e_2 , and e_3 follow normal distributions with mean 0 and variance σ^2_1, σ^2_2 and σ^2_3, respectively.

For mediation to take place, looking at Table 7, one should observe that both the coefficient (c') and significance level of the independent variable *TDI* in regression (3) diminish in comparison to those obtained (c) in regression (1). This fact signals that some of the effect of the *TDI* on *life-satisfaction* might be mediated via *GDPcapita*.

Table 8 reports the results of the Sobel-Goodman mediation tests that estimate the significance of the direct and indirect effects. The ratio of the product ab (indirect effect) over the sum (ab + c') (direct and indirect effect) measures the proportion of the effect mediated by *GDPcapita*. The Sobel-Goodman (SG) statistic (Goodman 1960; Sobel 1982) tests the hypothesis that the product ab of the estimated coefficients is different from 0. The percentage of the total effect that is mediated by *GDPcapita* is 57.23% (Sobel_Goodman test: p-value = 0.069).

Table 8. Results of the Sobel-Goodman mediation tests

Sobel Goodman Mediation Tests	Coefficient (p value)	Proportion of the total effect that is mediated	0.5723
Sobel	-0.2352 (0.06925626)		
Goodman-1	-0.2352 (0.07528369)	Ratio of indirect to direct effect	1.3381
Goodman-2	-0.2352 (0.06327206)		
a coefficient	-0.3646 (0.045855)**	Ratio of total to direct effect	2.3381
b coefficient	0.645003 (0.000012)***		
Direct effect c'	-0.1756 (0.232818)		
Total effect c	-0.4110 (0.021533)		
Indirect effect c-c'	-0.2352 (0.069258)		

We may then conclude that a substantial part of the effect of the *TDI* on *Life-satisfaction* (57.23%) is mediated through the *GDPcapita*.

5. Conclusions

The recent economic crisis has inflicted a huge shock on millions of citizens and has exposed some fundamental weaknesses of the European Union economy. To successfully overcome the economic crisis, the Europe 2020 Strategy aims to coordinate all of the Member States' efforts to turn the EU into a smart, sustainable and inclusive growth. With the aim of monitoring Member States' degree of achievement of the Europe 2020 Strategy targets, the European Parliament has selected a set of eight indicators. That set encompasses distinct types of indicators (economic, social and environmental) in order to get a balanced perspective and to provide a strategic overview of the achievement degree of the Europe 2020 Strategy targets. The multidimensionality responds to the three mutually reinforcing priorities of Europe 2020 Strategy (smart growth, sustainable growth, and inclusive growth), and constitutes a positive step in the direction of searching for alternative indicators to the GDP as a measure of socioeconomic performance (Commission of the European Communities 2009; Stiglitz et al 2009; Van den Berg 2007).

We have applied the DP_2 methodology of Pena Trapero (1977) to calculate the distance between each Member State synthetic situation in 2011 and the synthetic situation resulting from the Europe 2020 Strategy targets. We find that none of the Member States meets all of the targets, that Denmark is the closest and Malta is the furthest to the targeted situation and that there are large disparities among Member States. We have calculated the Relative Individual Information Coefficient (α_i) that shows that the R&D, renewable and leavers indicators are the crucial determining

factors of the distance between the Member States and the Europe 2020 targets. Thus, the efforts of European Community policy should focus on these disparity factors.

Despite the recent crisis has aggravated inequalities in different areas, no specific targets have been adopted for the reduction of social and economic inequalities in the EU 2020 Strategy. We consider that the major deficiency of the EU 2020 Strategy, i.e., that the social cohesion target has been set aside. Following the capabilities approach (Nussbaum 2000, 2011; Sen 1980, 1990) and the recommendations in the Commission report by Stiglitz *et al.* (2009), we extend the analysis by adding three inequality targets relative to income distribution, gender employment and child poverty. Independently of the criterion, it is sensible to include these three inequality indicators. The extended index shows that, though the ranking of Member States is pretty similar to that obtained with the eight targets index, distances increase for all of the Member States. The results of the individual information coefficient show that R&D, inequality in gender employment and leavers are the most influential indicators to determine the disparities between Member States in the extended TDI.

Next and within the framework provided by a subjective wellbeing approach, we examine the ranking of the EU Member States by looking at the average life satisfaction in each country. The result supports Sen's view that what people care about might be substantially different from what standard economics assumes they care about.

Finally, we have analysed the relationship between the objective position of each Member State regarding the EU 2020 synthetic target and life satisfaction level - inhabitants' subjective position- in each Member State. The mediation analysis shows that approximately the 57.23% of the effect of the synthetic index on life satisfaction is mediated by the GDP per capita. These results are in line with recent views in human development and well-being research (see Council of the European Union 2006; OECD

2013; Stiglitz et al. 2009; UNDP 2013). That is, the GDP per capita is only a mean to achieve socioeconomic progress, not the end.

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