A Bibliometric Analysis of the Sustainable Fiscal System

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Abstract. The main purpose of this paper is to analyse the interest in the field of fiscal system sustainability. The research methodology consists in the elaboration of a bibliometric analysis, which is based on a quantitative research method, in the form of an inventory of the publishing activity in the field chosen for study. The analysis consisted of querying the existing database in the Core Web of Science platform, a base in which we find documentation such as journals, scientific papers, books and others. The query determined the display of a number of 496 scientific documents existing in the database. The results obtained from the analysis of the data collected from the Web of Science with the help of the VOSviewer software highlight the existence of strong links between the main tools adopted by different countries regarding the sustainability of the fiscal system.

Keywords: sustainability, fiscal system, bibliometric analysis, economy, VOSviewer

Classification JEL: E44; G2; O16

1. Introduction

The sustainability of public finances is a subject of particular importance due to its direct impact on the entire economy and the entire society as a whole. Over time, it was analysed in different ways, the main directions of analysis were from the perspective of the budget deficit and public debt, but with the evolution of society, these underwent changes, continuous demographic changes forced the calculation of fiscal sustainability and other factors, such as the phenomenon of population aging, which implies an increase in social and fiscal obligations.

 Sustainability and, implicitly, sustainable development represent fundamental objectives of the European Union, and the existence and application of a sustainable fiscal system requires the implementation of fiscal and legislative measures at the level of a country that allow meeting current needs, but which do not distort the behaviour of economic agents for a sustainable development.

Science and research are an integral part of cultural wealth. They constitute an important tool of education, learning and knowledge of the truth. Sustainability and sustainable development are objectives and values that must be respected in the field of the fiscal system. In the academic community, science and research play an irreplaceable role, and in unity with pedagogical activities, science and research represent the driving force of the development of not only the economy, but the entire society, so that all the written documents obtained contribute immeasurably to the improvement and lifelong learning.

The main purpose of this paper is to document the interest in the research area in the field of the fiscal system, so I proposed to carry out a bibliometric analysis of sustainability in this field. The research methodology consists in the elaboration of a bibliometric analysis, a quantitative research method, in the form of an inventory of the publishing activity in the previously mentioned field.

Fiscal sustainability, or as it is also known in the specialized language, budgetary sustainability, can be defined as a characteristic of the fiscal regime, which in turn is

impacted by the volume of revenues and budget expenditures and structure. In the situation where the central authorities will choose to make reforms in the budgetary sphere and will analyse different alternative variants of the fiscal-budgetary policy, then each of these variants should be evaluated and budgetary stability should be ensured.

Bibliometrics by its definition has an ambivalent character, appearing on the border between two dimensions, that of science and that of the library, that of research and that of the dissemination of scientific production. Its main purpose is to statistically analyse written publications (books, articles), having a quantitative character par excellence and it is applied, most frequently, at a higher level for scientific and academic literature, being predominantly used in scientific research, both in the exact and applied fields (such as engineering or informatics, mathematics, chemistry, physics, environmental and information sciences), as well as in the humanities and social ones.

2. Theoretical aspects

Over time there has been considerable confusion in the terminology of bibliometrics, due in part to authors' use of "bibliometrics" synonymously for several metric fields, with influences from both information science and librarianship.

It offers the possibility to both quantitatively count the production in the scientific field by calculating and accounting the scientific publications for a certain selected field, the authors and publications for various research sectors; as well as grouping, ordering, classifying and even ranking data to create an overview of research trends in a field. In other words, bibliometric tools are used with the aim of studying the flow of publications, to rank the quality of works in the targeted field, to evaluate the pace with which it develops and shows interest, and even to identify the specialists, institutions or countries that have an important contribution to scientific development. Bibliometrics is based on bibliometric platforms such as Web of Science, Scopus or CABI, existing in the online environment, they include the most important scientific journals, books or conference papers.

This research benefits from data collected from the Web of Science database. WoS is one of the most important and popular sources of scientific documentation worldwide. This database is selected because it includes only high-quality academic journals.

This scientific mapping is available in the present research through the well-known VOSviewer software. VOSviewer was first released as a free bibliometric mapping tool in 2009 by Nees Jan van Eck and Ludo Waltman at the Centre for Science and Technology Studies (CWTS) of Leiden University. VOSviewer is a tool that uses the VOS Mapping technique invented by the same authors. VOS stands for visualization of similarities and aims to "provide a low-dimensional visualization in which objects are located in such a way that the distance between any pair of objects reflects their similarity as accurately as possible." In other words, VOSviewer produces "distance-based maps" where "the distance between two elements reflects the strength of the relationship between the elements", this is in contrast to "graph-based maps" where the distance between elements may not represent relationships or similarities, but in exchange lines or edges between elements are used to show relationships. CiteSpace which we cover in another ResearchRadar article produces such maps. VOSviewer is not the first or the only bibliometric software to build distance-based maps, however, as the VOS Mapping technique performs well compared to other mapping techniques that produce distance-based maps, VOSviewer is capable of generating fairly large-scale maps of over 5,000 items in a co-citation map, for example, in a fairly short period of time. It is probably the most popular scientific/bibliometric mapping tool in use right now, followed by CiteSpace and Bibliometrix/Biblioshiny.

Returning to the application in our discussion, we can summarize that this software aims to build and visualize a bibliometric network. The network data for this application may already be available before use, but at the same time it is also possible to build a new network data. This network can contain journals, scientific publications, research, countries, cities, keywords, research organizations, authors, co-authors, citations, co-citations and also bibliographic links. As an example of use we can say that to create a network, we provide as input VOSviewer bibliographic database file (more simply, Web of Science files) and files called reference manager.

The articles used by this application are also quite complex, they can be for example research, terms or publications that also present objects of interest to the application. For all pairs of identified articles there is the possibility of a link that highlights the connection between them, this greatly facilitates the work of the person doing the research and ensures the originality of the studies. These links are also extremely interesting and they can be: bibliographic coupling links for publications, co-author links for research, co-occurrence links for similar terms and concepts. Any identified link between items can influence through a positive numerical value, which highlights a high value when the link is strong in one direction or another. The strength of links between articles can positively or negatively influence the number of references considered as citations that at least two publications by at least two researchers have in common.

A network can be created by putting together articles, links or citations. By simple definition, the network is a set of elements that together with the links between them create a material, these elements in turn can also be grouped distinctly. From here we come to the need to also define the group, which is a set of elements included in a map, so it is essential to know if an element belongs to one group or another. Considering these links, we should mention that it is not mandatory that a group covers all the elements in a map so there may be elements that do not belong to any of the groups.

In VOSviewer, each group is labelled, requiring a number of groups for each item and this influences the decisive share of the attributes. Both attribute share and score are relevant so that items with higher share are considered more significant than those with lower share in the quantitative balance of the study.

Two share standards links and attribute can be considered. Total link strength which illustrates the number of connections between articles and their total strength as well. This research tool is a valuable support for the analysis proposed as content analysis, authorship and research dissemination worldwide.

The steps used in the extraction of works for bibliometric analysis are:

➢ Search in Web of Science-Clarivate for the main topic "sustainable fiscal system".
➢ Extracting the results found.
➢ Data entry in VOSviewer.
➢ Their analysis according to several criteria.

Considering two concepts from the subject area of Web of Science, we chose to search for "sustainable fiscal system" articles, papers and book chapters.

The Web of Science database returned 496 academic papers on these topics, with the year 2021 as the filter. The details (records and references) were collected through a .txt file that was loaded into the VOSviewer software for achieving the analysis.

3. Results and interpretations

3.1. Keyword analysis

The keyword method focuses on highlighting the most persistent keywords against their simultaneous occurrence. Thus, it is important to note that only the keywords mentioned by the author in the abstract are considered. The main goal is to observe the keywords most adopted by the authors in the field of sustainable fiscal

system. The number of documents in which two keywords are presented together (highlighted in each document by the authors) is also counted.

After analysing the 496 identified in the database, the VOSWiewer software highlighted 2413 words.

To perform the analysis, it was chosen that the minimum number of occurrences of a keyword in the documents was 5, and in this situation the software highlighted 107 words that meet this condition.

Figure no. 1 indicates the most important keywords and the nodes between keywords, respectively: the larger the keyword and the node, the higher the shares; when the distance between nodes is smaller, the relationship between them is stronger. Also, co-occurrence is more common when we have thicker lines. A series of related keywords or a group of keywords is indicated with the same colour.

Thus, the programme identifies seven clusters. The figure below represents the keywords with the most frequent co-occurrences.
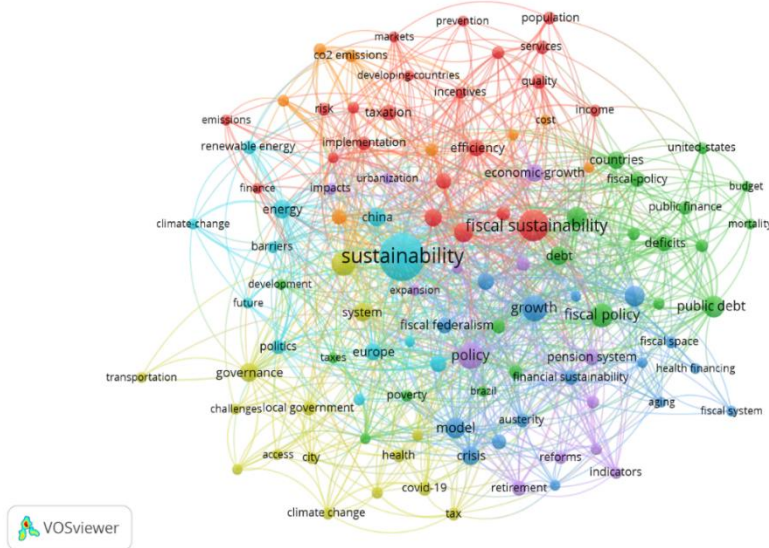

Figure 1. Keyword co-occurrence network
Source: personal calculation via VOSWiewer

The first cluster (red), with the largest number of words, contains 22 items, and is led by the word "fiscal sustainability" with 39 occurrences, followed by "management" with 16 occurrences and "performance" with 13 occurrences. Thus, a good leadership and management of the fiscal system, together with the positive results recorded, as well as with the well-defined links with the other clusters, contribute infinitely to the achievement of fiscal sustainability.

The second cluster (green) is governed by the word "fiscal policy" with 23 occurrences, totalling 21 items, also containing other relevant keywords in our analysis such as "public debt" with 19 occurrences and with 17 occurrences the term "system".

Cluster 3 (blue) includes a smaller number of items, 16 respectively, and the defining term for it is "growth" with a number of 27 occurrences followed by the terms: "reform" and "model" with 17 occurrences. This fact leads to the clear idea that any growth is based on various reforms to improve the fiscal system and the application of models that must be applied to increase its sustainability.

"Impact" is the term that defines cluster 4 (yellow), a cluster that is composed of 15 items, and that presents approximately 24 occurrences. In this cluster, 15 appearances also have "governance" and "the system", a fact that reflects the involvement of the state authorities and the system created by them so that their reforms have an impact on the fiscal system.

Cluster 5 (purple) includes 13 items, and its definition is given by the 28 occurrences of the terms "policy" and "determinants" and contributed by "debt sustainability" with 17 occurrences and "economic growth" with 13 occurrences.

Cluster 6 (blue) does not have a very large number of items, 12, but the impact given by the occurrences of its defining term makes it all the more important since "sustainability" is the central term in this paper. Thus, its 88 occurrences have direct links with the other terms here, namely "barriers" with 21 occurrences and "energy" with 15 occurrences.

Cluster 7 (orange) includes only 8 items, and their degree of appearance is not too high, including terms whose appearance is only 9, in the case of the word "consumption" and 7 in the case of "fiscal decentralization". It also includes the term "economic growth", with a number of 7 occurrences, however, due to different writing by the authors, it was included in cluster 7, although its place was in Cluster 5, according to the categories of impact factors.

Analysing figure no. 1 and each defining term of the cluster, we observe quite close relationships between them and the direct links between the clusters through them.

Table 1. VOSWiewer identified keywords

CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 4	CLUSTER 5	CLUSTER 6	CLUSTER 7
Expenses	Brazil	Getting older	Accession	Debt sustainability	Getting older	CO2 emissions
Developing countries	Budget	Austerity	Challenges	Determinants	Barriers	Competition
Efficiency	Cointegration	Crisis	City	Economic growth	China	Consumption
emissions	Countries	Decentralization	Climate	Expansion	Climate change	Cost
Expenses	Debt	Financial sustainability	Climate change	Impacts	Energy	Economic growth
Federalism	Deficits	Fiscal federalism	European union	Indicators	Europe	Fiscal decentralization
Finance	Development	Fiscal space	Governance	Land financing	Future	Innovation
Fiscal sustainability	Economy	The fiscal system	Health	Model	Pension reform	Fiscal reform
Implementation	The financial crisis	Growth	Impact	The pension system	Sustainability	
Incentives	Fiscal policy	Health financing	The institutions	Policy	Renewable energy	
Income	Inequality	Lessons	Local administration	Reforms	Social security	
Management	Death rate	Model	System	Retirement	Durability	
markets	Poverty	Panel data	Tax	Urbanization		
Performance	Public debt	Pensions	Transport			
The population	Public finances	Reform				
prevention	Social security	Welfare				
Quality	States					
Risk	Systems					

Services	Taxes
State	The United States
Sustainable developer	
Taxation	

Source: personal processing

3.2. Analysis of citations by country

The analysis of citations by country highlights the relationships between researchers and the network built by them. In this analysis, dots represent countries, and line thickness and spacing highlight the degree of collaboration between researchers. At this stage of the analysis, we will consider a minimum of four documents and three citations for a country. Under these conditions, from the 496 papers, the software identified 85 countries, but only 37 countries meet the conditions mentioned above, and they are united by the relationship between 9 clusters.
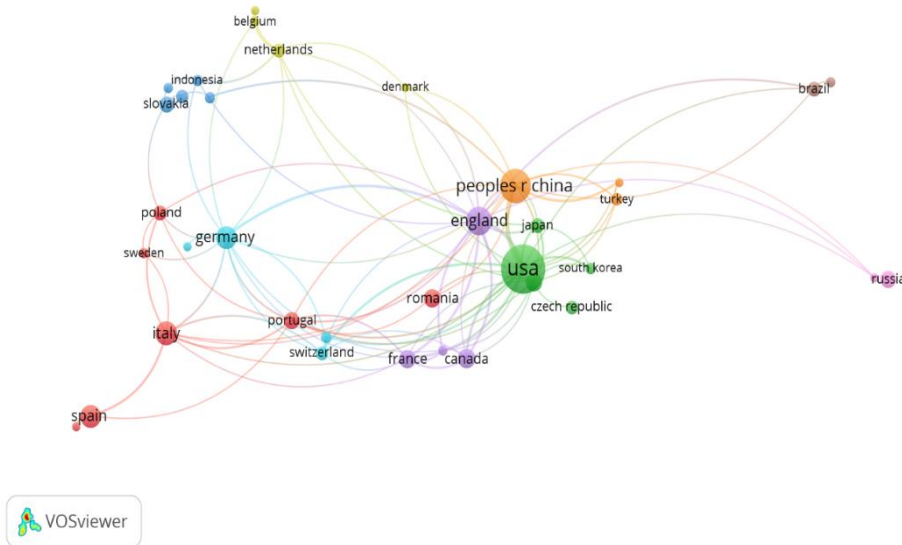

Figure 2. Citation network by country
Source: personal calculation via VOSWiewer

The highest link strength in the citation network is given by the USA, for which the software identified 116 documents and approximately 1841 citations, followed by China with only 58 documents and 686 citations and England with 41 documents and 897 citations. All three countries are in different clusters, but the collaborations between them are quite strong as can be seen from the relatively small distance and thickness of the connecting lines.

As for Romania, it contributed to the approach of the topic through the 16 articles identified in the Web of Sciences database and 60 citations, noted for the direct links with countries such as China, Australia and Portugal.
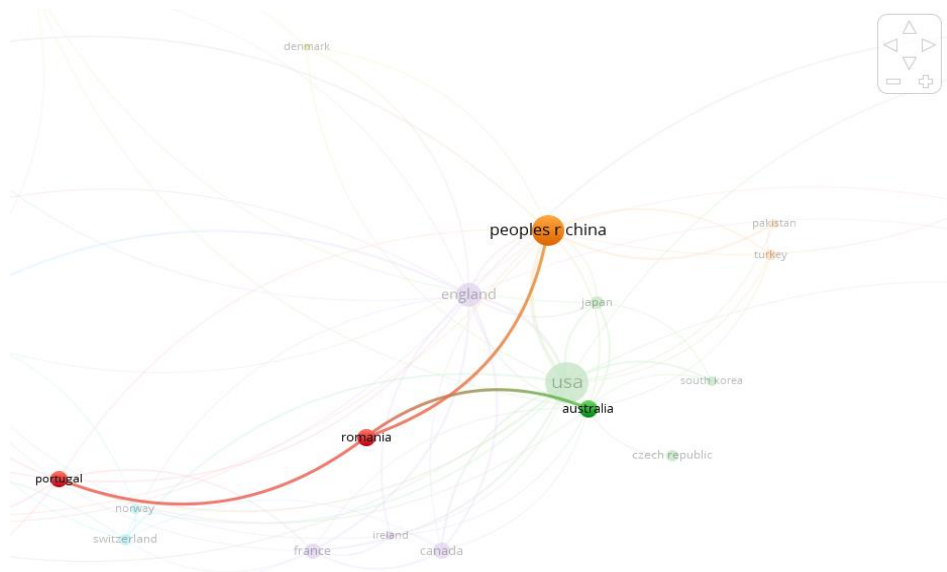
Figure 3. Citation network for Romania
Source: personal calculation via VOSWiewer

In order to be able to understand the interest in the field of sustainability of the fiscal system of the most important countries, we have taken in the table below the results generated by VOSWiewer with the information from each country separately, as follows:

Table 2. Results per country

No.	Country	Documents	Citations
1.	USA	116	1841
2.	CHINA	58	686
3.	ENGLAND	41	897
4.	ITALY	28	246
5.	SPAIN	27	222
6.	GERMANY	26	572
7.	CANADA	20	277
8.	AUSTRALIA	18	329
9.	FRANCE	17	177
10.	ROMANIA	16	60
11.	PORTUGAL	15	169
12.	RUSSIA	13	8
13.	SLOVAKIA	12	28
14.	JAPAN	12	523
15.	POLAND	12	149
16.	BRAZIL	10	328
17.	OLANDA	10	153
18.	UKRAINE	10	26
19.	CZECH REPUBLIC	10	17
20.	SWITZERLAND	9	108
21.	TURKEY	8	166
22.	INDONESIA	7	59
23.	SOUTH KOREA	7	34

24.	NORWAY	7	171
25.	SERBIA	7	26
26.	IRLANDA	6	66
27.	BELGIUM	6	237
28.	SWEDEN	6	55
29.	HUNGARY	6	15
30.	COLUMBIA	6	7
31.	GRECIA	5	50
32.	PAKISTAN	4	6
33.	DENMARK	4	49
34.	KAZAKHSTAN	4	22
35.	CROATIA	4	8
36.	MEXICO	4	13
37.	SOUTH AFRICA	4	23

Also worth mentioning are the countries whose number of articles is quite small, but whose citation is relatively high compared to other more developed states from the perspective of our analysed topic, countries such as Greece and Denmark or Kazakhstan and South Africa.

3.3. Author co-citation analysis on sustainable fiscal systems

In this section, the analysis focuses on the research area of the lead author network. Citations by author analysis reveals the most cited first authors of Web of Science indexed sustainability and fiscal system articles.
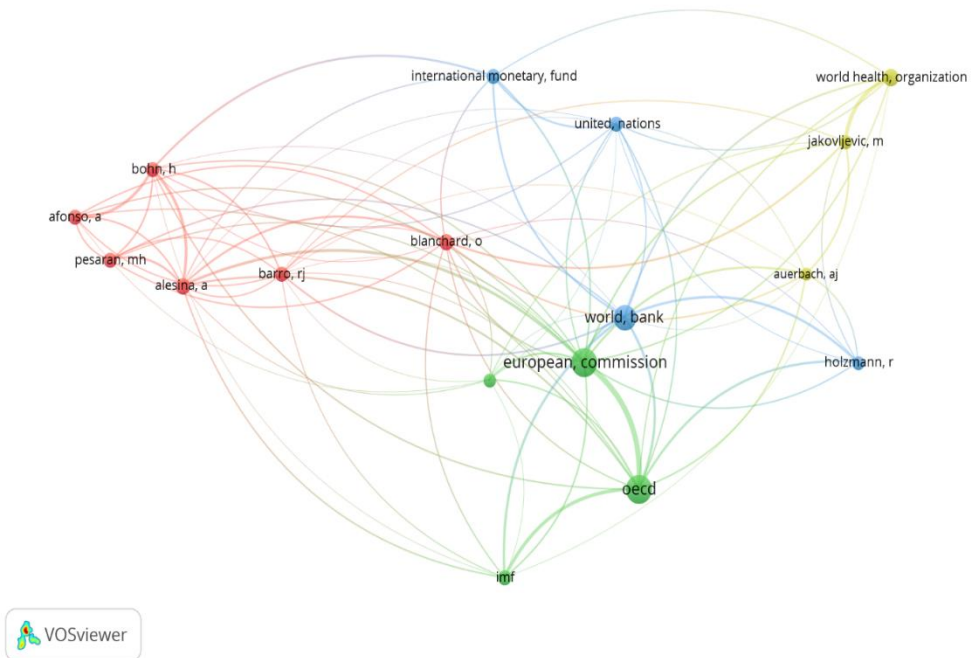

Figure 4. Author co-citation network on sustainable fiscal systems
Source: personal calculation via VOSWiewer

VOSviewer returned 17 authors based on the imposed filters: minimum two papers per author (as first author) and at least 20 citations for each paper. According to the VOSviewer results shown in Figure 3, the most cited authors in this analysis are the Italian Alberto Alesina, with 30 citations and 110 links, the French economist and professor Olivier Jean Blanchard with 31 citations and 75 links, and the British-Iranian economist Mohammad Hashem Pesaran with 29 citations and 51 links. All the previously mentioned authors are part of the same Cluster, but the highest number of citations for papers on fiscal system sustainability was also revealed for the European Commission (101 citations and 214 links) and the Organization for Economic Co-operation and Development (97 citations and 207 links), but in these cases, the relationships with other authors, part of the VOSviewer network, are less strong, hence even fewer corresponding links. These are followed by the citations of the World Bank and the World Health Organization, which leads to the thought that the state through its institutions and organizations is continuously interested in the evolution and the way in which the fiscal system becomes sustainable.

4. Conclusions

This study presents an analysis of the sustainability of the fiscal system from the bibliometric perspective, to see if this topic is important for researchers, thus we reached the following conclusions following the study carried out.

Firstly, the keyword-based analysis exposes the distribution of the most frequent keywords by their co-occurrence. Also, numerous keywords relevant to the present theme were identified, the software used highlighted the most important keywords: "fiscal sustainability", "fiscal policy", "growth", "impact", "policy", "determinants", "fiscal decentralization". Following the analysis, it can be stated that the sustainability of the fiscal system is closely related to the way the fiscal system develops, undergoes changes and is impacted by different factors.

Secondly, the co-citation analysis by country for scientific papers published in the field of fiscal system sustainability revealed 9 connecting nodes. The USA is the country with the most publications, followed by China and England. Romania contributed with 16 publications in the analysed field.

Thirdly, through co-citation analysis, we discovered the most important authors in the research area. Alberto Alesina or Olivier Jean Blanchard, had significant contributions to the debates and writings on the analysed topic. The works published by the European Commission, the Organization for Economic Co-operation and Development or the World Bank are of particular importance, offering the latest regulations and solutions to the possible challenges and changes that may affect the fiscal system and how it can become sustainable.

The results of the previous analysis can be considered the basic pillars in the government's decisions regarding the adoption and development of the fiscal system. In the results of the study, we can easily see that the sustainability of the fiscal system is not easy to achieve, a fact due to the impact of factors related to taxation.

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