Budget Transparency and Good Governance for Human Development and Citizens' Well-Being. New Empirical Evidence from the European Union

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This paper aims to study the synergies between budget transparency (proxied through the Open Budget Index) and good governance (measured through each of the 6 Worldwide Governance Indicators), with overall effects on human development (measured by the Human Development Index). Based on the literature underpinnings, most of the previous studies were based either on the bidirectional analysis of the influences exerted by budget transparency on the 6 pillars of governance, or on studying the relationship between good governance and the development prospects of states. Therefore, our study highlights the influences exercised on the level of human development, documenting the simultaneous causality of our coordinates, within the selected states. The sample includes 14 EU member states, selected according to the availability of reported budget transparency, for the period 2006-2021. The research methodology embeds a three-fold approach that relies on advanced modeling through robust regression models, structural equations modeling and Gaussian Graphical Models. The obtained results suggest that improving governance and human development can help promote budget transparency, and greater budget transparency can support better governance and higher human development by ensuring efficient use of public resources, considering the political factor as well.

Keywords: *Budget Transparency; Good Governance; Human Development; European Countries; Econometric Modelling.*

Introduction

In all states of the world, the option of distributing and redistributing the gross domestic product (GDP) through the budget system is the main prerogative of any government. According to the OECD (Witherell, 2002), the function of allocation and distribution of public resources is the most important when it comes to the performance of national governments. The budget is the main document through which the government implements the governance program, thus prioritizing actions and achieving annual and multi-annual targets, with a direct impact on citizens and their well-being. Therefore, such a document must be clear, transparent, and credible, building a budgetary surveillance system requiring a high level of transparency aimed at ensuring good governance (Rios *et al.*, 2016).

On the other hand, good governance is one of the factors that generate positive effects on the level of growth and economic development of states (Cristea & Dragulin, 2016; Noja & Cristea, 2017), despite the existing controversies in the specialized literature regarding the priorities which must be established at the level of governments (Heeks, 2001; Kurtz & Schrank, 2007; Smith, 2007; Baland *et al.*, 2010; Sundaram & Chowdhury, 2012; Khan, 2012). Regardless of the controversies, the choice of governments regarding the distribution of public funds generates a series of effects on human development and economic growth (Albassam, 2016; Bisogno & Cuadrado-Ballesteros, 2022), which suggests that fiscal responsibility, seen through the lens of transparency, exceeds the institutional framework and can contribute to increasing the quality of governance, improving the quality of life of citizens, and reducing poverty (Mejia Acosta, 2013).

In this context, the present study aims to examine the synergies between budget transparency (measured through the Budget Transparency Index-OBI), good governance (captured through each of the 6 global governance indicators-WGI), and the level of human development (measured by means of the human development index-HDI), for "assessing the development of a country, not economic growth alone" (United Nations Development Programme, 2023), documenting their simultaneous causality within the selected countries. The sample under analysis includes 14 member states of the European Union (EU-14) for which the degree of budget transparency (OBI) is determined by the International Budget Partnership, respectively: Bulgaria, Croatia, the Czech Republic, France, Germany, Hungary, Italy, Poland, Portugal, Romania, the

Slovak Republic, Slovenia, Spain, Sweden. The data were collected for the period 2006–2021, 2006 being the first year for which the OBI was determined.

The research methodology comprises three advanced econometric procedures, namely: (i) robust regression (RREG), in order to appraise direct influences between budget transparency and good governance level, but also reversely, namely in what measure each component of the WGIs may influence good governance, on the framework of human development; (ii) structural equations modeling (SEM), to globally assess (direct, indirect and overall) the impacts among variables, with final implication on welfare, measured through human development index; (iii) Gaussian Graphical Models (GGMs) to reveal the interconnections among all considered variables.

Examining the synergies between budget transparency, good governance and human development is important for assuring sustainable development, along with more efficient, accountable and fair governance. The results may help to identify the strengths and areas to improve the ways in which governments manage resources with overall benefits for the development of a country. Therefore, for the selected EU-14 countries, based on research objective and previous gaps in the literature underpinnings, the scientific questions of our research are: What are the direct implications between our credentials (the degree of budget transparency, each component of the WGIs, respectively, human development index)?; What are the overall effects on the human development index of budget transparency and each component of the WGIs?; What are the overall interconnections among WGIs dimensions, human development, and budget transparency degree? To properly answer these scientific questions, we transpose all of them into research hypotheses, as they are introduced at the methodology part.

Most of the previous studies were based either on the analysis of the influences exerted, in both directions, by budget transparency on a single pillar of governance (Carlitz, 2013; Cimpoeru, 2015; Chen & Neshkova, 2020) or on the 6 pillars (Albassam, 2016; Bisogno & Cuadrado-Ballesteros, 2022), or on studying the relationship between good governance and the growth and development prospects of states (Heeks, 2001; Neumayer, 2003; Khan, 2012; Addink, 2019). Considering these gaps from the specialized literature, through the formulated research questions, our research brings as a novelty the synergistic analysis and advanced modelling of the connections between state institutions, along the lines of good governance, budget transparency and human development, documenting their simultaneous causality at the level of the 14 European states that make up the sample analyzed. Moreover, the main contribution to the research is the interdisciplinary approach, as well as the advanced modelling of the links between state institutions, along the lines of good governance, budget transparency and human development.

The work is organized into several sections. The Introduction section presents the context of the research, the objectives pursued, and the novelty brought by the research.

In the second section, a literature review is carried out regarding the interdependencies between budget transparency, good governance, and human development, as well as a bibliometric analysis of relevant articles published on the same topic.

The data used and the research methodology are then described, followed by results and discussions that will relate to the results obtained by other authors. The paper concludes with a final section that also embeds research limitations as well as future research directions.

Theoretical Consideration

The development of public finances in the last decades is closely related to the concept of transparency and budgetary/fiscal responsibility, as the allocation and distribution of public resources compete to improve the performance of national governments (Curristine *et al.*, 2007), transparency being considered an important tool for enhanced good governance (Kosack & Fung, 2014).

Budget transparency is essential because it leads to participation which, in turn, gives citizens the opportunity to better understand their rights and responsibilities and to better understand government responsibilities. On the other hand, citizens can talk more effectively with the government about the allocation of limited resources and public policy priorities, with transparency becoming a prerequisite for the realization of other principles of good governance, such as accountability, trust, and efficiency (Wampler, 2000).

Good governance is an extremely comprehensive concept and, therefore, the specialized literature offers a vast space for its analysis. A review of the specialized literature shows that budget transparency seems to be directly related to good governance (Albassam, 2016; Fedorovych, 2020; Bisogno & Cuadrado-Ballesteros, 2022), but there are also a number of studies that are based on somewhat isolated analyzes and which emphasize only one aspect of good governance (Kolstad & Wiig, 2009; Carlitz, 2013; Cimpoeru, 2015; Yildiz *et al.*, 2017; Chen & Neshkova, 2020). Most of these studies highlight the positive influence that transparency generates on the performance of governments and, implicitly, on the level of development of states.

Albassam (2016) studied the relationship between budget transparency (proxied through the OBI) and good governance (measured through the 6 pillars of the WGIs) in a variety of political and government systems, for the period 2006-2012. The results obtained suggested a positive association between budget transparency and governance indicators, except for political stability.

The relationship between budget transparency and good governance was also studied by Bisogno and Cuadrado-Ballesteros (2022), the analysis is being carried out on a sample of 96 states for the period 2008–2019. The results obtained were similar, showing that a high level of budget transparency is associated with a high quality of governance and vice versa.

Birskyte (2019) analyzes the level of budget transparency in local governments in Lithuania and investigates what factors determine the degree of transparency. The author documents that municipality size and level of economic development are important factors that influence budget transparency. Larger municipalities and those with greater economic development tend to be more transparent. The research also finds that human development and civic participation can promote budget

transparency. Similar results were obtained by Puron Cid and Bolivar (2018) who examined the websites of 184 municipalities in Mexico between July and August 2015, with the specific aim of collecting data on financial transparency in local governments.

Simpson (2014) uses a sample of 100 countries to examine the link between the level of budget transparency, Millennium Development Goals (MDG) spending and outcomes. The central objective of the paper is to investigate whether there is a correlation between the degree of budgetary transparency of a country and the way it allocates and manages financial resources to achieve the MDGs. In particular, the author analyzes whether greater budget transparency contributes to a more efficient use of MDG funds and, consequently, to achieving more favorable results in meeting these development goals. The results obtained by the author suggest that countries with a higher level of budget transparency tend to better allocate resources to achieve development goals.

Following a similar research direction, Fomina and Vynnychenko (2017) analyze the impact of fiscal transparency on the performance of budget indicators in a sample of 36 countries (Albania, Algeria, Azerbaijan, Bolivia, Bulgaria, China, Croatia, Czech Republic, Egypt, France, Georgia, Germany, Hungary, Italy, Kazakhstan, Kyrgyzstan, Macedonia, New Zealand, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovakia, Slovenia, Republic of South Africa, Sudan, Spain, Sweden, Tajikistan, Ukraine, United States of America, United Kingdom, Venezuela, Vietnam), considering the level of budget transparency, per capita income, economic development and economic freedom. The main purpose of the research was to identify the link between the levels of fiscal transparency and the economic performance of the selected countries that have varying levels of budget transparency (proxied through the OBI) and economic development (proxied through the income per capita), for the period 2006–2015. The obtained results documented that, in some countries, budget transparency contributes to the reduction of public debt and the increase of allocated public expenditures, while in countries with medium and high levels of economic development, the opposite effect of budget transparency on public debt is observed. Also, the positive impact of budget transparency on the allocation of public expenditures is characteristic only of countries with high economic freedom.

Other authors (Kolstad & Wiig, 2009; Cimpoeru, 2015; Yildiz *et al.,* 2017; Brusca *et al.*, 2018; Chen & Neshkova, 2020; Montes & Luna, 2021) advanced the hypothesis that budget transparency contributes to the growth of fiscal-budgetary discipline and deterring corruption. Thus, Yildiz *et al.* (2017) analyze the link between transparency indicators (including: OBI, the e-government index and the quality of regulations) and corruption. Using a panel analysis on a sample of 48 countries for the period 2004–2015, the authors showed the existence of a positive and statistically significant effect of transparency indicators on corruption.

The same results were reached by Montes and Luna (2021), who analyzed a sample of 82 countries, for the period 2006–2014, and showed a direct causal link between corruption control and fiscal-budget transparency.

Similarly, Chen and Neshkova (2020) conducted an analysis on a sample of 95 countries, from 2006–2014, and outlined that budget transparency plays a key role in the perception of corruption, countries with a high level of transparency being perceived as less corrupt.

Thus, the specialized literature, based on governance theory, documents that budget transparency limits information asymmetry and, implicitly, the discretionary power of responsible factors, contributing to reducing the perception of corruption.

Several other studies (Adsera *et al.*, 2003; Brewer *et al.*, 2007; Torgler *et al.*, 2011) have analyzed the relationship between government effectiveness and the level of responsibility (Voice and accountability), as a pillar of good governance, which shows perceptions of the extent to which a state's citizens freely participate in the election of their government, the extent of freedom of expression and freedom of the press. The results obtained by the authors suggest that a high level of democracy is associated with a better performance of governments and a lower level of the perception of corruption.

Thus, considering that the budget is a contract between citizens and the state, which shows how resources are collected and allocated for the provision of public services (Carlitz, 2013), citizens' participation in the democratic process implies their access to information and social control. At the same time, it allows citizens to put pressure on decision-makers to ensure greater efficiency in the use of public money, while ensuring the requirement of transparency. Carlitz (2013) conducts a critical review of the literature linking budget transparency, accountability and economic development, concluding that it cannot be clearly established. Similar opinions can be found by Albassam (2016, p. 237), who documented the influence of human development using the Human Development Index (HDI) on the relationship between good governance and budget transparency, reaching the conclusion that "the level of human development of nations has minimal influence on shaping the relationship".

Keser and Gokmen (2018) investigated the link between governance and human development, in a study based on data collected from a panel of 33 European states in the period 2002–2012. The results of their analysis indicated positive association with human development for three governance indicators government effectiveness, regulatory quality, and the rule of law. In contrast, Davis (2017) explored the link between good governance and sustainable human development in Sub-Saharan Africa, the results suggesting a direct positive correlation between all 6 pillars of good governance and human development in this region.

Although in the specialized literature there is a series of controversies regarding the priorities that must be set at the government level, the political factor plays a decisive role (Heeks, 2001; Smith, 2007; Baland *et al.,* 2010; Thomas, 2010; Khan, 2012; Sundaram & Chowdhury, 2012), while good governance still remains one of the essential factors that generate positive effects on the level of human development (Pradhan, 2011; Ahmad & Saleem, 2014; Davis, 2017). In addition, the rule of law, as a pillar of good governance, becomes a key determinant of economic development and human capabilities (Agere, 2000; Boettke

& Subrick, 2003; Peerenboom, 2004; Haggard *et al.*, 2008). Last but not least, the link between good governance, the rule of law and transparency must represent a solid partnership between the state and citizens (Johnston, 2006).

Finally, the relationship between budget transparency and the level of human development has also been studied by other authors (De Renzio *et al.*, 2005; Fukuda-Parr *et al.*, 2011; Cuadrado-Ballesteros & Bisogno, 2023). Most of these researchers highlighted the positive influence exerted by budget transparency on the level of human development, but also the interrelationships between them. The study carried out by Fukuda-Parr *et al.* (2011) documented the correlation between OBI and human development measured by the Human Development Index (HDI), The Index of Economic

and Social Rights Fulfillment (I-ESRF), Gender Development Index (GDI), the Gender Empowerment Measure (GEM) and the Human Poverty Index (HPI), the results suggesting that states with a high level of transparency tend to respect citizens' rights and freedoms more.

To complement the classical literature review, a bibliometric analysis was also performed considering a large sample of data on over 400 articles extracted from Scopus that approach the similar research subject of budget transparency and governance quality. Figure 1 below entails the topical credentials approached by authors in various associated researchers and the co-occurrence and links of main terms and research guidelines approached by these studies.
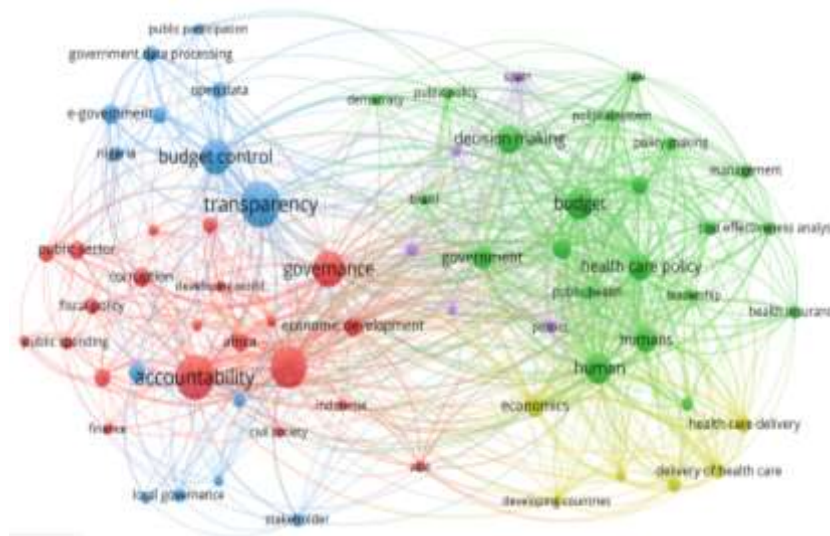

Figure 1. Co-Occurrence and Links between Terms/Keywords Approached in Relevant Literature Related to Budget Transparency and Good Governance

Source: Created by authors in VOSviewer, using Scopus indexed articles

Figure 1 reveals that budget control, governance, transparency, accountability, economic growth, and human development are at the core of similar terms on this topical subject. At the same time, public policy, decision making, and e-government are also strongly related to budget

control, while economic development and human well-being are correlated with governance, but also with public health and health care policy, particularly in the last years widely impacted by the Covid-19 pandemic.
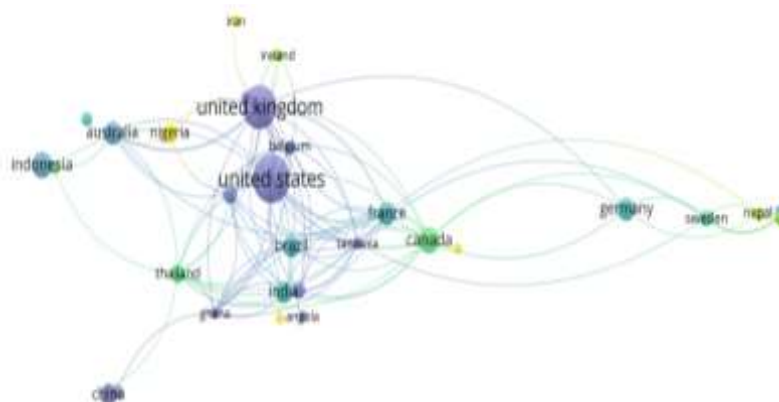
Figure 2. Map of Occurrence Studies on Budget Transparency and Good Governance, by Countries
Source: Created by authors in VOSviewer, using Scopus indexed articles

Being such a topical subject, with keen influences upon individual subjective well-being, budget control, and governance quality is intensively studied in numerous countries, ranging from the United States, the United Kingdom, China, Indonesia, or Canada to Ireland, Germany, Sweden, or France (Figure 2). However, to the best of our knowledge, only a few studies considered a comprehensive three-fold empirical approach to the synergies between budget transparency and the quality of governance and furthermore the linkages with human development and individual well-being at the level of the European Union.

Summing up, the authors' conclusions are varied, depending on the interest given to one or another of the good governance indicators, the direct link between budget transparency, good governance, and human development not being explicitly highlighted in all the studies presented. The subject thus remains a topical one, and the interest in the analysis of transparency in order to improve the quality of governance is significantly growing, even more in these challenging times.

Data and Methodology

The variables selected and used in the econometric models were grouped into three categories:

• *budget transparency*: Open Budget Index – OBI (score from 0 to 100);

• *good governance*: the 6 pillars of good governance – WGIs (scores ranging between -2.5 and +2.5), namely, Voice and Accountability – VACTB; Political Stability and Absence of Violence/Terrorism – PSTAB; Government Effectiveness – GEFCT; Regulatory Quality – RQLT; Rule of Law – RLW; Control of Corruption – CTRLCR;

• *well-being level*: Human Development Index (HDI) (score from 0 to 100).

The sample under analysis includes 14 member states of the EU (namely, Bulgaria, Croatia, the Czech Republic, France, Germany, Hungary, Italy, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Sweden), for which OBI is reported and determined, access to data being ultimate for the sample selection. Accordingly, the data were collected for the period 2006–2021.
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Aiming to assess the degree of budget transparency, the International Budget Partnership (IBP) has developed a research methodology – "Open Budget Survey", on a 2-year basis, since 2006, and has determined the indicator ***Open Budget Index (OBI)***. IBP uses budget transparency as an analysis tool aiming to improve governance efficiency, reduce poverty and provide a basic methodology for the evaluation of budget transparency to ensure it and also the budget system participation.

OBI has the role of assessing the transparency of the budget according to the amount and timeliness of the budgetary data that governments make public (Seifert *et al.*, 2013). The index attributes to countries subject to the budget analysis, a transparency score on a scale of 0 to 100 points using a subset of questions that assess the value and the immediacy of budget data that governments make available to the public in eight key budget documents, in accordance with international best practice standards (https://internationalbudget.org/open-budget-survey).

The study of ***Open Budget Index (OBI)*** includes OECD member countries, but there is no obligation for all countries to participate in the survey. From this point of view, the OBI, which was determined once every two years, has determined the collection of data according to the EU countries reporting it and the periods in which it was published. This aspect explains why only 14 countries are part of the sample.

According to the Open Budget Survey methodology (https://internationalbudget.org/open-budget-survey), depending on the score obtained, the states can be placed in one of the following categories: "Extensive information" (with an index between 81–100); "Significant information" (with an index between 61–80); "Some information" (with an index between 41–60); "Minimal information" (with an index between 21–40) and "Scant or no information" (with an index between 0-20).

As we can see in Figure 3a, OBI had a different evolution within the EU states selected in the sample, for the period 2006–2021, depending on the information on government finances provided by each state.
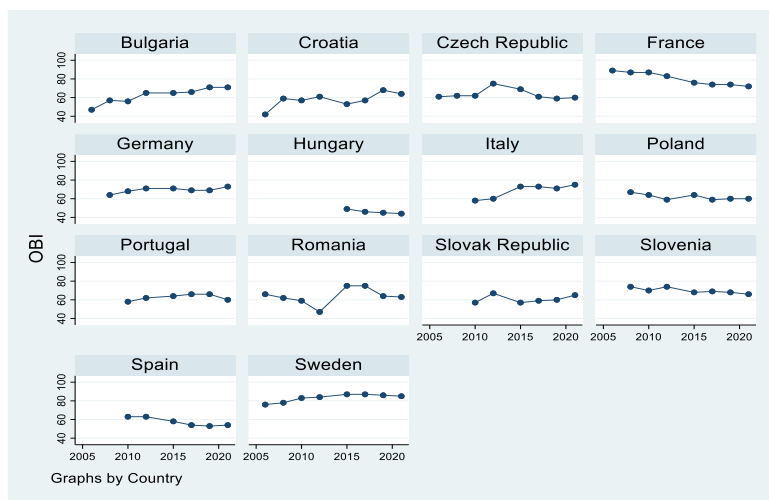
Figure 3a. OBI's Evolution in the EU 14 Countries Analyzed, 2006–2021
Source: Authors' processing
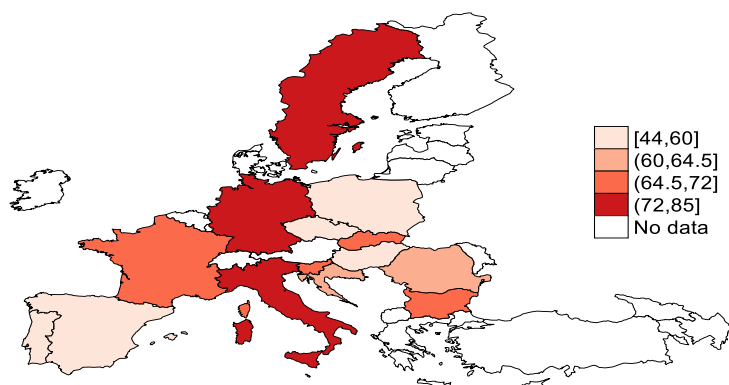
Figure 3b. OBI in Selected EU 14 Countries, 2021
Source: Created by authors in Stata

The analysis of the data published in 2021 compared to the first reporting year (Figure 3a and 3b), shows significant progress for 4 of the states included in the sample (Bulgaria from 47 to 71; Croatia from 42 to 64; Italy from 58 to 75 and Sweden from 76 to 85), but also a deterioration of information on government finances in 4 other states (France from 89 to 72; Spain from 63 to 54, Slovenia from 74 to 66 and Poland from 67 to 60). The states that joined the EU in 2007 (Romania and Bulgaria) had a different evolution of the transparency indices. While Bulgaria has steadily improved its score since 2006, Romania has had scores ranging from a low of 47 (2012) to a high of 75 (2015 and 2017). In the other fiscal years, in Romania, due to the non-publication of the budget for citizens and the late publication of information regarding the Pre-Budget Statement (https://internationalbudget.org/open-budget-sur vey/country-results/2019/romania), the score decreased to 64 (2019) and 63 (2021), respectively.

The data from the year 2021 show us only one state included in the "Extensive information" category (Sweden: 85), 8 states included in the "Significant information" category: Italy (75), Germany (73), France (72), Bulgaria (71), Slovenia (66), the Slovak Republic (65), Croatia (64) and Romania (63), and a number of 5 states included in the "Some information" category: Czech Republic (60), Poland (60), Portugal (60), Spain (54) and Hungary (44).

The Worldwide Governance Indicators (WGIs) "cover over 200 countries and territories, measuring six dimensions of governance since 1996. Concerns that have emerged along the lines of governance have led to the structuring of the Worldwide Governance Indicators (WGI) in three areas, for each being built two dimensions" (Kaufmann *et al.*, 2010, p. 4), respectively:

1. The processes by which governments are selected, monitored and exchanged: "Voice and Accountability; Political Stability and Absence of Violence/Terrorism;"

2. The Government's capacity to formulate and implement viable policies: "Government Effectiveness; Regulatory Quality";

3. The citizens and the state`s respect towards the institutions governing the social and economic interactions between them: "Rule of Law; Control of Corruption".

Aggregated indicators "are based on several hundred individual variables, collected from a wide variety of existing data sources. The data reflects the governance views on survey respondents and public, private and NGO sector experts around the world" (Kaufmann *et al.,* 2010, p. 1). The WGIs also explicitly report the error margins accompanying each country's estimate. These reflect the inherent difficulties in measuring governance through the use of any kind of data.

The data were extracted from the World Bank database (https://info.worldbank.org/governance/wgi/) and cover the period 2006–2021 for the 14 European countries included in the sample (Figure 4a and 4b).
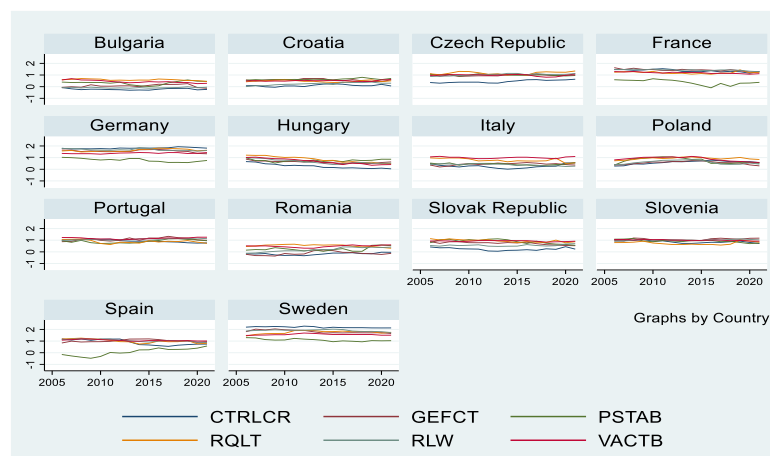
Figure 4a. WGIs Evolution in the EU 14 Countries Analyzed, 2006−2021
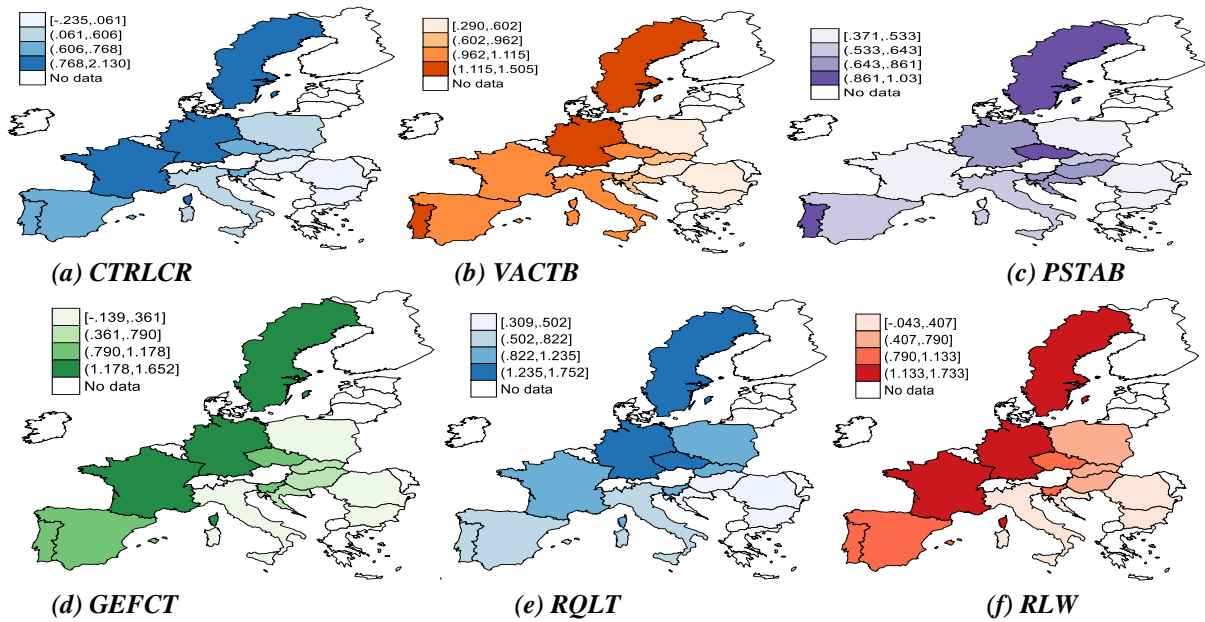*Source: Authors' processing*

(a) CTRLCR

(b) VACTB

(c) PSTAB

(d) GEFCT

(e) RQLT

(f) RLW

Figure 4b. WGIs in Selected EU 14 Countries, 2021
Source: Created by authors in Stata

The Human Development Index (HDI) is a measure of human development based on the progress made by countries on 3 dimensions of well-being: health, level of knowledge (education) and standard of living (by the means of gross national income per capita) (https://hdr.undp.org/data-center/human-development-index#/indicies/HDI). Since 1990, the United Nations Development Programme (UNDP) annually publishes a series of information in the Human Development Report

(HDR) on the progress of human development at the level of states. For each of the 3 dimensions, a minimum and a maximum are established, the HDI level being expressed as a value between 0 and 1. The higher the welfare level of a state, the higher the value of the index.

The data was taken from HDR, covering the period 2006–2021. The latest edition of the HDR (2022) includes the HDI ranking for 191 states from which the EU 14 countries were selected in the analyzed sample.
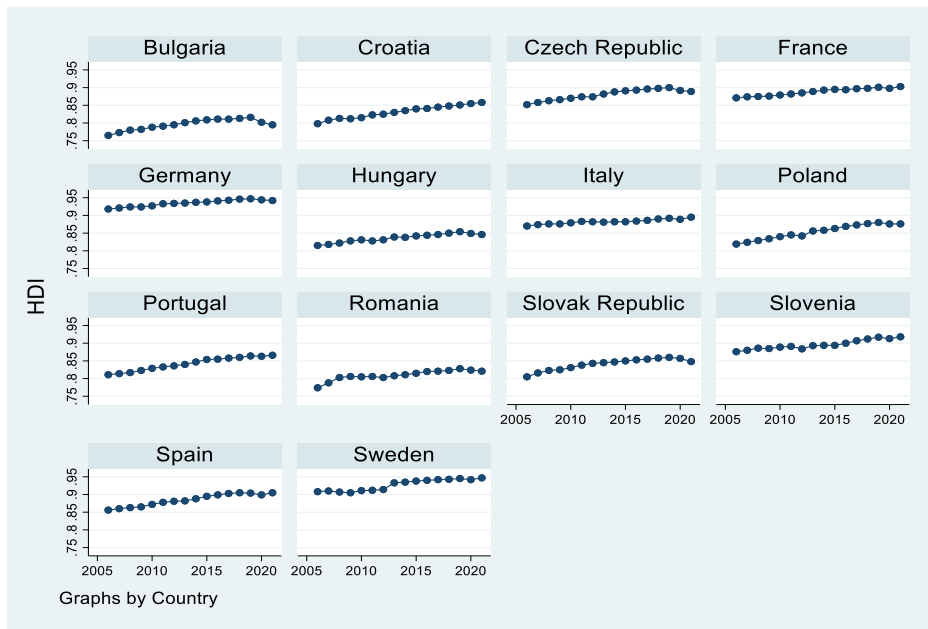

Figure 5a. HDI evolution in the EU 14 countries analyzed, 2006–2021
Source: Authors' processing

As can be seen in Figure 5a and 5b, for the year 2021, developed countries tend to register a higher level of HDI, very close to 1 (the highest level is reached by Sweden, with 0.947), and countries with slower development tend to reach a somewhat lower level (Romania, with 0.821, and

Bulgaria, with 0.795). Overall, however, all the states included in the analyzed sample registered progress in human development during the period under analysis.
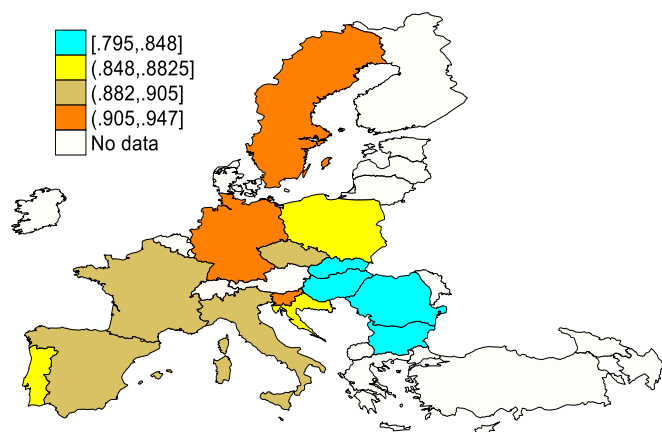
Figure 5b. HDI in Selected EU 14 Countries, 2021
*Source: created by authors in Stata*

Although some authors (McGillivray & White, 1993; Biswas & Caliendo, 2001; Mazumdar, 2003; Sakalas & Liepe, 2013) critically evaluate the human development index developed by the UNPD, considering that it does not contribute significantly to the assessment of development levels between groups of countries, it remains an alternative to the traditional method of measuring development through GDP/capita. The summary statistics of the data, synthesized in Table 1, reveal an average score for OBI over 65, with a maximum one of 89 (of 100), registered for France in 2006 (Figure 3), and a minimum value of 42, for Croatia, also in 2006 (Figure 3). The highest value of HDI is of 0.947,

registered in Sweden (2021) and Germany (2019), while the lowest one was of 0.765, determined for Bulgaria (2006) (Figure 5). As regards WGIs, the greatest average value was obtained for regulatory quality (RQLT) (over 0.96), and the least good, for political stability (PSTAB) (over 0.65). The highest score of the components of the WGIs, in the period 2006-2021, was registered by control of corruption (over 2.280) in Sweden (in 2012), and the lowest score was obtained by political stability (over -0.47) in Spain (in 2009) (Figure 4). The visual representation of the data, for the period 2006–2021, is emphasized also in the scatterplot matrix of the indicators (Figure 6).

Table 1

Summary Statistics of the Variables, 2006-2021 *Source: Authors'processing*

Variables	N	mean	Standard deviation	Minimum	Maximum
OBI	97	65.71134	10.30166	42	89
CTRLCR	224	0.6843923	0.7027136	-0.3317571	2.284981
GEFCT	224	0.843409	0.540528	-0.3597497	2.045359
PSTAB	224	0.6580589	0.3434269	-0.4737767	1.294893
RQLT	224	0.9630387	0.3855932	0.30902	1.907862
RLW	224	0.8376151	0.5698768	-.01302277	2.026205
VACTB	224	0.9472147	0.3360436	0.2600734	1.690358
HDI	224	0.8645268	0.0424762	0.765	0.947
N total	224				
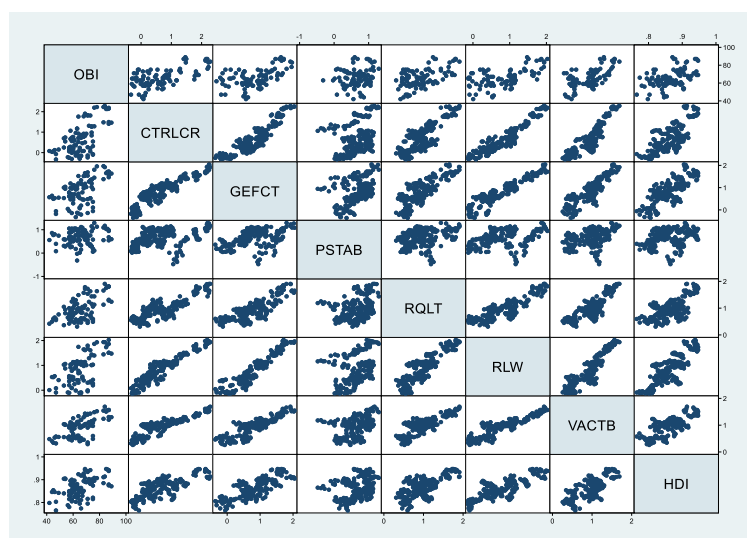
Figure 6. Scatterplot Matrix of the Indicators, Period 2006–2021. *Source: Authors' processing*

The research methodology encloses three advanced econometric procedures, namely: (*i*) *robust regression (RREG),* to assess direct impacts of the budget transparency on good governance and human development level, on the one hand, and, reversely, of each component of the WGIs and human development on budget transparency; *(ii) structural equation modeling (SEM)*, to globally assess (direct, indirect and overall) the influences between budget transparency, each dimension of WGIs, with overall cascade effect on welfare, measured by human development index (SEM1), on the one hand, and each dimension of WGIs on budget transparency, with global implication on human development (SEM2), on the other hand; *(iii) Gaussian Graphical Models (GGMs)* to appraise the interlinkages among all variables, using EBICglasso and PCOR methods.

The rationale behind using the methodological approach based on the three advanced econometric procedures relies on the fact that these techniques are essential to modeling longitudinal data, each providing notable advantages to achieve the main objectives of the study undertaken. Because the analysis is performed at the EU-14 level and there are notable differentials between the member states, robust regression was selected to cope with potential outliers in the sample, considering that it has three important properties, namely "efficiency, breakdown point and bounded influence" (Khan *et al.*, 2021, p. 3). Hence, RREG "takes the advantage of detecting influential outliers in the sample/set of variables that negatively affect the regression model and thus provide consistent estimates that bypass spurious regression" (Noja *et al.*, 2023, p. 155). We further apply structural equation modelling as a multivariate method that captures influences among interacting variables, SEM being a confirmatory technique that has the essential advantage of capturing complex relationships in a single setting, thus providing a "well-fitting" model. Lastly, Gaussian graphical models appraise the linkages between all

variables and capture conditional dependencies, thus avoiding thresholding/ spurious correlations.

Robust regression models (RREG) are firstly configured and processed through two types of iterations, Huber and biweight, to assess the impact of budget transparency on the quality of governance and the level of human development, but also to examine the effects of a sound regulatory government environment and individual well-being have on open budget practices. Therefore, two sets of single robust regression models are developed, as in Equations 1-8 below.

$$CTRLCR_{it}/ GEFCT_{it}/ PSTAB_{it}/ RQLT_{it}/ RLW_{it}/ VACTB_{it}/ HDI_{it} = \beta_0 + \beta_1 OBI_{it} + \theta_i + \varepsilon \quad (1)$$

$$OBI_{it} = \beta_0 + \beta_1 CTRLCR_{it} + \theta_i + \varepsilon \quad (2)$$

$$OBI_{it} = \beta_0 + \beta_1 GEFCT_{it} + \theta_i + \varepsilon \quad (3)$$

$$OBI_{it} = \beta_0 + \beta_1 PSTAB_{it} + \theta_i + \varepsilon \quad (4)$$

$$OBI_{it} = \beta_0 + \beta_1 RQLT_{it} + \theta_i + \varepsilon \quad (5)$$

$$OBI_{it} = \beta_0 + \beta_1 RLW_{it} + \theta_i + \varepsilon \quad (6)$$

$$OBI_{it} = \beta_0 + \beta_1 VACTB_{it} + \theta_i + \varepsilon \quad (7)$$

$$OBI_{it} = \beta_0 + \beta_1 HDI_{it} + \theta_i + \varepsilon \quad (8)$$

Robust regression takes the advantage of removing the outliers in the sample, thus providing robust estimates while coping with possible distortions in the estimated coefficients.

Structural equation modelling (SEM) is deployed to assess the interlinkages (direct, indirect, total) between budget transparency, governance framework and human development and well-being on a two-fold approach (SEM1 and SEM2). General representation of SEM1 is built in Figure 7, and of SEM2, in Figure 8.
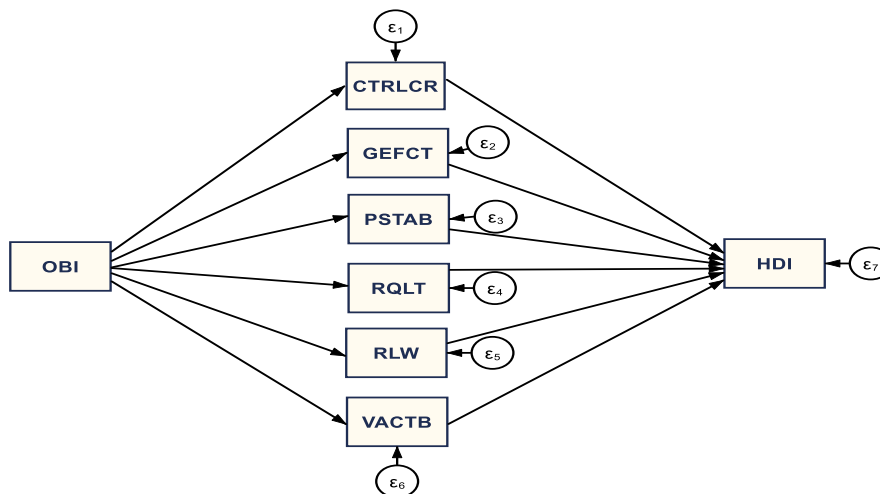
Figure 7. General Configuration of SEM1
Source: Created by authors in Stata
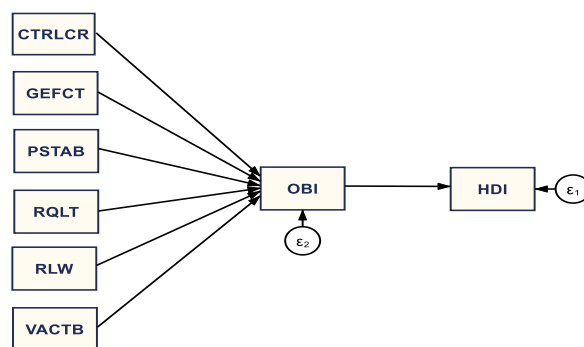
Figure 8. General Configuration of SEM2
Source: Created by authors in Stata

Finally, the synergies between all considered variables are analyzed through network analysis that is employed in current research through Gaussian Graphical Models (GGMs). GGMs are estimated through the Extended Bayesian Information Criterion with graphical least absolute shrinkage and selection operator (EBICglasso) and partial correlation (PCOR). Therefore, based on our research objective, literature review and methodology applied, we have framed to assess the following research hypotheses (H):

* *H1. There are strapping direct implications between each component of the WGIs, respectively human development index, and the degree of budget transparency, in both directions, in the EU-14 countries included in the panel;*

* *H2. There are strong implications between budget transparency and each component of the WGIs, with cascade/spillover impacts (direct, indirect and overall) on the human development index, in the EU-14 countries included in the panel;*

* *H3. There are strong implications between each component of the WGIs and budget transparency, with further global impacts (direct, indirect and overall) on the human development index, in the EU-14 countries included in the panel;*

* *H4. There are overall interconnections among WGIs dimensions, human development, and budget transparency degree, in the EU-14 countries included in the panel.*

Results and Discussions

Results of Robust Regressions models (RREG)

To assess direct influences between each component of the WGIs, respectively HDI, and the degree of budget transparency (OBI), in both directions, in the EU-14 countries for which OBI is determined, we built 7 robust regression models for each direction.

Therefore, regarding the influences of the level of budget transparency (OBI) on each component of the WGIs, but also of the degree of human development (HDI), the robust regression results (Table 2) reveal favorable influences between them, contrary to the opinions in the specialized literature where it could not be established a clear relationship (Carlitz, 2013; Albassam, 2016). Except for the component that captures political stability (PSTAB), for the period 2006–2021, all other components of the WGIs were positively (and statistically significant, $p<0.001$) influenced by the level of budget transparency in the EU-14 countries enclosed in our panel.

Among these components, the greatest influence of budget transparency was determined upon the control of corruption (CTRLCR) (positive estimated coefficient of 0.0451, for a degree of determination R^2 of 35.5 % which states that 35.5 % in the variations accounted in the control of corruption can be explained through the variations in the budget transparency), and the least felt, upon the regulatory quality part (the estimated coefficient is 0.0219, for a degree of determination of 28.6 %). Also, the human development index (HDI) is favorably influenced by OBI in these countries, as also evidenced by the relevant literature (De Renzio *et al.,* 2005; Fukuda-Parr *et al.*, 2011; Cuadrado-Ballesteros & Bisogno, 2023).

Therefore, the first direction of hypothesis H1, related to *direct implications of the degree of budget transparency on each component of the WGIs, respectively human development index,* is fulfilled.

Table 2

Results of RREG Models, Dependent Variables WGIs Components and HDI

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CTRLCR	GEFCT	PSTAB	RQLT	RLW	VACTB	HDI
OBI	0.0451***	0.0309***	0.00527	0.0219***	0.0351***	0.0223***	0.00214***
	(0.00624)	(0.00491)	(0.00331)	(0.00355)	(0.00514)	(0.00279)	(0.000407)
_cons	-2.275***	-1.131***	0.332	-0.483*	-1.459***	-0.511**	0.728***
	(0.415)	(0.326)	(0.220)	(0.236)	(0.342)	(0.186)	(0.0271)
N	97	97	97	97	97	97	97
R^2	0.355	0.295	0.026	0.286	0.330	0.401	0.225

Note: "Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$". *Source: Authors' research*

Reversely, the RREG results on the influences of each component of the WGIs and the degree of human development (HDI) upon the level of budget transparency (OBI) (Table 3) likewise disclose favorable influences between all of them, also with an exception for political stability component (PSTAB) (results are not statistically significant), as Bisogno and Cuadrado-Ballesteros (2022), Fedorovych (2020), Albassam (2016), have underlined. The most notable positive influence induced by the WGIs on budget transparency, for the period 2006–2021, was in terms of the regulatory quality component (RQLT) (the estimated coefficient is 13.88, statistically significant at 0.1 % threshold, with p<0.001, for a degree of determination of 27 %), and the lowest one, on the political stability (PSTAB) (the estimated coefficient is 4.728, for a degree of determination of 2.1 %). The influence of human development degree on budget transparency was very meaningful, with a positive impact (the estimated coefficient is 113.1, statistically significant at 0.1 %, for a degree of determination of 22.5 %), as revealed also by the literature (Pradhan, 2011; Ahmad & Saleem, 2014; Davis, 2017).

Table 3

Results of RREG Models, Dependent Variable - OBI

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OBI	OBI	OBI	OBI	OBI	OBI	OBI
CTRLCR	8.643*** (1.181)						
GEFCT		9.652*** (1.643)					
PSTAB			4.728 (3.310)				
RQLT				13.88*** (2.340)			
RLW					9.879*** (1.535)		
VACTB						18.71*** (2.507)	
HDI							113.1*** (21.54)
_cons	59.76*** (1.184)	57.51*** (1.678)	62.35*** (2.451)	52.36*** (2.425)	57.48*** (1.571)	47.99*** (2.504)	-32.50 (18.71)
N	97	97	97	97	97	97	97
R^2	0.361	0.266	0.021	0.270	0.304	0.370	0.225

Note: "Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$"
*Source: Authors' research*

Accordingly, the second direction of hypothesis H1, *there are strapping direct implications between each component of the WGIs, respectively human development index, and the degree of budget transparency,* is fulfilled.

Consequently*,* the hypothesis H1, *There are strapping direct implications between each component of the WGIs, respectively human development index, and the degree of budget transparency, in both directions, in the EU-14 countries included in the panel*, is overall fulfilled (with an exception for political stability component). Therefore, we propose adequate measures and strategies according to these findings to ensure openness, accountability, and integrity in public finance management, with strapping positive effects on citizens' wellbeing.

Results of Structural Equation Modelling (SEM Models)

To assess the *overall inferences between budget transparency and each component of the WGIs (direct impacts), with final spillover impacts on the human development index (indirect and overall effects), in the considered EU-14 countries (H2),* we have built SEM1 diagram (Figure 7). To check and ensure the robustness of the results obtained, we performed the following tests: *the Wald test* for each equation (Table A2 for SEM1) that reveals a *p*-value of 0.000 for each component; Goodness–of–fit tests - *likelihood ratio, information criteria, baseline comparison, and size of residuals*, and *the coefficient of determination (CD)* of 0.881, which means that 88.1% of HDI was influenced by OBI and WGIs (Table A2, for SEM1).
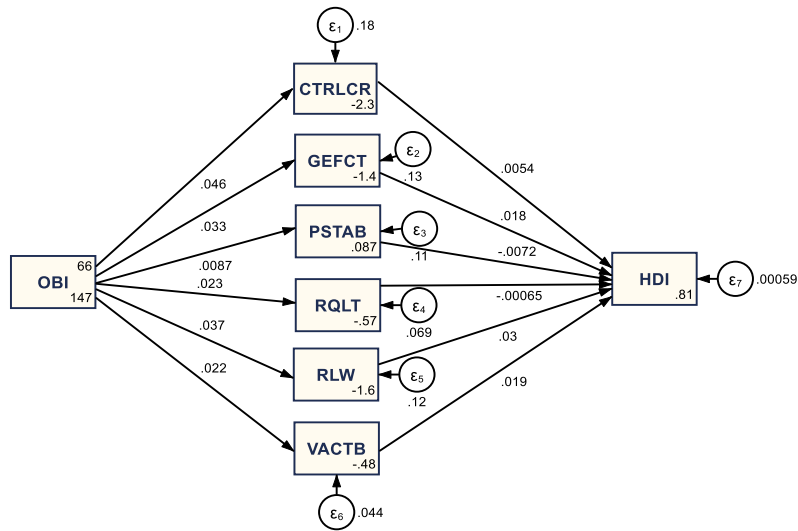
Figure 9. Results of SEM1 to Assess H2
Source: Authors' processing

Accordingly, the degree of budget transparency (OBI) favorably influences all components of the WGIs (Figure 9 and Table A1 from Annex – SEM1) (the estimated coefficients are positive and statistically significant, with p<0.001), being the most pronounced for control of corruption (CTRLCR) (the estimated coefficient is 0.0461). Their global impacts on the human development index, by each dimension of the WGIs, were registered only for rule of law (RLW), with a favorable final spillover effect (the estimated coefficient is 0.0302, for p<0.05). The other components also registered positive impacts on HDI, but not statistically significant. Thus, the 2nd hypothesis, *H2. There are strong implications between budget transparency and each component of the WGIs, with cascade impacts (direct, indirect and overall) on the human development index, in the EU-14 countries included in the panel,* is partially fulfilled. To further assess the *overall impacts of budget transparency on the human development index, under direct and indirect impacts of each component of the WGIs, in the considered EU-14 countries (H3),* we have built SEM2 diagram and estimated the global implications through the maximum likelihood estimator (MLE) with missing values (Figure 8).

Robustness is checked and acknowledged by the following tests that we first processed: *the Wald test* for each equation (Annex, Table A2 for SEM2) that revealed also *p*-value of 0.000 for each component; Goodness–of–fit tests - *likelihood ratio, information criteria, baseline comparison, and size of residuals*, and *the coefficient of determination (CD)* of 0.526, meaning that 52.6% of HDI was influenced by OBI under the notable impact of WGIs (Annex, Table A2 for SEM2).

The results (Figure 10, Table A1 from Annex – SEM2) disclosed that budget transparency (OBI) has favorably influenced the human development index (the estimated coefficient is 0.00250, with p<0.001), under indirect and favorable influences of WGIs only as regards the dimensions that embed the control of corruption (CTRLCR) and voice and accountability (VACTB) (the estimated coefficients are 7.353, respectively 11.41, statistically significant at p<0.05), as Pradhan (2011), Ahmad and Saleem (2014) and Davis (2017) also proved. However, most academics asserted that the rule of law, as a pillar of good governance, acted as a paramount key for economic development and human development (Agere, 2000; Boettke & Subrick, 2003; Peerenboom, 2004, Haggard *et al.,* 2008). However, in our case, the result for this component is not statistically significant.
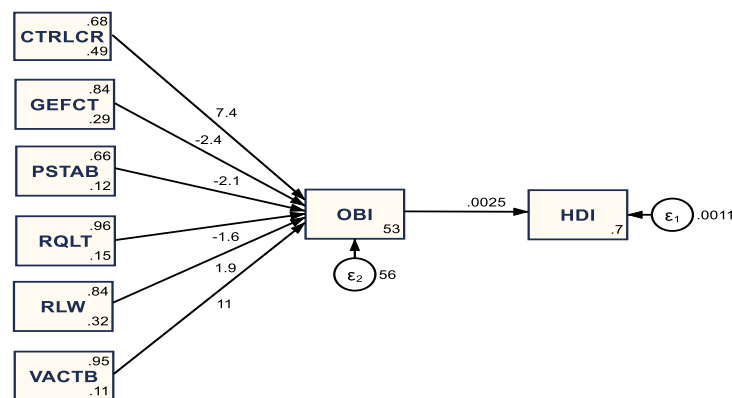
Figure 10. Results of SEM2 for H3
Source: Authors' processing

Thus, the 3rd hypothesis, *H3. There are strong implications between each component of the WGIs and budget transparency, with further global impacts (direct, indirect and overall) on the human development index, in the EU-14 countries included in the panel,* is also partially fulfilled.

Results of Gaussian Graphical Models (GGMs)

Finally, as regards the overall interconnections among WGIs dimensions, human development, and budget transparency degree, in the EU-14 countries included in the panel (hypothesis H4), we applied the network analysis and built the GGMs models, processed through EBICglasso and PCOR.

For the estimated Gaussian graphical networks, both by the EBICglasso and PCOR methods, we first calculated the centrality measures on variables in the form of a graphical representation (Figure A1, respectively Figure A3 in the Appendix). Similarly, we also included an evaluation of the clustering measures on variables in graphic form (clustering plot) for each applied method, EBICglasso and PCOR, based on four estimation algorithms (Figure A2, respectively A4 in the Appendix). Centrality measures are calculated at the variable level for *betweenness*, *closeness*,

degree and *expected influence*, as can be seen in Figure A1, respectively Figure A3 in the Appendix. Clustering measures are presented in a similar form by clustering coefficients, namely, *Barrat, Onnela, WS*, and *Zhang*.

Both by EBICglasso, and PCOR methods, the results reveal strong favorable connections between the level of budget transparency (OBI), voice and accountability (VACTB), and control of corruption (CTRLCR), as the other authors also proved (Brewer *et al.*, 2007; Torgler *et al.*, 2011, Yildiz *et al.*, 2017, Montes & Luna, 2021; Chen & Neshkova, 2020).

On the other hand, the results reveal unfavorable interlinkages between budget transparency and political stability (PSTAB), on the other hand (Figure 11 and Figure 12), as revealed also by Albassam (2016), for the period 2006-2012, in a variety of political and government systems.

Human development level (HDI) is positively associated with rule of law (RLW), government effectiveness (GEFCT) and voice and accountability (VACTB), on the one hand, and unfavorable related to political stability (PSTAB), on the other hand (Figure 11 and Figure 12), as Keser and Gokmen (2018) also proved, for the period 2002-2012, in a study based on data collected from a panel of 33 European states.
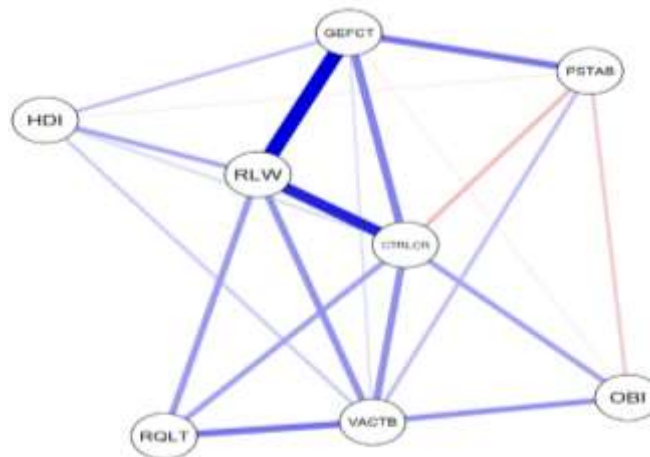
Figure 11. Results of GGM, EBICglasso Method
Source: Authors' processing
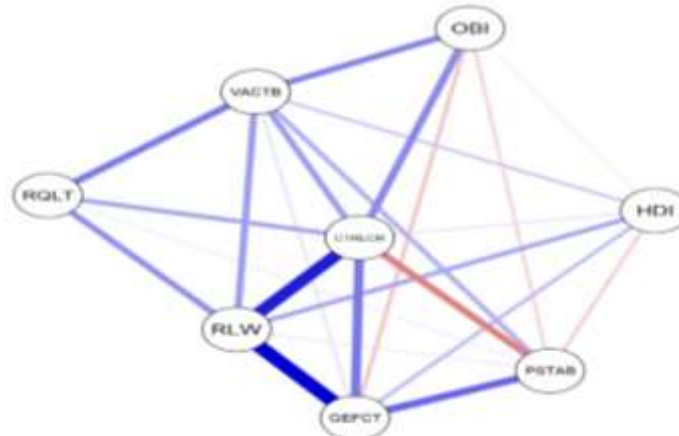
Figure 12. Results of GGM, PCOR method
Source: Authors'processing

These results can be explained by the fact that countries with a higher level of human development are associated with stronger institutions, but, at the same time, they may face increased pressures to maintain or improve the quality of life, which may influence political stability.

Thus, the 4th hypothesis, *H4. There are overall interconnections among WGIs dimensions, human development, and budget transparency degree, in the EU-14 countries included in the panel,* is fulfilled.

Conclusions

The research approached in an innovative way a very topical subject at the level of the European Union with notable effects on various areas. In the context of the European Union, which has an integrated and complex economy, the treated topic is relevant for economic research, as well as for economic policy analysis. The research has considered the declared intention of enriching the preoccupations for open budget methods and the achievement of good governance and, in this way, supporting sustainable development by improving individual well-being.

The obtained results suggest that budget transparency plays an essential role in improving the quality of governance and its effectiveness, being at the same time a relevant tool for increasing the level of human development. The detailed results that answer to our scientific questions, in accordance with the research hypotheses assessed, suggest the following milestones: a direct link between good governance (except for the component capturing political stability), the dimensions defining the area of government capacity and human development are outlined, which have led us to the idea that a new generation of governance indicators is now needed (H1); the overall effects on the human development index of each component of the WGIs, under the indirect impact of budget transparency revealed favorable impacts only for rule of law (H2), on the one hand, and the level of budget transparency had a positive impact on the human development in terms of two specific dimensions of the global governance, namely corruption control and voice and accountability, on the other hand (H3); the overall interconnections between global governance and budget transparency revealed favorable ones as regards voice and accountability and control of corruption dimensions, and unfavorable interlinkages between them, considering political stability, on the one hand, while human development level was positively associated with rule of law, government effectiveness and voice and accountability, and unfavorable related to political stability, on the other hand (H4).

These results suggest that improving governance and human development at the state level can help promote budget transparency, and greater budget transparency can in turn support better governance and higher human development, by ensuring efficient use and fair use of public financial resources, with the mention that it is important to take into account the political factor as well.

Therefore, we propose a set of measures, for the EU-14 countries, that include the following directions: designing high-level budget plans for the forthcoming fiscal year;

using open data to enable understandings of the budgetary process; introducing transparent and independent mechanism of public procurement with the further realistic engagement of stakeholders; effective monitoring of financial flows; manage corruption by mapping entry points at specific phases of public procurements; proactive disclosure of relevant public data; strengthening internal management and control of public resources.

The differences of our obtained results in relation to the other authors are related to multi-level approach, in our case. Most of the previous studies were based either on the interrelations, on both directions, between budget transparency and a single pillar of governance, as Carlitz (2013), Cimpoeru (2015) and Chen and Neshkova (2020) proved, or considering all the 6 pillars, as Albassam (2016), Bisogno and Cuadrado-Ballesteros (2022) assessed, or on the good governance-economic growth/development relations, as Heeks (2001), Neumayer (2003), Khan (2012) and Addink (2019) investigated. Other studies considered either the identification of the link between the levels of fiscal transparency and the economic performance of states that have different levels of budgetary transparency and economic development (Simpson, 2014; Fomina & Vynnychenko, 2017), or the identification of the level of budgetary transparency in local administrations (Puron Cid & Bolivar, 2018; Birskyte, 2019).

Similarities of our findings with the previous ones are in line with the positive association between human development and budgetary transparencies, as Bisogno and Cuadrado-Ballesteros (2022), Fedorovych (2020), Albassam (2016), Pradhan (2011), Ahmad and Saleem (2014), Davis (2017), De Renzio *et al.* (2005), Fukuda-Parr *et al.* (2011) and Cuadrado-Ballesteros and Bisogno (2023) also proved. Also, the level of human development is positively associated with some the governance pillars - rule of law, government efficiency, and voice and responsibility - as Keser and Gökmen (2018) proved for 33 European countries.

The results obtained suggest that budget transparency can contribute to reducing corruption by providing clear information on the allocation and spending of public resources. In this regard, the EU-14 panel's examination of the synergies between budget transparency and good governance showed us that governments that invest in budget transparency can achieve significant improvements in the control of corruption and respect for the rule of law.

The strength of the paper is the innovative approach to enhance new empirical evidence based on the sample of states in the EU. These data can provide a clear and up-to-date picture of the relationship between budget transparency, good governance and human development, as well as citizens' well-being in the specific context of the EU. The results are relevant and useful to decision-makers in European countries, in order to analyze the currently adopted strategies and to further improve public policies that can contribute to strengthening human development. Thus, the obtained results add a new perspective to the synergies between institutions, regulations, budget transparency, and human development while bringing new contributions to the specialized literature.

The study is not without limitations that emerge mainly from the lack of data available on longer time series that are

relevant in capturing the amplitude of the analyzed coordinates at the level of the European Union. Another limitation of our research is given by the reduced number of EU countries that participate in the OECD survey related to Open Budget Index, since there is no obligation in this respect for all countries. Furthermore, OBI is calculated biennial, which determines a reduced availability of data and a narrowed sample.

Future research will consider, also, additional proxies for both budget transparency, governance quality and individual subjective well-being, oriented to other dimensions of sustainable development, such as poverty alleviation, energy or digital technologies and innovation.

Annexes

Table A1

SEM Detailed Results

Variables	(1)	(2)
	SEM1	**SEM2**
Main		
PSTAB		
OBI	0.00867*** (0.00188)	
CTRLCR		7.353* (3.226)
GEFCT		-2.360 (3.836)
PSTAB		-2.120 (2.353)
RQLT		-1.647 (3.603)
RLW		1.888 (4.666)
VACTB		11.41* (5.064)
_cons	0.0870 (0.126)	53.11*** (3.337)
GEFCT		
OBI	0.0334*** (0.00223)	
_cons	-1.358*** (0.149)	
CTRLCR		
OBI	0.0461*** (0.00278)	
_cons	-2.350*** (0.186)	
RQLT		
OBI	0.0233*** (0.00164)	
_cons	-0.569*** (0.110)	
RLW		
OBI	0.0368*** (0.00227)	
_cons	-1.585*** (0.152)	
VACTB		
OBI	0.0217*** (0.00136)	
_cons	-0.479*** (0.0907)	
HDI		
PSTAB	-0.00716 (0.00554)	
GEFCT	0.0180 (0.00961)	
CTRLCR	0.00536 (0.00816)	
RQLT	-0.000648 (0.00889)	
RLW	0.0302*	

Variables	(1) SEM1	(2) SEM2
	(0.0118)	
VACTB	0.0185 (0.0124)	
OBI		0.00250*** (0.000231)
_cons	0.808*** (0.00822)	0.700*** (0.0153)
/		
mean(OBI)	65.86*** (0.870)	
var(e.PSTAB)	0.106*** (0.0101)	
var(e.GEFCT)	0.127*** (0.0124)	
var(e.CTRLCR)	0.180*** (0.0177)	
var(e.RQLT)	0.0687*** (0.00675)	
var(e.RLW)	0.125*** (0.0121)	
var(e.VACTB)	0.0437*** (0.00431)	
var(e.HDI)	0.000592*** (0.0000559)	0.00106*** (0.000112)
var(OBI)	146.6*** (16.81)	
var(e.OBI)		55.54*** (7.474)
N	224	224

*Note: "Standard errors in parentheses, * p < 0.05, ** p < 0.01, *** p < 0.001"*
Source: Authors' research

Table A2

Wald Test for the Equations of the SEM Models, 2006–2021

Variables	SEM1			SEM2		
	Chi²	df	*p*-value	Chi²	df	*p*-value
PSTAB	21.27	1	0.000	-	-	-
GEFCT	224.69	1	0.000	-	-	-
CTRLCR	275.02	1	0.000	-	-	-
RQLT	201.43	1	0.000	-	-	-
RLW	262.74	1	0.000	-	-	-
VACTB	254.94	1	0.000	-	-	-
HDI	455.62	6	0.000	117.49	1	0.000
OBI	-	-	-	137.52	6	0.000

Source: Authors' processing

Table A3

Goodness–of–Fit Tests for the SEM Models, 2006–2021

| Tests	SEM1	SEM2
Likelihood ratio		
„Model vs. saturated" chi²_ms	1144.378 chi²_ms (16)	161.380 chi2_ms (6)
p > chi²	0.000	0.000
„Baseline vs. saturated" chi²_bs	2118.459 chi²_bs (28)	304.847 chi2_bs (13)
p > chi²	0.000	0.000
Population error		
„RMSEA (Root mean squared error of approximation)"	0.562	0.341
90% CI, lower bound	0.535	0.297
upper bound	0.590	0.387
pclose (Probability RMSEA <= 0.05)	0.000	0.000
Information criteria		
„AIC (Akaike's information criterion)"	756.390	-260.608
„BIC (Bayesian information criterion)"	851.916	-223.080
Baseline comparison		
„CFI (Comparative fit index)"	0.460	0.468
„TLI (Tucker–Lewis index)"	0.055	-0.154
Size of residuals		
„CD (Coefficient of determination)"	0.881	0.526

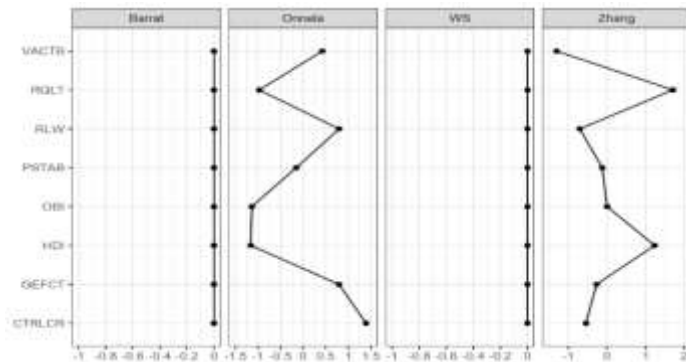Note: SRMR is Not Reported because of Missing Values. *Source: Authors' processing*
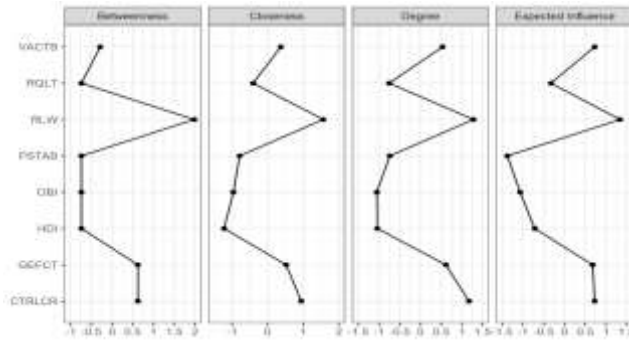
Figure A1. Centrality plot GGM, EBICglasso Method
Source: Authors' research
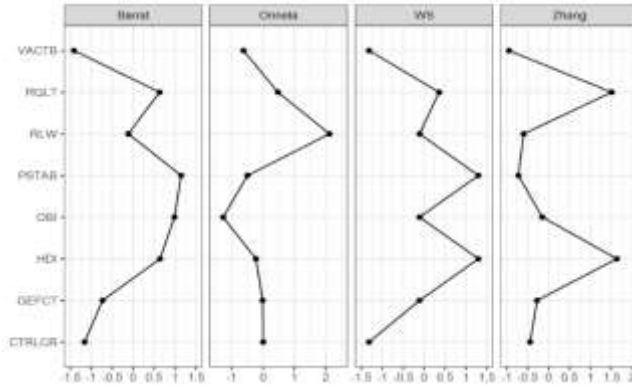
Figure A2. Clustering plot GGM, EBICglasso Method
Source: Authors' research
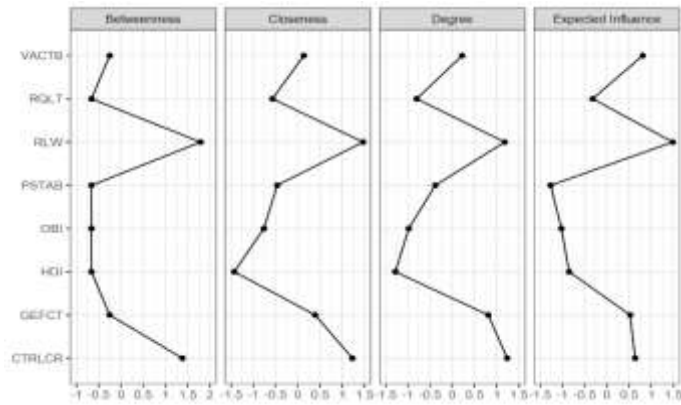
Figure A3. Centrality plot GGM, PCOR method
Source: Authors' research

Figure A4. Clustering plot GGM, PCOR Method

Source: Authors' research

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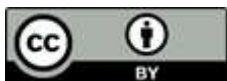
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