TOWARDS INCLUSIVE PROSPERITY AND DEVELOPMENT IN EUROPEAN COUNTRIES USING THE TRANSITIONING PERFORMANCE INDEX

Sledování inkluzivní prosperity a rozvoje v evropských zemích pomocí Indexu výkonnosti přechodu

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Annotation

The need to assess sustainable processes and states is a driving assumption for the paper, having as an objective to explore the assessment model of the Transitioning Performance Index by the European Union. The purpose is to analyze for 24 out of the EU-27 countries for the year 2020 using multivariate, the distribution of performance within the 37 indicators used for the estimation of the transitioning performance index. The results produced 24 principal components of which the first 8 accounted for 89 percent cumulative variation and 10 accounted for 93 percent. The 24 countries selected were further classified into 4 groups based on the PCA results and the observable correlations between the original variables and the PCA were also determined. The results showed that the main indicators and the new PCA could be used as policy and decision-making guidelines for individual countries to determine strengths, weaknesses and opportunities for inclusive and sustainable development initiatives and programmes.

Keywords

sustainability performance, inclusive development, Transitioning performance index

Anotace

Základním předpokladem tohoto článku je potřeba hodnotit udržitelné procesy a jejich aktuální stav, a tudíž cílem je prozkoumat model hodnocení udržitelnosti, tzv. index výkonnosti přechodů (TPI index) sestavený Evropskou unií. Účelem je pro 24 zemí z celkových 27 států EU pomocí vícerozměrné analýzy zkoumat rozložení výkonnosti v rámci 37 ukazatelů používaných pro odhad indexu výkonnosti přechodů pro rok 2020. Výsledky poskytly 24 hlavních komponent, z nichž prvních 8 představovalo 89 % kumulativní variace a 10 představovalo 93 %. Vybraných 24 zemí bylo dále klasifikováno do 4 skupin na základě výsledků analýzy hlavních komponent (PCA) a byly také stanoveny pozorovatelné korelace mezi původními proměnnými a PCA. Výsledky ukázaly, že hlavní indikátory a nové PCA mohou být využity jako metodická vodítka pro stanovení politik a rozhodovací procesy v jednotlivých zemích k určení silných a slabých stránek a příležitostí pro iniciativy a programy inkluzivního a udržitelného rozvoje.

Klíčová slova

hodnocení udržitelnosti, inkluzivní rozvoj, Index výkonnosti přechodu

JEL Classification: *O40, O52, O32*

1. Introduction

Several sustainability indicators are increasingly being developed, and as public policy and programmes making decisions increasingly become decentralized their significance becomes obvious. To ensure the effectiveness of initiatives at the local, regional, national, and international levels, sustainability indicators must reflect the shared values, concerns and hopes for the future as well as ensuring meaningful interactive participation in the development of a set of indicators Vilcina & Boronenko. (2011); Galgoczi. (2009); Falciola et al. (2020). This also requires enduring and effective communication between researchers, policymakers, user and interest groups Kelly & Moles. (2002) in Coelho et al. (2010).

The relevance of sustainable development is that it plays a central role in the creation of regional, national and international strategies for most public and private organizations as well as countries and local governments Pawlonka. (2019); Jones. (2006). As such, using sustainable development as a planning goal will also necessitate building indicators that can assist policy-makers in identifying appropriate policies as well as monitoring the effectiveness of said policy actions Gustavson et al. (1999) in Coelho et al. (2010). Moreover, indicators in themselves are powerful tools of growing interest and with varying interesting applications Parris & Kates, (2003) in Coelho et al. (2010), which help to assess progress made towards targets, highlight key policy initiatives needed to be taken, raise public awareness of actions made that can contribute to sustainability in target areas, educate the public and interest groups about sustainable development, and ensure transparency in the trade-offs and synergies between different objectives Horvath et al. (2012); Satrovic & Muslija. (2019); EU. (2022).

The aim of the paper is to analyse the various indicators for the transitioning performance published by the European Commission for the year 2020 using multivariate analysis. This is to enable on one hand to examine and classify the indicators into smaller components that will keep the original variation and allow for better understanding of the efforts that go into the performance. On the other hand, the aim is to make it possible to break down the original four dimensions into more finer dimensions and give a better understanding of the relationships among the indicators. To achieve this, the paper is organized as follows: a literature review on sustainability performance, followed by methodology and analysis of the results of the transitioning performance index and finally a conclusion and recommendation.

2. Literature Review

Several attempts have been made to measure economic progress, economic and social welfare, or quality of life using methods other than Gross Domestic Product (GDP), which is a basic measure of a country's overall economic output. As a result, new requirements have gradually been incorporated to make such measurements as comprehensive, sustainable and all-embracing as possible Anielski. (2001) and Hecht. (2002) in Bilbao-Ubillos. (2013); Vondrova & Fifekova. (2015); Sloka et al. (2019). The concept of 'development' as currently used by the United Nations Development Programme (2001) in Bilbao-Ubillos. (2013) is more comprehensive yet more stringent than the traditional concept since it comprises a process of broadening the options open to the people of a country as well as increasing their functions and abilities to ensure that the level of development is measured in terms of the real freedoms that people enjoy Freidenfelde. (2011); Madaleno. (2008).

Since the early 1990s, sustainability has been one of the most addressed goals for the design of policies, programs, plans and projects in different sectors of governments, business and non-governmental organizations. This is due to issues of environmental quality and social exclusion in international political and scientific debates Rodrigues-Filho et al. (2013); Zadoroznaja. (2010). It should be noted that, important international initiatives on the development of sustainability assessment systems are acknowledged, including the Millennium Development Goals UNDP. (2011), the Index of Sustainable Economic Welfare – ISEW Lawn. (2003), and the Dashboard of Sustainability IISD. (2007), and also the Transitioning Performance Index by the European Union Rodrigues-Filho et al. (2013); Ruiz et al. (2013); Odugbesan et al. (2022). Scoreboards and composite indicators, like the new Transitions Performance Index, are powerful tools for informing and mobilizing citizens in the EU and for monitoring the impact of national policies EU. (2020, (2022).

2.1 Relevance of sustainability measures and introducing the Transitioning Performance Index

In times of increasing interest in sustainability topics exaggerated due to depletion of resources, global warming and social inequalities, various concepts and projects that aim at the goals of sustainable development experience high popularity. Moreover, issues of globalization and urbanization have resulted in central, environmentally deprived areas and long, interregional/international value chains with winning global players and an ever-growing gap between rich and poor. This can be because urban growth has outpaced the ability of governments to build essential infrastructures and create value Carius et al. (2018). It is established that value creation either at local or grand scales can be facilitated by using relevant trans-sectoral synergies which is fundamental to sustainable development and the strengthening of target economies. This visualization of the economic, environmental and social impacts will not only support decision-making processes, but can be used as a political argument aimed at promoting and fostering planning and development initiatives Carius et al. (2018).

The Transitions Performance Index shortened as (TPI) is a composite indicator that measures the performance of countries along four main transitions, namely, economic, social, environmental and governance. Most of the indicators for this index are outcome-oriented to present a combined impact of the policy mix implemented in each country. Each of the four transitions adds an important element to the overall assessment of performance,

challenges, and opportunities EU. (2020). The TPI does not present geographical predetermination therefore there is no clear-cut North-South, East-West divide, including on the European continent. Scoreboards have proved to have a powerful influence for informing and for monitoring the impact of national policies EU. (2022). However, since challenges are global, the TPI also presents the data at the global level, so that best performances and challenges all over the world can be identified and be a source of inspiration and action. It uses comparable international data and covers countries which in total represent approximately 76% of the total population EU. (2020). It provides a 'beyond GDP' approach that enables a comparison of country performances in progressing towards fair, equitable and sustainable prosperity. It contributes to providing a broader perspective on prosperity that focuses on resilience, inclusiveness, sustainability, and prosperity and that supports the EU's 2022 Annual Sustainable Growth Strategy EU. (2020, (2022).

2.2 Feasibility and relevance the Transitioning Performance Index and TPI Selection for the year 2020

Normally there are concerns on the feasibility and/or robustness of measures developed to measure economic and social trends and performances. The TPI is not without these concerns too and as such the European Commission's Competence Centre on Composite Indicators and Scoreboards normally shortened as (JRC-COIN) performed an independent statistical audit to validate the TPI's methodological process and answer queries related to whether it met these concerns of robustness and made recommendations for future releases of the index EU. (2020, (2022). It should be noted that, first and foremost, the statistical assessment of the JRC is independent. Also, it is based on the strict accordance and recommendations of the Handbook on Constructing Composite Indicators and the review of more than 100 international composite indicators and scoreboards. Thus covering a wide array of policy domains and experience gained from them EU. (2021). JRC-COIN, with its statistical expertise and experience developing these tools, provides the needed expert assistance for informed policy decisions and progress monitoring which helps policymakers in monitoring the impact of the EU strategies and policies at their national, regional, and local levels. Therefore, with such robust composite indicators, policymakers can shape policy and monitor progress in many different areas EU. (2020, (2022).

In the European Union, programming is one of the essential elements of the functioning of the Structural Funds and involves the preparation of multi-annual development plans. It is undertaken through a partnership-based decision-making process through several stages, until the measures are taken over by the public or private bodies entrusted with carrying them out. Moreover, the programming period for a single period lasts for seven years in order to maintain the simplification of the management system defined in Regulation (EC) No 1260/1999. The seven-year periods began in 2000, hence the previous programming periods were 2000-2006 2007-2013, and 2014 – 2020 and the current one is 2021-2027 EU. (2021, (2022). It should be noted that the index uses indicators with specific goalposts to follow the path taken by various countries towards fair and prosperous sustainability over the past decade. It illustrates the contributions of each transition to the overall performance of a country, indicating strengths and weaknesses, opportunities, and possible trade-offs.

3. Methodology and Analysis

The TPI index indicators for the year 2020 lists 37 indicator scores between 0 to 100. Greece, Malta and Luxembourg were not included in the analysis due to missing data from the set. To reduce bias from the multivariate analysis, countries without complete data in the TPI indicators set were excluded from the principal component analysis. Secondly the index for the year 2020 were used because it is the most recent information and provides data after recent economic and social challenges.

Tab. 1: Details of the year, variables, and countries for analysis.

Year	Variables	Countries
2020	1. Education 2. Wealth 3. Productivity 4. Industrial base 5. Health 6. Work and inclusion 7. Free time 8. Equality 9. Emission reduction 10. Biodiversity 11. Resource productivity 12. Energy productivity 13. Fundamental rights 14. Security 15. Transparency 16. Sound public finances 17. Gov. expenditure in education per student (% of GDP per capita) 18. Internet users (%) 19. Proportion of people with ICT skills (composite) 20. Output per worker (2011 constant GDP PPP$) 21. Gross expenditure on R&D (% of GDP) 22. Gross value added of manufacturing (% of GDP) 23. Patent families filed in two offices (per billion PPP$ GDP) 24. Employment rate of the population aged 20-64 (%) 25. Employment-to-population ratio gender gap 25+ (%) 26. Gross enrolment ratio, pre-primary (%) 27. Gini coefficient disposable income post taxes and transfers (0-100) 28. Income share held by the poorest quintile (%) 29. Terrestrial key biodiversity areas (KBAs) protected (%) 30. Freshwater key biodiversity areas (KBAs) protected (%) 31. Pesticide use per area of cropland (kg/ha) 32. Resource productivity (PPP$ per kg) 33. Material footprint (tonnes per capita) 34. Voice and accountability index (z-score) 35. Rule of law Index (z-score) 36. Corruption perceptions index (0-100) 37. Basel anti-money laundering index (0-10)	Austria Belgium Bulgaria Croatia Cyprus Czechia Denmark Estonia Finland France Germany Greece Hungary Ireland Italy Latvia Lithuania Luxembourg Malta Netherlands Poland Portugal Romania Slovakia Slovenia Spain Sweden (Greece, Malta and Luxembourg were removed from the data set due to missing data.)

Source: EU. (2022)

3.1 Determining number of new components to replace original variables.

Using the PCA, the original variables are reduced to 24 principal components with number of eigenvalues >1 using the code sum(p$sdev^2>1) as 8, and the summaries shown in Fig. 1 and Tab. 2. In figure and tabular forms. The first 8 components account for approximately 89% of the variation while the first 10 components accounted for approximately 93% of the cumulative variation which means we can use these 8 components to explain the changes in the sustainability performance according to the TPI methodology. These components will reduce the total indicators needed for the measurements and make it easier to observe the relationships between the indicators. Fig. 1 shows the same information in a graphical method but for the first 10 components using the drop of the lambda/variances. The new components are in descending order according to their weight in influencing the variation, and there is no correlation between the new components, therefore they can be used to fix the issue of multicollinearity. The first eigenvalue calculated from the matrix is the variance / dispersion of the first principal component and so forth until last principal component.

Based on the results of the analysis there were observable correlations between the original variables and the principal components. Some observable results showed that the first PCA had very strong negative correlations of -0.8 and -0.9 with initial variables Education, Corruption perceptions index, Rule of law Index, Voice and accountability index, Patent families filed in two offices, Gross expenditure on R&D, Proportion of people with ICT skills, Fundamental rights, Productivity and wealth. This group of original variables can be classified in a set

because they have similar influences. An average positive correlation was observed with Material footprint (in tonnes per capita) and a weak positive correlation of approximately 0.2 and 0.3 were observed with Emission reduction and Biodiversity. This group of original variables also has similar influences.

For the second PCA an average to a strong positive correlation of approximately 0.5 and 0.7 were observed with variables Health, Resource productivity, Energy productivity, Security, Resource productivity (PPP$ per kg). Alternatively, an average to strong negative correlations of approximately -0.5 and -0.7 were observed with variables Basel anti-money laundering index, Pesticide use per area of cropland (kg/ha), Terrestrial key biodiversity areas (KBAs) protected, Employment rate of the population aged 20-64, Gov. expenditure in education per student (% of GDP per capita), Sound public finances, Biodiversity. Hence. These variables can also be placed in similar groups due to their shared influences. This provides a guideline for countries that seek to evaluate their sustainability performance by allowing them to observe beforehand the potential influences these indicators will have should they focus attention on their problem areas.

The trends for the correlations are observed for all the PCA and the original variables but after the first 8 PCA, the following components show very weak to weak positive or negative relationships without any strong correlations observed. Hence, variables sharing strong relationships as explained in the previous paragraphs can be the focus of attention for countries striving to improve sustainability performance. This also expands on the original 4 dimensions into 8 main components with having degrees of relationship observed with original indicators.

Tab. 2: Summary Results of Principal Component Analysis

| PCA	Standard deviation	Proportion of Variance	Cumulative Proportion
PCA 1	3.8401	0.3985	0.3985
PCA 2	2.4790	0.1661	0.5646
PCA 3	1.9744	0.1054	0.6700
PCA 4	1.57875	0.06736	0.73736
PCA 5	1.34998	0.04926	0.78662
PCA 6	1.21874	0.04014	0.82676
PCA 7	1.14906	0.03568	0.86245
PCA 8	1.04703	0.02963	0.89207
PCA 9	0.89866	0.02183	0.91390
PCA 10	0.80879	0.01768	0.93158
PCA 11	0.78021	0.01645	0.94803
PCA 12	0.7067	0.0135	0.9615
PCA 13	0.62759	0.01065	0.97218
PCA 14	0.54453	0.00801	0.98019
PCA 15	0.49358	0.00658	0.98677
PCA 16	0.39843	0.00429	0.99106
PCA 17	0.33466	0.00303	0.99409
PCA 18	0.3042	0.0025	0.9966
PCA 19	0.21781	0.00128	0.99788
PCA 20	0.19007	0.00098	0.99885
PCA 21	0.16350	0.00072	0.99957
PCA 22	0.11236	0.00034	0.99992
PCA 23	0.05595	0.00008	1.00000
PCA 24	1.358e-15	0.000e+00	1.000e+00

Source: author's own processing

Fig. 1: Variance of Principal Component Analysis
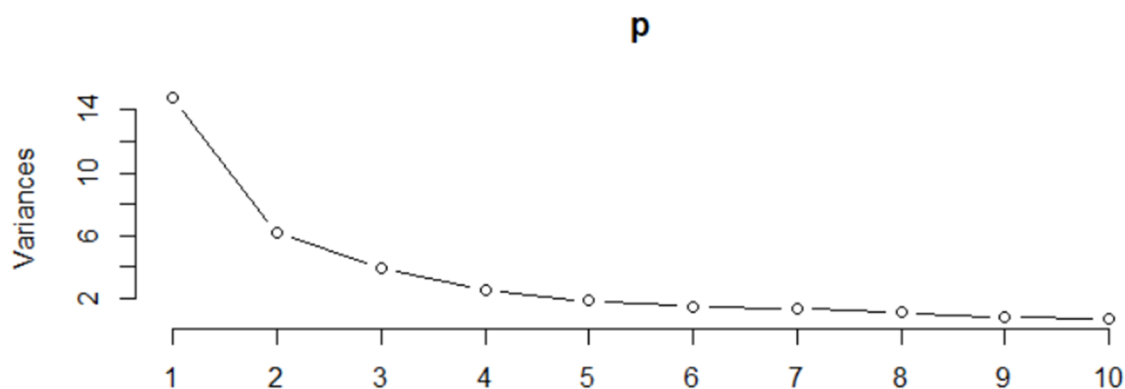
Source: author's own processing

3.3 Classification of countries based on PCA results.

The PCA also attempts to classify the countries (denoted as individuals) according to relationships observed with the new components. In this case, countries that have their indicators performing similarly will be observed close to each other in the central axes, whiles those that perform out of sync with be observed as outliers and further from the central axes. It should be noted that the classification of the countries is done with the new components deduced from the analysis as shown in the Tab. 2. Which means that countries in similar or close grouping will have their transitioning performance influenced by similar indicators. As observed in Fig. 2, the countries are placed in a two dimensional planed (shortened as Dim1 and Dim2 respectively) and based on the dependencies and relationships of variables with the principal components of Tab. 2. Fig. 2 shows this classification of countries and Tab.3 gives the corresponding countries represented by the numbers. It should be noted that the numbering of countries has no rule, and it is purely alphabetically numbered.

Fig. 2: Principal component analysis for countries (individuals)
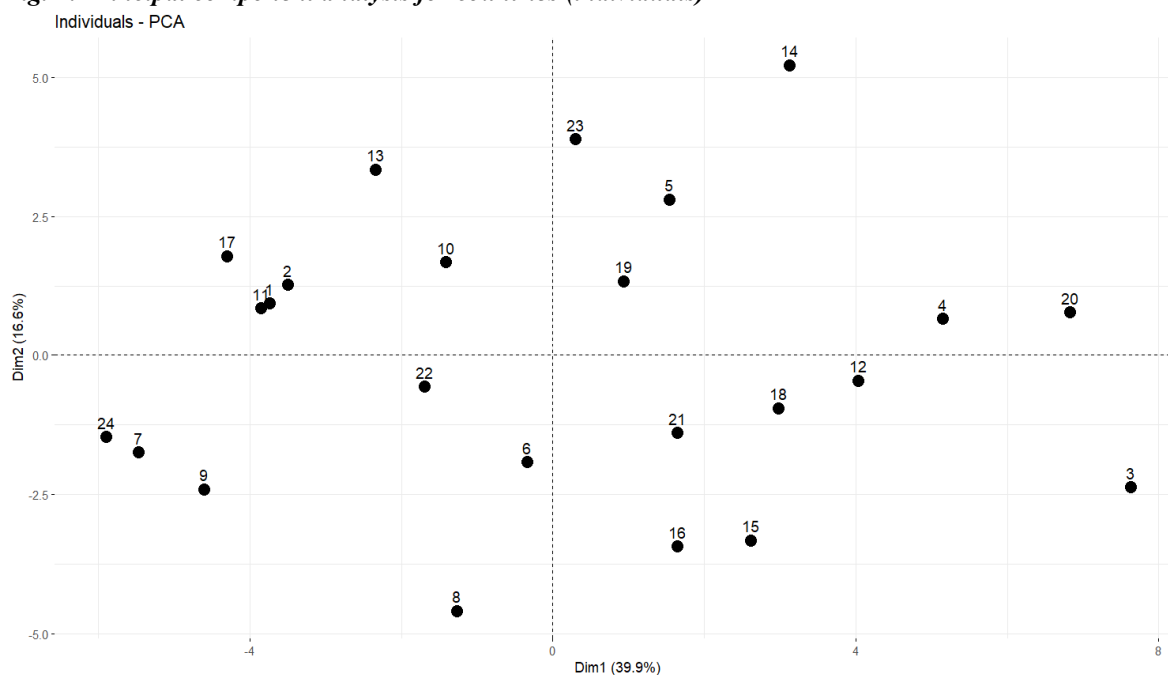
Source: author's own processing

Tab. 2: Summary Results of Principal Component Analysis

Group 1	Group 2	Group 3	Group 4
1 - Austria	4 - Croatia	6 - Czech Republic	3 - Bulgaria
2 - Belgium	5 - Cyprus	7 - Denmark	12 - Hungary
10 - France	14 - Italy	8 - Estonia	15 - Latvia
11 - Germany	19 - Portugal	9 - Finland	16 - Lithuania
13 - Ireland	20 - Romania	22 - Slovenia	18 - Poland
17 - Netherlands	23 - Spain	24 - Sweden	21 - Slovakia

Source: author's own processing

Group 1 are observed for mostly central and western European countries. Group 2 is observed for mostly southern and south-eastern European countries. Group 3 is observed for mostly North European countries with the Czech Republic and Slovenia which are geographically demarcated in central Europe being included. Group 4 is observed for south-eastern and northern European countries with Slovakia and Poland which are geographically demarcated as central European countries included. This confirms the issue of outliers that may not be bound by geographical locations but rather indicator performances for the measurement.

4. Conclusion

The results for the paper show that individual countries can use the Transitioning performance index indicators and the PCA to determine areas of strengths in their endeavors towards inclusive and sustainable development. Also, it will help in identifying areas of weakness that could negatively affect initiatives and actions or that will need to be addressed to ensure inclusiveness towards prosperity. This can be done by observing the relationships that exist among the variables, and since there are no correlations observed among the new components, the indicators can be better distributed, and their performance better understood. Moreover, certain indicators are correlated and influence performance in similar directions as observed for the original variables with strong negative or positive influences for the principal components. This means that countries focusing on areas of concern to them such as Education, Corruption perceptions index, Rule of law Index, Voice and accountability index, Patent families filed in two offices, Gross expenditure on R&D, Proportion of people with ICT skills, Fundamental rights, Productivity and wealth can expect to have close or similar influences on their total performance, since working on one or more could inadvertently influence other areas in the same group.

The results also show that countries are not bound by geographical demarcations in terms of performance. Although majority of countries in similar geographical locations share common socio-economic and cultural characteristics that might influence decisions and performance orientation, ultimately, indicators performance should be based on the individual needs and challenges for the countries. This will mean that countries in clear geographical locations will still perform differently as observed for central European countries falling into dispersed groups across the four, a trend that is observed in most countries as well. Finally, these can also provide areas of opportunities that would need to be taken advantage of to ensure that actions are targeted to what is particularly needed for each individual country, rather bulk geographical expectations. This can also be extended towards more local levels so that more refined results and guidelines can be achieved during policy and decision making at grassroots levels.

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