

Multicriteria decision model for constructing composite indicators and its application in representing multidimensional governance

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ARTICLE INFO

Dataset link: <https://databank.worldbank.org/>

Keywords:

Multidimensional phenomenon
World governance indicators
Ordered weighted averaging
Entropy
Principal component analysis
Benefit of the doubt

ABSTRACT

Governance is a complex, multidimensional construct difficult to measure and has economic, social, and sustainability implications. This study revisits the literature on governance, examining its conceptual frameworks and its relationships with economic, social, and sustainability factors. The study reveals several gaps in the representation of multidimensional governance. First, the almost exclusive use of Principal Component Analysis (PCA) and Simple Additive Weighting with Equal Weights (SAW-EW) to operationalize the construct. Second, the limited use of tests to verify the quality and reliability of the representations. Third, the analysis of governance as a unidimensional construct. This research aims to address these gaps by incorporating quality and reliability parameters into a new multicriteria decision model for constructing composite indicators. The multicriteria decision model uses ranking uncertainty, links to other variables, and the composite indicator's informational and discriminant power to identify the best method for representing multidimensional governance. The use of this framework across OECD countries shows that the Entropy method represents multidimensional governance with greater quality and reliability than the PCA, SAW-EW, Benefit of the Doubt (BoD), and Ordered Weighted Average (OWA) methods. The Entropy method ensures a more accurate alignment between the concept of multidimensional governance and economic, social, and sustainability aspects, providing robust information for political and investment decisions. The quality and reliability framework is adaptable to other multidimensional phenomena, with the best method defined for each context.

1. Introduction

There are various definitions of governance, including the mechanisms for selecting, monitoring, and replacing governments, as well as the government's ability to formulate and implement effective policies (Kaufmann et al., 2009). Although there is no consensus regarding the definition of governance (Thomas, 2010), researchers agree that governance is a multidimensional construct associated with several social and economic phenomena, including human development, access to clean energy, sustainable development, foreign direct investments, unemployment, and innovation levels in countries (Khodary, 2016; Cruz and Marques, 2017; Ibanez et al., 2024; Zhu et al., 2024; Özekin and Aksoy, 2025; Fakhri et al., 2025).

While many definitions of governance exist, few methods have been employed to represent the multidimensional phenomenon. In particular, multidimensional governance has been assessed using composite indicators constructed via Principal Component Analysis (Feyisa et al., 2022; Kassi and Dong, 2023) and the Simple Additive Weighting with Equal Weights method (Khodary, 2016; Velázquez and Barba, 2019). Furthermore, it is worth noting that the governance composite indicators in the literature do not adequately assess the quality and reliability of the results (e.g., Oino, 2019; Beleneši et al., 2021; Rashid et al., 2024). Finally, the construction of composite indicators has focused on explaining only one or a few facets of governance, such as electricity access governance (Falchetta et al., 2021), irrigation governance ratings (Akuriba et al., 2020), and technical and democratic governance

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<https://doi.org/10.1016/j.ejdp.2026.100073>

Received 26 March 2026; Received in revised form 24 June 2026; Accepted 9 September 2026

Available online 10 September 2026

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(Vätavu et al., 2022).

These are significant concerns given the repercussions of governance composite indicators on political and investment decisions (Gani, 2007; Bellos and Subasat, 2012; Torfing and Ansell, 2020), raising the following questions:

- What other methods can be used to represent multidimensional governance?
- Do all methods present sufficient quality and reliability to represent multidimensional governance?
- Which method presents the most outstanding quality and reliability?
- Does this method allow for a satisfactory explanation of the social, economic, and environmental indicators associated with governance?

This research aims to address these gaps by providing more accurate information for political and investment decisions. To this end, the study incorporates four quality and reliability parameters into a new multicriteria decision model to select the method that best represents the multidimensional phenomenon. The so-called quality and reliability framework uses ranking uncertainty, linkage with other variables, average variance extracted, and entropy of composite indicators constructed by six different methods as criteria for selecting the best representation of multidimensional governance. The applicability and robustness of this framework are illustrated in the case of the multidimensional governance of OECD countries.

Among the study's contributions are the representation of multidimensional governance through a wide range of methods. The analysis of the quality and reliability of composite indicators from a wider range of tests. The analysis of the relationship between multidimensional governance and various social, environmental, and economic indicators. Furthermore, the study contributes to the literature on composite indicators by introducing an objective approach to selecting the best method for representing multidimensional phenomena, enabling the selection of weights for the Ordered Weighted Averaging (OWA) operator and thereby removing subjectivity from this process.

In addition to this introduction, this research is organized as follows. Section 2 examines the governance conceptual framework, with a particular focus on the Worldwide Governance Indicators. Section 3 presents the multicriteria decision model, describing quality-reliability tests and a new quality-reliability index that enables the selection of the most appropriate method for constructing a governance composite indicator. Section 4 presents the representation of the multidimensional governance of Organization for Economic Co-operation and Development (OECD) countries, obtained by applying the operational framework developed in this study. Finally, Section 5 presents the conclusions, outlines the research limitations, and identifies potential avenues for future research.

2. Multidimensional governance

Since the 1990s, many countries have sought to promote good governance in order to achieve development (Thomas, 2010). From then on, the concept of governance gained strength in political discourse and academic studies (Kohler-Koch and Rittberger, 2006). In the literature, there are various definitions of governance; some are broad and encompass diverse stakeholders, while others are narrowly focused on the behavior of public agents (Cruz and Marques, 2017).

The United Nations Development Program defines governance as the set of values, policies, and institutions employed in economic, political, and social management by governments, civil society, and the private sector (Nelson, 2004). The European Commission (2003) defines governance as the set of rules, processes, and behaviors employed to manage resources and meet societal demands, reflecting the state's ability to serve its population (European Commission, 2003). The World Bank (1994) defined good governance as a synthesis of formulating

predictable, open, and enlightened policies. In other words, a bureaucracy is shaped by a professional ethos, an executive branch of government responsible for its actions, strong civil society participation in public affairs, and the rule of law. In other words, governance reflects the capacity and effectiveness of governments in managing resources and implementing policies that serve the common good (World Bank, 2017).

The emphasis on good governance has increased with the rise in foreign direct investment and the assets of international investors abroad (Khodary, 2016; Oman and Arndt, 2010). For these reasons, good governance has become crucial for sustainable development and for establishing trust between institutions through transparent transactions and accountable decision-making (Cruz and Marques, 2017), which, in turn, has generated high demand for governance indicators (Gisselquist, 2014).

Given their impact on political and investment decisions (Gani, 2007; Bellos and Subasat, 2012; Torfing and Ansell, 2020), the representation of multidimensional governance is critical. Defining the conceptual framework of the multidimensional phenomenon, including identifying its sub-indicators, is challenging (Nardo et al., 2005; OECD, 2008). A poorly defined multidimensional phenomenon will undoubtedly be poorly represented by the composite indicator, regardless of the methodological choices adopted in its construction (Terzi et al., 2021; Alaimo Seri, 2024).

2.1. Conceptual-operational frameworks of multidimensional governance

Governance is a multidimensional construct, and synthesizing it into a unidimensional measure requires the construction of a composite indicator (Mitra, 2013; Cruz and Marques, 2017). In particular, international investors, official development aid agencies, academics, and the media have proposed several governance composite indicators for analytical and decision-making purposes (Oman and Arndt, 2010), e.g., the Country Policy and Institutional Assessment (World Bank, 2010), Transparency International's Corruption Perceptions Index (Thompson and Shah, 2005), Freedom House's Freedom in the World (Giannone, 2010), and the worldwide governance indicators (Kaufmann et al., 2011). Composite indicators capture and simplify the understanding and comparison of multiple factors or dimensions of a complex, multidimensional concept (Nardo et al., 2005; OECD, 2008; Greco et al., 2019). As such, they serve as a helpful tool for compressing and preserving the information necessary to understand countries' governance, enabling analysis of development priorities, the construction of scientific knowledge, and even influencing dominant groups (Gisselquist, 2014). Furthermore, composite indicators quantitatively estimate countries' governance quality, enabling comparisons and decision-making (Oman and Arndt, 2010).

A search on the abstract, title, and keywords of articles indexed in Scopus on June 19, 2026, identified 25 articles with the following combination of terms: ("composite indicator" OR "composite index") AND ("governance indicators" AND "World Bank") AND (institutions OR efficiency OR poverty OR economic). However, content analysis of these articles revealed that only 20 construct governance composite indicators.

The first interesting point observed in the retrieved articles is the diversity of objectives and application areas of the governance composite indicators. The studies evidence the relationship between governance and the performance of institutions and financial markets (Oino, 2019; Beleneși et al., 2021; Feyisa et al., 2022; Rashid et al., 2024) the achievement of private investments (Falchetta et al., 2021), the flow of foreign direct investments (Nxumalo and Makoni, 2021; Bouchoucha, 2022), the efficiency of the health system (Vätavu et al., 2022; Hadipour et al., 2023), the growth of investments in specific sectors, such as renewable energy (Kassi and Dong, 2023), or even to identify countries' government styles (Zahariadis et al., 2023). More recent studies also reveal a close relationship between governance

Table 1

Governance composite indicators: methods and sub-indicators.

Method	Composite indicator	Sub-indicators	Source
PCA	Political, economic, and institutional governance	6	Bouchoucha (2022) and Feyisa et al. (2022)
	Technical and democratic governance	6	Vátavu et al. (2022)
	Mode of problem-solving and inclusiveness	6	Zahariadis et al. (2023)
	Governance composite index	6	Nxumalo and Makoni (2021), Kassi and Dong (2023), Kakar et al. (2024), Salakpi et al. (2026), Scalamonti (2026) Falchetta et al. (2021)
	Electricity access governance	8	
	Corporate governance and institutional quality	12	Rashid et al. (2024) and Oino (2019)
	Institutional quality	14	Hadipour et al. (2023)
	Non-financial reporting disclosure ¹	13	Belenesi et al. (2021)
	Governance assessment	11	Khodary (2016)
	Irrigation governance ratings	46	Akuriba et al. (2020)
SAW	Adherence to best corporate governance practices ²	13	Velázquez and Barba (2019)
	Governance composite index	6	Scalamonti (2026)
MPI	Governance composite index	6	Santos (2025)
Sommev	Governance composite index	6	
DEA	Good governance	6	Özekin and Aksoy (2025)

Note: 1 Categorical PCA. 2 First employs the PCA to obtain the 13 sub-indicators of the SAW composite indicator.

composite indicators and the human development index (Özekin and Aksoy, 2025), energy justice (Rahman et al., 2025), unemployment (Fakih et al., 2025), and countries' innovation levels (Ibanez et al., 2024; Zhu et al., 2024).

The second point that warrants attention is the limited diversity of methods for constructing composite indicators relative to the plurality of methods reported in the literature (El Gibari et al., 2019; Fernandez and Martos, 2020). Table 1 shows that 70% of composite indicators are constructed using the principal component analysis (PCA). The remaining studies employ the Simple Additive Weighting (SAW; Khodary, 2016; Akuriba et al., 2020; Velázquez and Barba, 2019), Mazziotta–Pareto Index (MPI; Scalamonti, 2026), Subjective-objective method of maximizing extracted variance (Sommev; Santos et al., 2025), and Data Envelopment Analysis (DEA; Özekin and Aksoy, 2025).

The third point observed in the literature analysis is the diversity of constructs or conceptual frameworks addressed. The Worldwide Governance Indicators, with six sub-indicators, have been the most widely used conceptual framework for governance (Kaufmann et al., 2011; Pinar, 2015; Barbier and Burgess, 2021). A highlight of these studies is the index's nomenclature, which takes various forms, including the governance index (Nxumalo and Makoni, 2021), the institutional quality index (Rashid et al., 2024), and the governance quality index (Kassi and Dong, 2023). The other conceptual governance frameworks found use a larger number of sub-indicators. The Electricity Access Governance Index (Falchetta et al., 2021) follows a conceptual framework similar to the Worldwide Governance Indicators and comprises eight sub-indicators. In contrast, the Irrigation Governance Ratings Index aggregates 46 sub-indicators and is the most comprehensive conceptual framework in terms of the number of sub-indicators. The other governance frameworks range from 11 to 14 sub-indicators, indicating a similar conceptual structure. From a conceptual

framework perspective, this study adopts the Worldwide Governance Indicators due to their popularity, availability, data quality, and comparability with other studies.

2.2. Worldwide governance conceptual framework

Several governance indicators in the reviewed literature focus on signaling the country's ability to attract investment, allocate public resources efficiently, and meet societal interests (Kaufmann, 2004). Furthermore, the reviewed literature indicates that the Worldwide Governance Indicators' conceptual framework is the most frequently used and corroborates prior evidence of its greater adoption by the media, academia, and international organizations (Kaufmann et al., 2009). This framework defines governance as "the traditions and institutions by which authority in a country is exercised" and encompasses 25 data sources aggregated into the six dimensions detailed below (Kaufmann et al., 2009).

- *Control of corruption*: captures perceptions about how governments are employed for private gain, including small and large forms of corruption (Islam, 2026).
- *Government effectiveness*: captures perceptions of the quality of public services, the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies (Khan and Hussain, 2024).
- *Rule of law*: captures insights into the extent to which agents trust and comply with society's rules, particularly the quality of enforcement of contracts, property rights, and the police and courts, as well as the likelihood of crime and violence (Croissant and Pelke, 2022).
- *Political stability and absence of violence*: captures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism (Scalamonti, 2026).
- *Regulatory quality*: captures perceptions of the government's ability to formulate and implement sound policies and regulations that enable and promote private-sector development (Islam, 2026).
- *Voice and accountability*: captures perceptions about the extent to which a country's citizens can participate in choosing their government, as well as freedom of expression, freedom of association, and free media (Osinubi and Simatele, 2026).

2.3. Composite indicators construction

After defining the conceptual framework, the composite indicator can be calculated through three main procedures: scale normalization, weighting, and aggregation of sub-indicators (Mazziotta and Pareto, 2017; El Gibari et al., 2019). Mathematically, scale normalization transforms the different measurement units of sub-indicators into a single, comparable scale (Cinelli et al., 2021). Weighting allows the assignment of relative importance to sub-indicators (Becker et al., 2017). Aggregation combines the normalized and weighted sub-indicators into a unidimensional measure to represent the multidimensional concept (Greco et al., 2019). Composite indicator construction methods combine these three procedures, with the weighting scheme being the procedure that most distinguishes them.

From an operational framework perspective, this study uses six methods to construct the worldwide governance composite indicator. The Principal Component Analysis, Simple Additive Weighting with Equal Weights, Benefit of the Doubt, and Entropy were selected for their popularity (El Gibari et al., 2019; Fernandez and Martos, 2020). In addition to these popular methods, ordered weighting averaging was selected because it allows biasing the composite indicator scores upward or downward to varying degrees (Libório et al., 2025).

Principal Component Analysis (PCA): Is a dimensional reduction method that maximizes variance (Pearson, 1901). Composite indicators constructed by PCA have the main advantage of retaining information

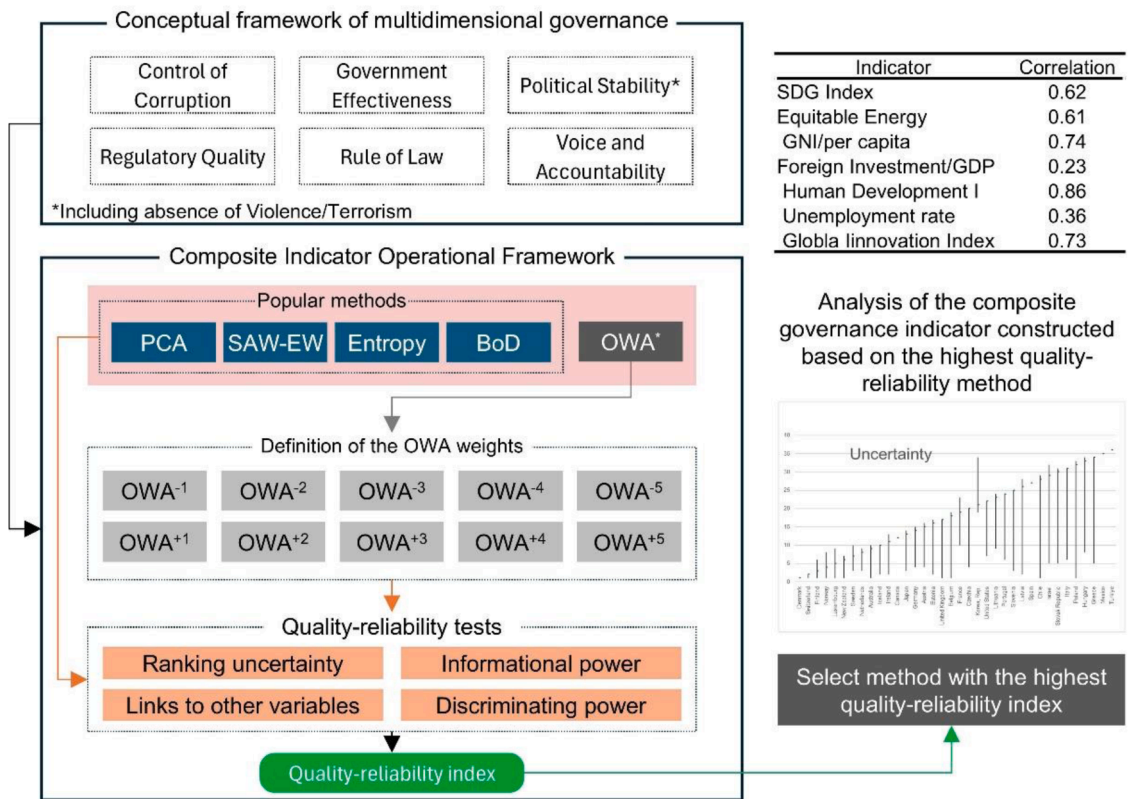


Fig. 1. Multicriteria decision model for selecting composite indicators.

from sub-indicators (Nardo et al., 2005). Among its main disadvantages is the assignment of weights to sub-indicators that are incompatible with the concept of a multidimensional phenomenon (Libório et al., 2021). Furthermore, PCA is limited to formative representations, in which the sub-indicators are causes of the multidimensional phenomenon, and cannot be applied to reflective representations (Mazziotta and Pareto, 2019, 2024).

Simple Additive Weighting with Equal Weights (SAW-EW): Consists of the arithmetic aggregation of normalized and weighted sub-indicators with equal weights. The method's primary advantages are its ease of implementation and clear communication of results. Furthermore, the method is advantageous when no well-established conceptual framework exists for the relative importance of the sub-indicators. These characteristics make SAW-EW one of the most popular methods for constructing composite indicators.

Benefit of Doubt (BoD): Is a variation of Data Envelopment Analysis developed by Cherchye et al. (2007) for the construction of indicators. Its main characteristic is the individualized weighting of sub-indicators via a weight matrix, thereby maximizing composite indicator scores for each decision-making unit (Vidoli et al., 2024). In short, this weighting scheme assigns higher weights to the sub-indicators that perform best within each decision-making unit, thereby avoiding disputes over the definition of weights (Nardo et al., 2005; OECD, 2008).

Entropy: Is an objective method of weighting sub-indicators that assigns higher weights to sub-indicators with greater capacity to differentiate decision-making units. The weights are extracted from the data using entropy measures, such as Shannon (Libório, Karagiannis, et al., 2024), and linear methods (Coimbra et al., 2025). The advantage of this method is that it enables greater informational diversity, thereby facilitating the distinction among decision-making units (Libório et al., 2024).

Ordered weighted averaging (OWA): proposed by Yager (1988), offers versatility in directing composite indicator scores upward or downward, enabling decision-makers to emphasize either the positive or negative

aspects of the multidimensional phenomenon (Libório et al., 2022). These emphases can assume different intensities, offering multiple representations for the same multidimensional phenomenon (Ekel et al., 2019), e.g., security of energy supply (Badea et al., 2011), human development (Leon-Castro et al., 2021), quality of life (Shu et al., 2022), child well-being from a health perspective (Ribeiro et al., 2024), and public infrastructure of cities (Fusco et al., 2024).

2.4. Research gaps

Identifying the method for constructing the composite indicator is a challenging multi-criteria decision problem for several reasons. First, methods for constructing composite indicators combine normalization functions, sub-indicator weights, and aggregation schemes in different ways, yielding composite indicators with diverse scores and rankings (Cinelli et al., 2021). These different scores and rankings create uncertainty about which combination yields the most reliable composite indicator for representing the multidimensional phenomenon (Dialga and Giang, 2017). Consequently, decision-makers face the challenge of determining which method or composite indicator to use (Mazziotta and Pareto, 2017). Second, a composite indicator constructed by one method may exhibit conflicting quality and reliability, achieving good results in one test and poor results in others (OECD, 2008). Third, the tests may have different acceptance thresholds, or none at all, to serve as references. For example, a correlation coefficient of 0.50 or greater is sufficient to confirm the moderate association between the composite indicator and the external variable, according to the rule of thumb of Hinkle et al. (2003). In turn, the reference value for the average variance extracted, which measures informational power, must be at least 0.30 (Libório, Ekel et al., 2024). Fourth, there are no reference thresholds in the literature for all quality tests, which makes comparisons and interpretation of results difficult. Fifth, decision-makers may consider one test more relevant than another for assessing the quality and reliability of the composite indicator. In this regard, the literature also does not

provide reference values for the relevance of each test, so tests have been used without distinguishing their relevance (Camacho et al., 2023; Suárez et al., 2024).

This study seeks to address these gaps by developing a novel multicriteria decision model for selecting a composite indicator. To this end, the study uses a broad set of quality-reliability metrics from composite indicators, which are consolidated into a global index that indicates each method's suitability for representing the multidimensional phenomenon.

3. Multicriteria decision model for selecting a composite indicator

The multicriteria decision model introduced in this study evaluates the quality and reliability of composite indicators constructed using different methods and identifies which method best represents the multidimensional phenomenon of interest. Fig. 1 illustrates the workflow of this model, which begins with defining the conceptual framework. The next step involves constructing the OWA composite indicator. In this step, the different OWA weights (see Table 9 of the annex) are used to construct ten OWA composite indicators (see Table 10 of the annex). These constructed composite indicators are subsequently evaluated using four quality-reliability tests detailed in Section 3.1. Then, the OWA composite indicator with the highest quality-reliability index, detailed in Section 3.2, is selected. Choosing only one OWA composite indicator is crucial to avoid bias in the uncertainty calculation for the other methods presented in Table 11 of the annex. The final step involves calculating and identifying the composite indicator with the highest quality-reliability index.

3.1. Quality and reliability tests

The quality and reliability of governance composite indicators constructed using different methods were assessed using both well-established and non-traditional tests. In particular, uncertainty analysis and the links to other variables were conducted in accordance with the OECD (2008) guidelines. Additionally, informational and discriminating power were assessed as non-traditional tests (Ribeiro et al., 2024).

Uncertainty analysis: tests the stability of the composite indicator's internal structure. In other words, it measures variation in country rankings across composite indicators constructed using different methods (normalization, weighting, and aggregation), thereby indicating the reliability of the scores (Greco et al., 2019). One approach to assessing uncertainty is to compute the average rank variation between the constructed composite indicator and alternative composite indicators produced by other methods. The calculation is quite simple to perform using the following function:

$$\phi = \frac{1}{\psi} \sum_{\omega=1}^{\psi} |K_{\omega} - K_{CI_{\omega}}| \quad (1)$$

where ϕ corresponds to the average change in the ranking of countries ψ , K_{ω} corresponds to the ranking of the ω -th country in the composite indicator and $K_{CI_{\omega}}$ corresponds to the ranking of the ω -th country in the alternative composite indicators, that is, a composite indicator constructed using a different method.

Links to other variables: assess the composite indicator's explanatory power in capturing the multidimensional phenomenon. The test uses Spearman's (1904) correlation, which is robust to outliers and works well regardless of whether the data are normally distributed. For this, the following function is applied:

$$\rho = \frac{\text{cov}[K_{\omega}, K_{\epsilon_{\omega}}]}{\sigma_{K_{\omega}} \sigma_{K_{\epsilon_{\omega}}}} \quad (2)$$

Table 2

Relevance of the composite indicator's quality and reliability tests.

	Frequency	Relevance
Uncertainty analysis	417	0.696
Links to other variables	149	0.249
Informational power	23	0.038
Discriminant power	10	0.017

where ϵ_{ω} is to the external variable, $\text{cov}[K_{\omega}, K_{\epsilon_{\omega}}]$ is the covariance of the rank of the composite indicator K_{ω} and ϵ_{ω} , $\sigma_{K_{\omega}}$ and $\sigma_{K_{\epsilon_{\omega}}}$ corresponds to the standard deviations of the K_{ω} and ϵ_{ω} ranks, respectively.

Informational power: measures the proportion of information in the sub-indicators retained in the composite indicator, signaling its internal reliability. The test is performed by averaging the variances extracted from each sub-indicator concerning the composite indicator through the following function:

$$\text{ave} = \frac{1}{\rho} \sum_{\lambda=1}^{\rho} \left(\frac{\text{cov}(CI_{\omega}, \epsilon_{\lambda\omega})}{\sqrt{CI_{\omega}} \times \sqrt{\epsilon_{\lambda\omega}}} \right)^2 \quad (3)$$

where $\text{cov}(CI_{\omega}, \epsilon_{\lambda\omega})$ corresponds to the covariance matrix of the composite indicator CI_{ω} and ϵ_{ω} .

Discriminating power: measures the dispersion of composite indicator scores, indicating the degree of ease (or difficulty) the decision-maker will have in differentiating countries. The test is based on Shannon, 1948 entropy index and can be performed by the function:

$$H' = -\frac{1}{\ln \delta} \sum_{\omega=1}^{\delta} CI_{\omega} \ln CI_{\omega} \quad (4)$$

where H' is the Shannon diversity of information, and $\ln$ corresponds to the Neperian logarithm.

3.2. Quality-reliability index

The proposed index is a relational quality-reliability measure of composite indicators constructed using different methods. It uses the method's performance relative to other methods to build a quality-reliability ranking for each test. Finally, the quality-reliability index is computed considering the ranking and relevance of each test:

$$QR_{\text{index}} = \frac{\sum_{\eta=1}^{\kappa} R_{CI_{\eta}} O_{\eta}}{\kappa} \quad (5)$$

where $R_{CI_{\eta}}$ is the rank of the composite indicator in the η -th quality-reliability test, O_{η} is the relevance (importance factor) of the η -th test, and κ is the number of tests.

In this study, the frequency of test use in articles that cite OECD (2008) and mention "composite index" or "composite indicator" in the abstract, title, and keywords was used as a measure of test relevance. Table 2 shows the result of this search, considering the terms associated with the tests: ("uncertainty analysis"), ("links to other variables"), ("informational power" OR "information power"), and ("discriminant power" OR "informational diversity").

Table 2 reveals that the two tests recommended by the OECD (2008) are used most frequently, indicating a relevance of 0.945 in the composite indicator quality and reliability.

4. Application example: governance composite indicator in OECD countries

The first step was to extract data from the governance sub-indicators associated with the conceptual framework defined in Section 2. The data were collected on March 28 from the World Bank Data Bank (<https://databank.worldbank.org/>). More specifically, data on the six governance sub-indicators were collected for 2022 across 36 OECD

Table 3

Descriptive statistics of worldwide governance indicators.

	Control of Corruption	Government Effectiveness	Political Stability	Regulatory Quality	Rule of Law	Voice and Acc.
Mean	0.63	0.61	0.70	0.68	0.72	0.75
Std. error	0.04	0.04	0.04	0.04	0.04	0.03
Median	0.67	0.66	0.75	0.73	0.79	0.77
Std. dev.	0.24	0.25	0.22	0.25	0.23	0.19
Variance	0.06	0.06	0.05	0.06	0.05	0.04
Kurtosis	0.13	0.15	3.59	0.63	1.93	6.10
Skewness	−0.67	−0.77	−1.79	−1.01	−1.35	−2.04

Note: All normalized sub-indicators have a maximum value of 1 and a minimum value of 0.

Table 4

Quality-reliability of OWA composite indicators.

Emphasis	Intensity	Ranking uncertainty	Links to other variables	Informational power	Discriminating power
Positive	Maximum	3.602	0.57	0.79	0.99
	High	1.886	0.58	0.83	0.99
	Medium	1.466	0.59	0.85	0.99
	Low	1.441	0.59	0.86	0.99
	Minimum	1.343	0.59	0.86	0.98
Negative	Maximum	2.287	0.54	0.77	0.96
	High	1.793	0.57	0.84	0.97
	Medium	1.485	0.58	0.85	0.97
	Low	1.404	0.59	0.86	0.98
	Minimum	2.750	0.59	0.86	0.98

Table 5

Quality-reliability index of OWA composite indicators (higher the better).

Emphasis	Intensity	Ranking uncertainty	Links to other variables	Informational power	Discriminating power	Quality-reliability
Positive	Maximum	1	2	2	10	0.14
	High	4	5	3	9	0.43
	Medium	7	8	5	8	0.72
	Low	8	9	7	7	0.82
	Minimum	10	10	9	6	0.99
Negative	Maximum	3	1	1	1	0.24
	High	5	3	4	2	0.44
	Medium	6	4	6	3	0.55
	Low	9	6	8	4	0.81
	Minimum	2	7	10	5	0.36

countries. Next, the data were normalized using the Max./Min. function (Cinelli et al., 2021), homogenizing the scale of the sub-indicators to the interval [0,1]. Table 3 presents the descriptive statistics for these data (see Table 8 in the annex for detailed data).

Second, composite indicators were constructed. Four composite indicators were constructed using the most popular methods, and ten composite indicators were constructed using the OWA operators with different weights. Subsequently, the composite indicators were correlated with indicators frequently used in the literature to assess multi-dimensional governance.

- Economic development: Gross National Income per capita (Marino et al., 2016; Al-Naser and Hamdan, 2021).
- Innovation level: Global Innovation Index (Ibanez et al., 2024; Zhu et al., 2024).
- Human development: Human Development Index (Özekin and Aksoy, 2025).
- Access to clean energy: Energy Justice Index (Rahman et al., 2025).
- Unemployment level: Unemployment Rate (Fakih et al., 2025).
- Sustainability: Sustainable Development Goals Index (Barbier et al., 2021).
- Foreign Direct Investments: Foreign Direct Investments per Gross Domestic Product (GDP) (Nxumalo and Makoni, 2021; Bouchoucha, 2022).

Third, quality-reliability indices were calculated for the OWA

Table 6

Quality-reliability of governance composite indicators.

	BoD	Entropy	SAW-EW	PCA	OWA
Ranking uncertainty	2.011	0.717	0.717	0.750	0.872
Links to other variables	0.571	0.593	0.591	0.591	0.594
Informational power	0.798	0.862	0.863	0.863	0.859
Discriminating power	0.991	0.983	0.983	0.983	0.985

composite indicators. The OWA composite indicator with the highest quality-reliability index was then selected. Table 4 shows the test results.

Table 4 shows that ranking uncertainty increases with the intensity of emphasis. However, greater uncertainty or internal instability does not reduce the composite indicator's ability to explain other governance-related variables, nor does it significantly impair its informational and discriminatory power.

However, composite indicators constructed with different emphases and intensities exhibit different qualities and reliabilities. The transformation of the quality and reliability of the OWA composite indicators in the rankings presented enables us to identify these differences easily. Table 5 presents these differences, along with the quality and reliability indices of the ten OWA composite indicators.

The results reveal that the OWA indicator, which emphasizes the most positive aspects of governance in OECD countries with the lowest intensity, has the highest quality and reliability indices.

Once the OWA composite indicator is selected, its ranking

Table 7

Quality-reliability index of governance composite indicators (higher the better).

	BoD	Entropy	SAW-EW	PCA	OWA
Ranking uncertainty	1	4	4	3	2
Links to other variables	1	4	2	2	5
Informational power	1	3	4	4	2
Discriminating power	1	3	3	3	2
Quality-reliability index	0.167	0.658	0.581	0.465	0.458

uncertainty is recalculated using established methods. Finally, the quality-reliability indices for PCA, BoD, SAW-EW, Entropy, and OWA are calculated and compared. Table 6 presents the quality-reliability tests for each method.

The test results reveal that the BoD exhibits substantially higher uncertainty than the other methods, indicating structural instability. Furthermore, all composite indicators correlate with other variables above the 0.50 threshold. However, the correlation coefficients in Table 6 reflect the average correlation with other variables. In this sense, it is essential to note that none of the composite indicators correlate with the unemployment rate or foreign direct investment above the 0.50 threshold.

Finally, all composite indicators exhibit similar information and discrimination power. However, transforming the quality and reliability tests into rankings makes it easier to differentiate among the methods' performance. Table 7 presents this ranking and the quality-reliability index computed from the rankings and the weights defined in Table 2 of Section 3.2.

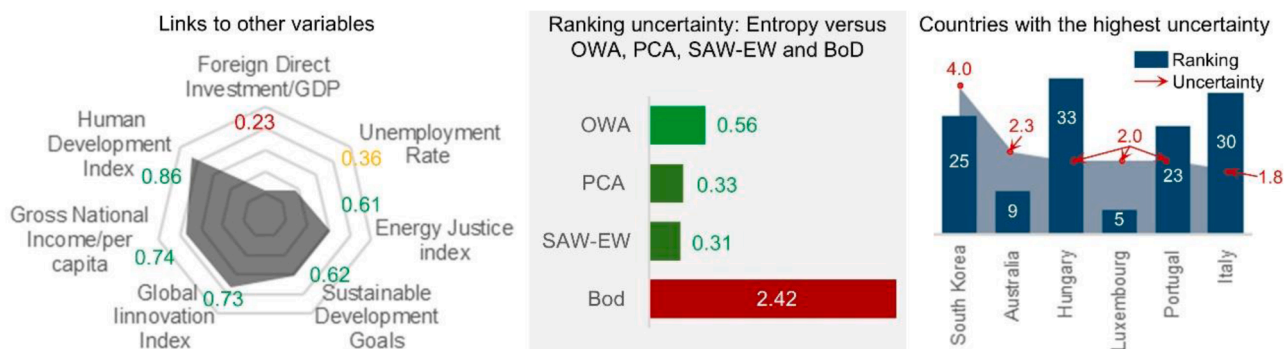
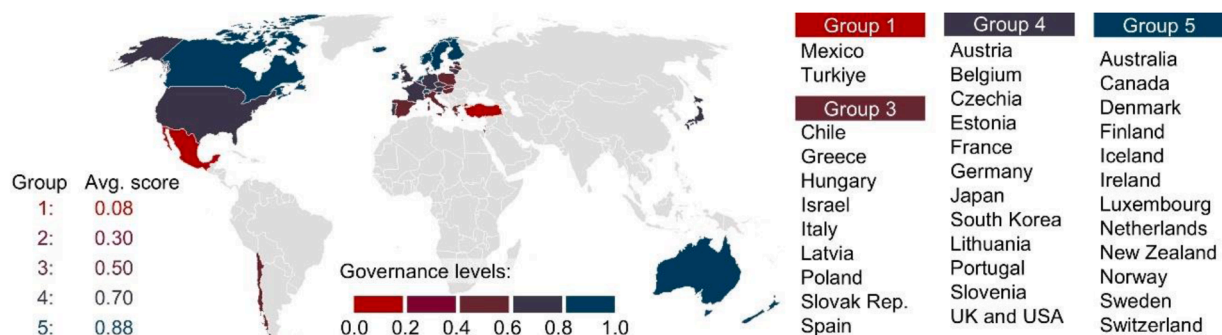
The results show that the composite indicator constructed by the Entropy method has the highest quality-reliability index, indicating that it offers the best representation of the multidimensional governance of OECD countries among the methods employed. This is an important finding because the Entropy method has been largely overlooked or disregarded by researchers who have primarily used PCA and SAW-EW. This finding further suggests that multiple methods should be

considered to represent governance, as they differ in ranking uncertainty, links to other variables, informational power, and discriminating power.

The research findings also indicate that relying on a single method to represent multidimensional governance can lead to inaccurate or misleading decisions. SAW-EW, PCA, and OWA present quality and reliability, representing multidimensional governance. However, these methods offer a less accurate portrayal of governance, with quality-reliability indices of 0.581, 0.465, and 0.458, which are lower than those of the Entropy method. BoD performed worse than the other methods in all quality tests. The BoD composite governance indicator can lead to misleading decisions, as countries' rankings vary considerably relative to those produced by other methods. However, it is worth noting that Entropy's composite governance indicator has limitations, even though it offers greater quality and reliability than other methods.

The first limitation concerns the significance and strength of the correlations obtained in the links-to-other-variables test. On the one hand, the correlations of the composite indicator Entropy correlate with the other variables, supporting the literature that associates governance with economic development (Marino et al., 2016; Al-Naser and Hamdan, 2021), countries' innovation levels (Ibanez et al., 2024; Zhu et al., 2024), human development (Özekin and Aksoy, 2025), access to clean energy (Rahman et al., 2025), unemployment levels (Fakih et al., 2025), and Sustainability (Barbier et al., 2021). On the other hand, the correlation between the composite indicator Entropy and the foreign direct investment (FDI) rate is weak and insignificant, contrary to the findings in the supporting literature (Nxumalo and Makoni, 2021; Bouchoucha, 2022). Fig. 2 illustrates the correlation coefficients between the composite indicator and the governance-related variables.

Another point of attention regarding the composite governance indicator is the uncertainty in rankings. On average, five countries change two positions in the governance ranking: South Korea, Australia, Hungary, Luxembourg, and Portugal. Another country with above-average variation in rankings is Italy, which shifts by an average of 1.8 positions across methods used to construct the composite indicator.

**Fig. 2.** Links to other variables and uncertainty of the composite governance indicator constructed using the Entropy method.**Fig. 3.** Governance levels of OECD countries.

Despite the limitations of the governance composite indicators, comparisons between countries, trend analysis, and identification of changes over time are possible. The map in Fig. 3 provides an overview of the five governance levels within the 36 OECD countries.

The map enables the identification of benchmark countries in governance, countries with well-developed governance that require institutional reform to achieve excellence, and countries with low levels of governance or those in the process of developing governance. For example, the governance structures of Group 5 countries can serve as a reference for Groups 1 and 3, indicating which reforms these countries can implement to improve their governance. Furthermore, it can help decision-makers make informed investments by considering the relationship between governance levels and a country's economic performance and unemployment rates.

It is worth noting that, while composite indicators summarize overall performance, they may mask important differences due to the heterogeneity of the sub-indicators (Walheer, 2019). The Internal Heterogeneity Index (IHI) allows us to distinguish countries with balanced governance structures from those whose scores are driven by strong disparities across sub-indicators. In this regard, the results show a strong positive association between the IHI and ranking uncertainty ($r \approx 0.87$). This finding indicates that countries exhibiting larger disparities among governance sub-indicators tend to have more unstable rankings. Approximately 76% of the variation in ranking uncertainty was explained by IHI, suggesting that internal heterogeneity is a major driver of ranking instability.

Despite achieving relatively high governance scores, Israel, Hungary, and Italy exhibit substantially higher IHI values than Switzerland, Ireland, and Luxembourg. This indicates a heterogeneous governance profile, in which strong performance on certain sub-indicators is accompanied by weaker performance on others, causing the aggregate score to mask important internal disparities. In contrast, the latter group displays a more homogeneous distribution of performance across governance sub-indicators. This greater internal consistency is associated with lower ranking uncertainty and more robust positions in the composite indicator. These findings demonstrate that countries with similar governance scores may differ considerably in their underlying governance structure.

5. Conclusions

This study revisited the literature on governance, revealing its close relationship with economic, social, and sustainability factors. The study also revealed that governance has been examined within several conceptual frameworks, and the World Governance concept is the most widely used by researchers and experts in this field. Conversely, only the PCA and SAW-EW methods have been used to operationalize the concept of governance. The study also identified other gaps, including the limited use of tests to assess the quality and reliability of multidimensional governance, as well as the model's focus on explaining a specific facet of governance.

The study results indicate that the OWA, PCA, SAW-EW, and Entropy methods present similar quality and reliability. BoD presents similar quality and reliability to the other methods in terms of links to other variables and in informational and discriminant power tests, but ranks highly for uncertainty, indicating an unstable structure. These results suggest that some methods can yield inaccurate or misleading decisions, whereas others offer greater precision in representing multidimensional governance. In particular, the Entropy method offers superior quality and reliability compared to other methods, leading to a more accurate representation of multidimensional governance and more accurate decisions.

Among the contributions to the governance literature is the indication of the Entropy method as an operational framework capable of capturing social, economic, and environmental aspects of economies. In particular, the method constructs a composite indicator that is

moderately or strongly correlated with the following variables: the Human Development Index, Gross National Income per Capita, the Global Innovation Index, the Sustainable Development Goals Index, and the Energy Justice Index.

The study also makes a specific contribution to the literature on composite indicators by introducing a quality and reliability framework to select the method that best represents the multidimensional phenomenon. The index combines traditional tests (uncertainty analysis and links to other variables) and non-traditional tests (informational and discriminant power). It uses frequency of use to determine the importance of the quality and reliability indices. In this context, uncertainty analysis and links to other variables are the most frequently used tests, accounting for 0.945 of the index's relevance. The study also innovates by adopting a quality-and-reliability index to determine the OWA operator weights, thereby reducing subjectivity in this process.

From a managerial perspective, the proposed multicriteria decision model provides policymakers, international organizations, and researchers with a systematic approach for selecting composite indicators based on quality and reliability criteria rather than methodological convenience. By integrating multiple evaluation tests into a single quality-reliability index, the model reduces uncertainty about method selection and supports more transparent, evidence-based decisions. The findings indicate that different construction methods may lead to substantially different representations of governance, potentially affecting policy priorities and resource allocation decisions. Furthermore, the IHI provides an additional diagnostic tool to identify countries whose governance rankings are particularly sensitive to weighting and aggregation choices. This allows decision-makers to distinguish between robust governance assessments and rankings that may be more vulnerable to methodological uncertainty, thereby improving the interpretation and use of composite indicators in policy design, benchmarking, and international comparisons.

Among the study's limitations, it is worth noting the lack of evidence for the correlation between the composite governance indicator and foreign direct investment per capita. This negative result may be due to the similarity among the countries in the sample. Future studies should include a more heterogeneous sample and examine additional data on foreign direct investment. Another line of future research is to consider additional governance-related variables and analyze panel data to verify causal relationships.

Funding statement

This work was supported in part by the National Council for Scientific and Technological Development (CNPq) under Grant 402464/2024-9, and by the Minas Gerais State Agency for Research and Development (FAPEMIG) under Grants APQ-000353/2022.

Ethical approval and informed consent statements

Not applicable.

CRediT authorship contribution statement

Iara Sibebe Silva: Writing – original draft, Visualization, Investigation, Formal analysis, Data curation, Conceptualization. **Angélica Cidália Gouveia dos Santos:** Writing – original draft, Visualization, Investigation, Formal analysis, Data curation, Conceptualization. **Elisa Fusco:** Writing – original draft, Validation, Methodology, Formal analysis. **Francesco Vidoli:** Writing – review & editing, Supervision, Methodology. **Marcos Flávio Silveira Vasconcelos D'Angelo:** Writing – review & editing, Validation, Resources, Project administration, Funding acquisition. **Petr Iakovlevitch Ekel:** Writing – review & editing, Supervision, Resources, Project administration, Methodology, Funding acquisition. **Matheus Pereira Libório:** Writing – original draft, Validation, Methodology, Formal analysis.

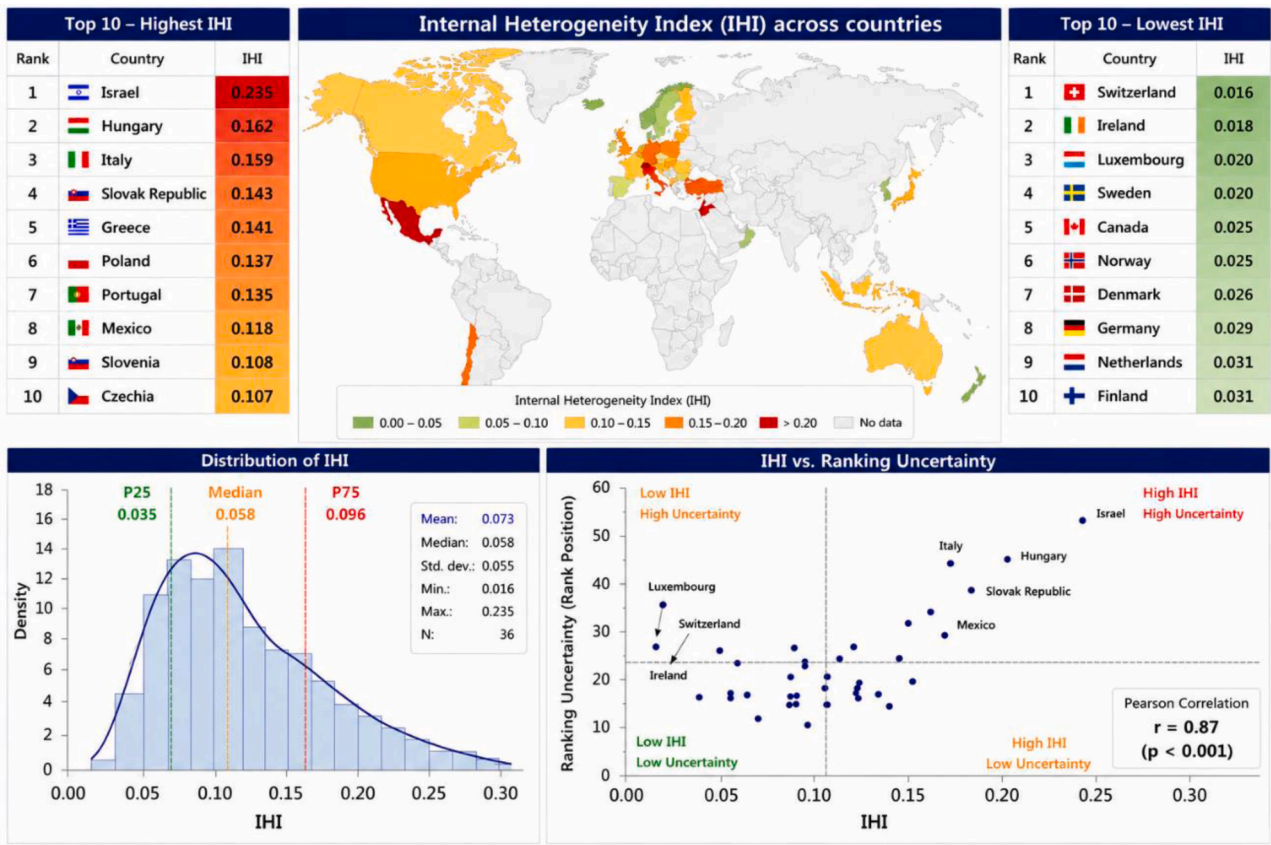


Fig. 4. Internal heterogeneity of governance in OECD countries. **Note:** Internal Heterogeneity Index (IHI) is the average deviation of sub-indicators from each country's own governance profile. Higher values indicate greater disparities among sub-indicator dimensions, whereas lower values denote more balanced governance structures.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledges

During the preparation of this work, the author(s) used ChatGPT to assist in the construction of Fig. 4 and Claude to verify that all reviewers' suggestions were adequately addressed. The author(s) reviewed and edited the output as needed and took full responsibility for the content of the published article.

Annex

OECD countries worldwide governance indicators

The conceptual framework of the Worldwide Governance Indicators is the most widely adopted approach for measuring governance and has been extensively used by academia, the media, and international organizations (Kaufmann et al., 2009). Table 8 presents its six sub-indicators for 2022 in the 36 OECD countries. In particular, control of corruption measures perceptions of the misuse of public power for private gain (Islam, 2026); government effectiveness reflects the quality of public services and policy implementation (Khan and Hussain, 2024); rule of law assesses trust in and compliance with societal rules and institutions (Croissant and Pelke, 2022); regulatory quality captures the government's ability to design and implement policies that support private-sector development (Islam, 2026); political stability and absence of violence captures the likelihood of political instability or politically motivated violence (Scalamonti, 2026); and voice and accountability measures citizen participation, freedom of expression, association, and media independence (Osinubi and Simatele, 2026).

Table 8
Sub-indicators of multidimensional governance of OECD countries.

Country	Control of Corruption	Government Eff.	Political Stability ¹	Regulatory Quality	Rule of Law	Voice and Act.
Australia	0.81	0.78	0.87	1.00	0.84	0.83
Austria	0.66	0.75	0.74	0.71	0.91	0.86
Belgium	0.73	0.65	0.71	0.70	0.78	0.82
Canada	0.78	0.79	0.79	0.90	0.86	0.87

(continued on next page)

Table 8 (continued)

Country	Control of Corruption	Government Eff.	Political Stability ¹	Regulatory Quality	Rule of Law	Voice and Act.
Chile	0.58	0.36	0.53	0.57	0.55	0.70
Czechia	0.49	0.59	0.80	0.76	0.70	0.73
Denmark	1.00	0.97	0.82	0.98	0.98	0.93
Estonia	0.75	0.70	0.77	0.84	0.81	0.79
Finland	0.95	0.87	0.83	0.95	1.00	0.94
France	0.67	0.62	0.64	0.67	0.73	0.75
Germany	0.83	0.67	0.73	0.83	0.85	0.86
Greece	0.31	0.31	0.52	0.33	0.42	0.70
Hungary	0.27	0.35	0.75	0.30	0.46	0.50
Iceland	0.76	0.79	0.97	0.73	0.91	0.87
Ireland	0.79	0.79	0.83	0.88	0.85	0.88
Israel	0.53	0.65	0.00	0.68	0.64	0.59
Italy	0.45	0.31	0.66	0.35	0.41	0.74
Japan	0.75	0.82	0.89	0.79	0.86	0.72
South Korea	0.52	0.70	0.71	0.65	0.72	0.67
Latvia	0.50	0.42	0.67	0.66	0.63	0.69
Lithuania	0.52	0.55	0.74	0.72	0.68	0.74
Luxembourg	0.85	0.88	0.90	0.97	0.93	0.91
Mexico	0.00	0.00	0.21	0.05	0.00	0.30
Netherlands	0.86	0.80	0.77	0.91	0.89	0.91
New Zealand	0.93	0.70	1.00	0.99	0.92	0.95
Norway	0.90	0.95	0.82	0.82	0.93	1.00
Poland	0.44	0.23	0.68	0.45	0.46	0.57
Portugal	0.51	0.55	0.79	0.47	0.70	0.81
Slovak Rep.	0.36	0.28	0.66	0.51	0.53	0.67
Slovenia	0.52	0.58	0.76	0.44	0.65	0.70
Spain	0.50	0.52	0.61	0.49	0.59	0.72
Sweden	0.90	0.80	0.84	0.90	0.90	0.91
Switzerland	0.88	1.00	0.94	0.87	0.93	0.94
Turkiye	0.16	0.04	0.08	0.00	0.14	0.00
United Kdm.	0.77	0.65	0.69	0.85	0.81	0.81
United States	0.62	0.66	0.49	0.78	0.79	0.66

Note: ¹Including absence of violence/terrorism.

Construction of OWA composite indicators

A composite indicator constructed by the OWA follows five simple steps (Yager and Kacprzyk, 2012). In the first step, the sub-indicators are normalized by the following expression:

$$\Omega_{\lambda} = \frac{\lambda_{\omega} - \min(\lambda_{\omega})}{\max(\lambda_{\omega}) - \min(\lambda_{\omega})} \quad (6)$$

where ω_{λ} is the value of the sub-indicator λ for the country ω , $\max(\omega_{\lambda})$ and $\min(\omega_{\lambda})$ are the maximum and minimum values of the sub-indicator λ among all countries ψ .

In step two, the matrix of normalized sub-indicators $\Omega_1, \Omega_2, \dots, \Omega_{\rho}$ are transposed. In step 3, the sub-indicators are ordered from largest to smallest. After this ordering, the vector $\Omega_1, \Omega_2, \dots, \Omega_{\rho}$ assumes the format $\alpha_1, \alpha_2, \dots, \alpha_{\rho}$ in which α_1 corresponds to the λ -th highest value among $\Omega_1, \Omega_2, \dots, \Omega_{\rho}$. In the fourth step, the weights $\beta_1, \beta_2, \dots, \beta_{\rho}$ are defined. Not that these weights are assigned to the ordering and not to the sub-indicators themselves. Finally, the composite indicator is constructed in the fifth step by the following expression:

$$\text{OWA}(\Omega_1, \Omega_2, \dots, \Omega_{\rho}) = \sum_{\lambda=1}^{\rho} \beta_{\lambda} \alpha_{\lambda} \quad (7)$$

where the weights β_{λ} meet the conditions $\beta_{\lambda} \in [0, 1]$ and $\sum_{\lambda=1}^{\rho} \beta_{\lambda} = 1$.

Definition of the OWA weights

The definition of the weights β_{λ} assumes great importance in OWA, as it allows for emphasizing governance's positive or negative aspects at varying intensities and offers multiple representations of the multidimensional phenomenon (Libório et al., 2022). However, the definition of β_{λ} is subjective in that the decision-maker has no control over the impact of his/her choices on the results (Libório et al., 2024). Furthermore, the weight vector β_{λ} can assume different values, resulting in different scores and raising doubts about which weight vector best represents the multidimensional phenomenon. In particular, adjusting the direction and intensity of the emphasis of the OWA operator weights allows for obtaining $(n-1) \times 2 + 1$ weight vector β_{λ} , where n is the number of sub-indicators. Then, the OWA weights are obtained from a fuzzy quantifier $Q_i : [0, 1] \rightarrow [0, 1]$ according to:

$$\beta_{\lambda i} = Q_i, \left(\frac{i}{\rho}\right) - Q_i, \left(\frac{i-1}{\rho}\right), i = 1, \dots, \rho \quad (8)$$

For negative emphasis or direction, the linguistic quantifier "At least j " criteria is performed employing the function:

$$Q_{\text{At least } j}(r) = \begin{cases} 0, & r < a, \\ \left(\frac{r-a}{1-a}\right)^{\gamma}, & a \leq r \leq 1, \end{cases} \quad (9)$$

where $a = j/\rho$, and $\gamma > 0$ controls the shape of the quantifier.

Thus, the corresponding weight vector is:

$$\beta_{ji} = \left(\frac{\frac{i}{\rho} - a}{1 - a} \right)^\gamma - \left(\frac{\frac{i-1}{\rho} - a}{1 - a} \right)^\gamma, i = 1, \dots, \rho \quad (10)$$

For positive emphasis or direction, the linguistic quantifier “More than j ” criteria is performed employing the function:

$$Q_{\text{More than } j}(r) = \begin{cases} 0, & r < a, \\ 1 - \left(\frac{1-r}{1-a} \right)^\gamma, & a \leq r \leq 1, \end{cases} \quad (11)$$

with $a = j/\rho$. The resulting OWA weights are:

$$\beta_{ji} = \left[1 - \left(\frac{1 - \frac{i}{\rho}}{1 - a} \right)^\gamma \right] - \left[1 - \left(\frac{1 - \frac{i-1}{\rho}}{1 - a} \right)^\gamma \right], i = 1, \dots, \rho \quad (12)$$

OWA operator weights for the worldwide governance framework

Table 9 shows that eleven weight vectors β_j can be obtained from the six sub-indicators of the worldwide governance framework. Note that each linguistic operator (“At least j ” and “More than j ” criteria) can be represented by five vectors of different weights. Each of these vectors offers a different degree of bias intensity in scores.

Table 9
Weight vectors in the construction of the OWA composite indicators.

Direction	Intensity	Orness degree	Weight vector
Positive More than j criteria	Maximum	1.00	{1.00; 0.00; 0.00; 0.00; 0.00; 0.00}
	High	0.88	{0.50; 0.50; 0.00; 0.00; 0.00; 0.00}
	Medium	0.78	{0.33; 0.33; 0.33; 0.00; 0.00; 0.00}
	Low	0.71	{0.25; 0.25; 0.25; 0.25; 0.00; 0.00}
	Minimum	0.66	{0.20; 0.20; 0.20; 0.20; 0.20; 0.00}
Negative At least j criteria	Maximum	1.00	{0.00; 0.00; 0.00; 0.00; 0.00; 1.00}
	High	0.88	{0.00; 0.00; 0.00; 0.00; 0.05; 0.50}
	Medium	0.78	{0.00; 0.00; 0.00; 0.33; 0.33; 0.33}
	Low	0.71	{0.00; 0.00; 0.25; 0.25; 0.25; 0.25}
	Minimum	0.66	{0.00; 0.20; 0.20; 0.20; 0.20; 0.20}
Neutral	None	0.50	{0.17; 0.17; 0.17; 0.17; 0.17; 0.17}

Table 9 shows that the application of neutral emphasis corresponds to the SAW-EW method insofar as all sub-indicators are aggregated with equal weights. Another point to highlight is that only the highest- or lowest-performing sub-indicators are included in the weight vector, reflecting maximum intensity.

At this point, given that each weight vector yields a different composite indicator and that the decision-maker is unaware of their quality and reliability, the following question arises: which OWA composite indicators should be selected to represent global governance? In this regard, the multicriteria decision model based on quality and reliability tests allows decision-makers to address this question.

OWA composite indicators of multidimensional governance

The OWA composite indicators are constructed from the sub-indicators ordered by importance multiplied by the weight vector presented in Table 9. These different weight vectors allow the construction of the ten variations of composite indicators presented in Table 10.

Table 10
OWA composite indicators of multidimensional governance of OECD countries.

Country	Positive (More than j criteria)					Negative (At least j criteria)				
	Max.	High	Medium	Low	Min.	Max.	High	Medium	Low	Min.
Australia	1.00	0.94	0.90	0.89	0.87	0.78	0.80	0.81	0.82	0.83
Austria	0.91	0.89	0.84	0.82	0.79	0.66	0.69	0.70	0.72	0.74
Belgium	0.82	0.80	0.78	0.76	0.75	0.65	0.68	0.69	0.70	0.71
Canada	0.90	0.89	0.88	0.86	0.84	0.78	0.79	0.79	0.81	0.82
Chile	0.70	0.64	0.62	0.60	0.59	0.36	0.45	0.48	0.50	0.52
Czechia	0.80	0.78	0.76	0.75	0.72	0.49	0.54	0.59	0.63	0.65
Denmark	1.00	0.99	0.99	0.98	0.97	0.82	0.88	0.91	0.93	0.94
Estonia	0.84	0.83	0.81	0.80	0.79	0.70	0.73	0.74	0.75	0.76
Finland	1.00	0.98	0.97	0.96	0.94	0.83	0.85	0.88	0.90	0.91
France	0.75	0.74	0.72	0.71	0.69	0.62	0.63	0.64	0.65	0.67

(continued on next page)

Table 10 (continued)

Country	Positive (More than j criteria)					Negative (At least j criteria)				
	Max.	High	Medium	Low	Min.	Max.	High	Medium	Low	Min.
Germany	0.86	0.86	0.85	0.84	0.82	0.67	0.70	0.74	0.77	0.78
Greece	0.70	0.61	0.55	0.49	0.46	0.31	0.31	0.32	0.34	0.38
Hungary	0.75	0.63	0.57	0.52	0.47	0.27	0.29	0.31	0.35	0.38
Iceland	0.97	0.94	0.92	0.89	0.86	0.73	0.75	0.76	0.79	0.81
Ireland	0.88	0.88	0.87	0.86	0.85	0.79	0.79	0.80	0.82	0.83
Israel	0.68	0.67	0.66	0.64	0.62	0.00	0.27	0.37	0.44	0.48
Italy	0.74	0.70	0.62	0.57	0.52	0.31	0.33	0.36	0.38	0.44
Japan	0.89	0.88	0.86	0.84	0.82	0.72	0.74	0.75	0.77	0.79
South Korea	0.72	0.72	0.71	0.70	0.69	0.52	0.59	0.61	0.64	0.65
Latvia	0.69	0.68	0.67	0.66	0.63	0.42	0.46	0.52	0.55	0.58
Lithuania	0.74	0.74	0.73	0.72	0.69	0.52	0.54	0.58	0.62	0.64
Luxembourg	0.97	0.95	0.94	0.93	0.92	0.85	0.87	0.88	0.89	0.89
Mexico	0.30	0.26	0.19	0.14	0.11	0.00	0.00	0.00	0.01	0.05
Netherlands	0.91	0.91	0.90	0.89	0.87	0.77	0.79	0.81	0.83	0.85
New Zealand	1.00	1.00	0.98	0.97	0.96	0.70	0.81	0.85	0.88	0.90
Norway	1.00	0.98	0.96	0.95	0.92	0.82	0.82	0.85	0.87	0.88
Poland	0.68	0.63	0.57	0.54	0.52	0.23	0.34	0.37	0.40	0.43
Portugal	0.81	0.80	0.77	0.71	0.67	0.47	0.49	0.51	0.56	0.60
Slovak Republic	0.67	0.67	0.62	0.59	0.55	0.28	0.32	0.38	0.42	0.47
Slovenia	0.76	0.73	0.70	0.67	0.64	0.44	0.48	0.51	0.55	0.58
Spain	0.72	0.67	0.64	0.61	0.59	0.49	0.50	0.50	0.53	0.54
Sweden	0.91	0.91	0.90	0.90	0.89	0.80	0.82	0.85	0.86	0.87
Switzerland	1.00	0.97	0.96	0.95	0.94	0.87	0.88	0.89	0.91	0.91
Turkiye	0.16	0.15	0.13	0.11	0.08	0.00	0.00	0.01	0.03	0.05
United Kingdom	0.85	0.83	0.82	0.81	0.79	0.65	0.67	0.70	0.73	0.75
United States	0.79	0.79	0.74	0.72	0.70	0.49	0.56	0.59	0.61	0.64

Composite indicators comparisons

Once the quality and reliability of the composite indicators in Table 10 have been calculated, it is possible to select the OWA operator weight vector that best represents multidimensional governance. Then, it is possible to compare the quality and reliability of the composite indicators constructed by the different methods presented in Table 11.

Table 11

Composite indicators, scores, and rankings of multidimensional governance of OECD countries.

Country	Scores					Ranking				
	Bod	Entropy	SAW	PCA	OWA	Bod	Entropy	SAW	PCA	OWA
Australia	1.00	0.84	0.85	0.85	0.86	1	9	9	9	8
Austria	0.92	0.77	0.77	0.78	0.79	13	15	16	15	14
Belgium	0.84	0.73	0.73	0.74	0.73	18	18	18	18	18
Canada	0.93	0.83	0.83	0.83	0.84	11	11	11	11	11
Chile	0.70	0.53	0.55	0.55	0.54	29	28	28	28	28
Czechia	0.81	0.67	0.68	0.67	0.72	20	19	19	20	19
Denmark	1.00	0.95	0.95	0.95	0.94	1	1	1	1	1
Estonia	0.86	0.77	0.78	0.77	0.78	16	15	15	16	16
Finland	1.00	0.92	0.92	0.92	0.92	1	3	3	2	3
France	0.77	0.67	0.68	0.68	0.68	22	19	19	19	22
Germany	0.90	0.78	0.80	0.80	0.79	15	14	13	13	14
Greece	0.70	0.42	0.43	0.44	0.46	29	34	34	33	34
Hungary	0.75	0.44	0.44	0.44	0.47	25	33	33	33	33
Iceland	0.99	0.84	0.84	0.84	0.85	8	9	10	10	10
Ireland	0.92	0.83	0.83	0.83	0.84	13	11	11	11	11
Israel	0.69	0.51	0.51	0.52	0.51	31	29	29	29	30
Italy	0.75	0.48	0.49	0.50	0.50	25	30	31	30	31
Japan	0.93	0.80	0.80	0.80	0.81	11	13	13	13	13
South Korea	0.67	0.66	0.66	0.66	0.69	34	21	22	22	20
Latvia	0.71	0.58	0.60	0.60	0.61	28	26	26	26	26
Lithuania	0.77	0.64	0.66	0.66	0.69	22	23	22	22	20
Luxembourg	1.00	0.90	0.91	0.90	0.92	1	5	4	6	3
Mexico	0.30	0.09	0.09	0.10	0.11	35	35	35	35	35
Netherlands	0.96	0.85	0.86	0.86	0.86	9	8	8	8	8
New Zealand	1.00	0.90	0.91	0.91	0.91	1	5	4	4	5
Norway	1.00	0.91	0.90	0.91	0.91	1	4	6	4	5
Poland	0.68	0.46	0.47	0.47	0.48	33	32	32	32	32
Portugal	0.84	0.64	0.64	0.64	0.66	18	23	24	24	24
Slovak Rep.	0.69	0.48	0.50	0.50	0.53	31	30	30	30	29
Slovenia	0.77	0.61	0.61	0.61	0.63	22	25	25	25	25
Spain	0.72	0.57	0.57	0.57	0.58	27	27	27	27	27
Sweden	0.95	0.87	0.87	0.87	0.87	10	7	7	7	7

(continued on next page)

Table 11 (continued)

Country	Scores					Ranking				
	Bod	Entropy	SAW	PCA	OWA	Bod	Entropy	SAW	PCA	OWA
Switzerland	1.00	0.93	0.93	0.92	0.94	1	2	2	2	1
Turkiye	0.16	0.07	0.07	0.07	0.05	36	36	36	36	36
United Kdm.	0.86	0.75	0.76	0.76	0.76	16	17	17	17	17
United States	0.80	0.66	0.67	0.67	0.68	21	21	21	20	22

Data availability

<https://databank.worldbank.org/> (The data used in the study is owned by the World Bank and can be accessed through the World Bank DataBank at)

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