How Important Is the Relationship between Financial Development and Economic Growth? Bibliometric Analysis

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Abstract*. This study presents a bibliometric analysis, the aim being the investigation of the scientific works carried out on the topic of research specific to the field of financial development and the implications on economic growth, as well as the analysis of the connection between the themes in the research area. The relationship between financial development and economic growth is widely addressed in the field of research, encountering various hypotheses regarding the direction and sign of influence between these 2 components. As a result, the number of works is significant, and such an analysis allows us to rank and identify the most cited authors as well as the most popular research centers in the given field. Using the Web of Science database, which provides numerous bibliometric indicators, we investigated 7839 references in the field of interest from 2000-2023. The analysis was carried out with the help of the VOSviewer research tool, which allows the visualization of similarities between works. Thus, we analyzed and created maps for keyword co-occurrence, co-authorship as well as co-citations in the field of financial development and economic growth. This analysis allows us not only to identify the works in the area of interest, but also provides a detailed picture of the authors, institutions and countries that develop research and give special importance to the study in the field we are targeting. The results of the analysis highlight the existence of a strong link between financial development and economic growth with other extended areas such as the environment. Also, the study shows that most of the research takes place in countries such as China, USA, Turkey, and the collaboration between the authors allows researchers to carry out studies in centers in less developed countries such as Pakistan.*

Keywords: bibliometric analysis, VOSviewer, Web of Science, financial development, economic growth

JEL Classification: G2; O16

1. Introduction

The importance of financial development for the entire economic system made this concept widely addressed and studied both theoretically and empirically. During the studies, numerous definitions and ways of quantifying financial development were outlined. Zhao Weili (2021) defines financial development as "the continuous improvement of financial efficiency brought about by the expansion of the scale of financial transactions and the modernization process of the financial industry." Thus, through this definition, the elimination of barriers in the financial field is emphasized through the ease of access to financial markets, the reduction of transaction costs and the diversification of financial instruments, as well as the proper functioning of financial

institutions. The World Bank emphasizes the role of financial development through the five key functions of a system financial, namely: (i) producing ex ante information about possible investments and capital allocation; (ii) monitoring investments and exercising corporate governance after granting financing; (iii) facilitating trading, diversification and risk management; (iv) mobilizing and putting pooling of savings; and (v) facilitating the exchange of goods and services. (https://www.worldbank.org).

As a result, it is unthinkable to neglect the financial sector and its development, considering its importance and role nowadays. Both in developed economies, but especially in those in the process of being developed, emphasis is placed on promoting the financial sector by introducing new financial instruments, by reducing costs regarding access to financial markets, as well as by good supervision and operation of financial markets and institutions.

Most empirical studies, in order to quantify financial development and its role, analyze it in relation to economic growth or by measuring its impact on macroeconomic performance. McKinnon (1974) emphasized that financial development "shapes economies", helping them to develop by ensuring the efficiency of intermediation, offering the highest return on investment opportunities. According to Stiglitz and Weiss (1983), a well-developed financial market channels an economy's savings to profitable investments, enhancing the positive impact that financial development has on economic growth. Another protagonist of this hypothesis is Levine (1997), arguing that capital accumulation and technological innovation represent the paraphernalia between financial development and growth. Even the most recent works, such as (Wen et al. 2021; Bist 2018; Guru and Yadav 2019), support the positive impact that financial development plays on economic growth.

The impact of financial development on economic growth was also analyzed through the level of employment, poverty reduction and inflation. Wasmer and Weil (2004) through the study identified that a weak monitoring in the credit sector would lead to a low level of lending, and this phenomenon would slow down the creation of more job opportunities for companies. As a result, the level of employment would be reduced, with chain effects on the entire economic system. This hypothesis has been supported by recent empirical studies and by Bayar (2016), Epstein and Shapiro (2019) and Raifu (2019), as well as other authors.

However, there were also protagonists who denied the impact of financial development on economic growth, such as Robinson (1952), some claiming that its role was overemphasized Lucas (1988), others arguing that economic growth drives economic development and not the other way around (Beckmann, 2007; Kosmidou et al., 2012). As a result, we see that this topic is covered extensively, given varying degrees of importance, making it even more attractive as a topic of study. Through this article, I aim to highlight the importance of this topic through bibliometric analysis.

Bibliometric analysis has become very popular due to the results that can be obtained through it. The use of bibliometric analysis is growing in popularity (Zupic and Cater 2015). Bibliometric approaches are used for a variety of purposes, including performance analysis and scientific mapping (Cobo et al. 2011). Thus, with the help of this analysis we can evaluate the performance of research in a certain field, and through mapping we can schematically visualize its evolution.

In other words, an area of scientific knowledge expressed through an aggregated collection of intellectual contributions from members of a more clearly defined scientific community or specialty is the unit of analysis in cartographic science (Chen 2017). In order to obtain relevant and interpretable results, it is necessary to correctly choose the database that will be used in the analysis as well as the tool used.

The paper is structured into four sections as follows: section 2 provides the theoretical background and describes the related materials and method; section 3 interprets the results and the last section presents the conclusions of the study.

2. Materials and methods

To carry out the analysis, we used the Web of Science Core Collection database, which is one of the most popular and important sources of scientific documentation worldwide, as it includes only high-quality academic journals. Acceptable content for Web of Science is determined by an evaluation and selection process based on the following criteria: impact, influence, timeliness, peer review, and geographic representation (WoS).

To obtain the materials necessary for the analysis, we used the keywords /financial development and economic growth/ for the domains of WoS: economics, sustainability science, management, political science. The study includes all documents published in the above-mentioned fields from the year 2000 to 2023. Also, the final sample was limited to articles only and includes 7839 documents.

As a tool in scientific mapping we used VOSviewer software. According to the user manual, this software tool allows the construction and visualization of bibliometric networks and the creation of maps based on network data. These networks may include, for example, journals, researchers or individual publications and may be built on citation, bibliographic coupling, co-citation or co-authorship relationships. VOSviewer also provides text mining functionality that can be used to construct and visualize co-occurrence networks of important terms extracted from a body of scientific literature. The present program allows analysis of bibliographic database files (WoS, Scopus, Dimensions, Lens and PubMed). as well as reference manager (RIS type) files. Methodologies such as co-authorships, citations, co-citations, co-occurrences as well as bibliographic coupling links can be used through this tool. Such methodologies are beneficial for illustrating the bibliometric and intellectual structure of a field study when combined with network analysis (Baker et al. 2020; Tunger and Eulerich 2018). And through these methodologies it is possible to analyze: keywords, authors, institutions, countries, which help to identify the most frequently used keywords, the authors and the most frequently cited research centers. In addition, bibliometric analysis can be used to assess the publication's popularity among specialists and verify the author's reputation (Ball and Tunger 2005). Also, according to Zupic and Cater (2015), this type of investigation helps in literature review by leading the researcher to influential research papers or publications as well as objectively mapping the field of study.

In this study, we analyzed the co-occurrence of author keywords, (more precisely, the keywords that appear under the abstract) with a minimum page of 50 works where these keywords are found; co-citation (the minimum threshold being 50 articles receiving a citation from the same document); and co-authorship from the perspective of institutions and countries (the number of co-authors among the most effective sources) also with a minimum threshold of 50 papers. The maps built by VOSviewer express the existence of links between articles, such as: bibliographic coupling links for publications, co-author links for researchers and institutions, and co-occurrence links for keywords. The links can be strong, through positive values, or they can be weak, expressed through negative values. The larger the node of an item, the greater the weight of that item in the entire analyzed sample and is considered more significant. Sets of elements group together to form clusters, but it should be emphasized that clusters do not necessarily cover all elements in a map. Therefore, there may be elements that do not belong to any of the groups. In interpreting the results, links and the attribute total link strength are taken into account, which illustrates the number of connections between items and their total strength.

Using a similar tool in the bibliometric analysis, rankings can be made regarding the most cited authors, the research centers with the most publications in the field of interest, as well as the most frequently used keywords.

3. Results

3.1. Keyword co-occurrence network of the author of publications related to financial development and economic growth

This analysis aims to highlight the most persistent keywords in the sense of simultaneous occurrence of keywords in the same article. It should be emphasized that the keywords included in the analysis are only those stated by the author in the abstract part. Thus, through this graphic representation, we can deduce which are the most used keywords by the authors in the field of financial development and economic growth. Also, the method used allows us to identify not only the number of occurrences of the keywords used by the author, but also the connection between these words.

Figure 1 shows the words most used by the authors in the field of interest as well as the connection between them. The larger the node of the keyword, the greater the weight it holds, and the smaller the distance between the nodes, the stronger the relationship between them. We must not omit the thickness of the lines either, because the thicker they are, the more frequent the co-occurrence. The series of related words or groups of words are indicated with the same color, thus, in our case, 4 clusters were formed: cluster one (red), cluster two (green), cluster three (blue) and the fourth cluster (yellow). Considering that the database under analysis comprised 7839 articles, we used a minimum keyword co-occurrence threshold of 50, meaning that keyword must appear in at least 50 articles to be considered relevant. The total number of keywords (used by the authors) identified was 11862, and those that met the condition explained above were 75.

The first cluster (red) is led by "economic development" with 225 occurrences and 279 total strong links and contains the most number of keywords (26), keywords such as: sustainable development, financial inclusion, innovation, growth, income inequality and other.

Cluster two (green) contains 25 items and is led by renewable energy with 327 co-occurrences and 632 strong links, ranking 5th overall. The ranking of the group is followed by carbon emissions and urbanization. The links between the nodes of this cluster are the shortest compared to the other clusters, indicating a strong relationship between these keywords.

Cluster 3 (blue) is represented by the analyzed keyword "economic growth", which is also the largest node, meaning it has the highest weight. This word has 1735 occurrences and 2755 strong links with other keywords. This cluster has the thickest lines between the nodes, indicating a more frequent co-occurrence compared to the others. This cluster also contains the keywords "co2 emissions" and "energy" consumption/ which have significant nodes: 472 and 447 respectively of occurrences.Besides these keywords with remarkable weights (being in the top 5 places) it also contains 14 other words such as "fdi", "granger causality", "cointegration" and others.

The last cluster contains the smallest number of items, but it is represented by one of the keywords of this analysis, namely "financial development", which has 1493 occurrences and 2462 puernic links. The other keywords included in this group are: globalization, human capital, institutional quality, natural resources and panel cointegration. These nodes are the most distant, indicating a weak relationship between them.

**Figure 1. Authors keywords' co-authorship network regarding financial
development and economic growth**
Source: own processing in VOSviewer

3.2. Author Co-Citation Network on Financial Development and Economic Growth

In this section, the analysis focuses on the network research area of the main cited authors. In this case, taking into account the large number of authors, the threshold is at least 50 citations of an author, so that the authors with the most citations can be included in the analysis. Thus, figure 2 represents 4 clusters, with 1000 authors out of a total of 97401 found in the papers and with a total of 4341171 strong links. Authors are grouped into 4 clusters as follows: cluster one (red), cluster two (green), cluster three (blue) and cluster 4 (yellow). The first cluster (red) consists of 441 items, the author with the most citations (4268) but also with the highest total strength of links (157966) in this group is Mh. Peseran. Another author belonging to this cluster and in the top 10 authors is E. Dogan with 1509 citations and a total link strength of 68936.

The second cluster (green) has the shortest inter-node distances, indicating a strong relationship between them. It contains 347 items and is headed by R. Levine, the most cited author in this group, with 3783 citations and 95776 total link strength, ranking 3rd in the total sample. According to this citation criterion, we can also consider 2 more authors: T. Beck with 2905 citations and 73442 total link strength, and World Bank with 2002 citations and 52931 total link strength.

Cluster three (blue) consists of 203 authors, and from the perspective of citation and total link strength, it can be considered the most important of the 4, as it is represented by the author M. Shahbaz, with the most citations (6209) and total link strengths (252897) from the entire analyzed sample. The large nodes of this cluster indicate that these items have the highest weights in the entire analyzed sample. In this cluster is also the author U. Al-Mulai, who is in fourth place in the overall ranking, with 1988 citations, having a total link power of 90769. The last cluster (yellow) contains only 9 items, and P. Pedroni is the author with the most citations and links in this group,

namely 1263 and 49137, respectively. Following this analysis and graphical representation, we can conclude that from the total of 9740 authors included in the sample of 7839 documents downloaded from the Web of Science, the most cited authors over the years 2000-2022 are: Shahbaz, Pesaran, Levine, Al-Mulali, Apergis and Beck, as well as the World Bank.
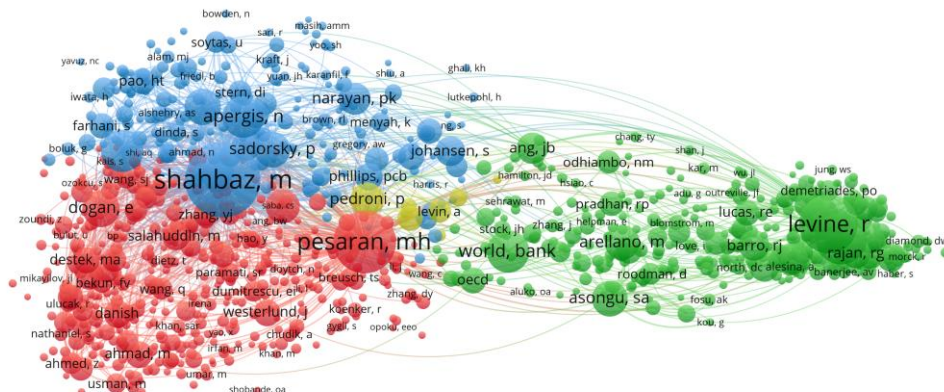
Figure 2. Author co-citation network on financial development and economic growth
Source: own processing in VOSviewer

3.3. Analysis of country co-authors

By means of country co-author analysis, the structure of research collaboration networks in a given field can be examined. This analysis allows us to identify the origin of the research teams as well as the network relationships between the authors. The nodes present on graph 3 represent countries, and the distance and thickness between them represents the degree of collaboration. Based on the threshold of 50 regarding both the minimum number of documents of a country and the minimum number of citations of a country, only 41 countries out of 143 meet the set conditions. Thus, 6 clusters were obtained as follows: cluster one (red), cluster two (green), cluster three (blue), cluster four (yellow), cluster five (purple), and cluster six (turquoise). The red cluster is the largest cluster, consisting of 13 items, and has the smallest distances between nodes indicating that the relationship between them is stronger. It is led by the US with 2060 documents and a total of 566 strong links, followed by the UK with 519 documents and 488 strong links. This cluster also includes Brazil, Germany, Greece, Italy, Iran, the Netherlands, Portugal, Scotland, Spain, Sweden and Switzerland.

Cluster two (green) consists of 8 items: Russia, Turkey and Central and Eastern European countries such as Romania, Czech Republic, Croatia and Poland. The largest share is held by Turkey (722 documents and 605 strong links). The ranking is followed by Russia with 299 documents and a total of 235 strong links.

Cluster three (blue) is the most representative cluster, comprising the countries with the highest weights in the analysis and with the thickest lines signifying that co-occurrence is more frequent. The cluster consists of 8 items, among which: China, with the highest weight in the entire ranking (2060 documents and 1400 strong links) and Malaysia with 462 publications and 538 strong links, the 6th position in the overall ranking. This cluster also includes Australia, Indonesia, Japan, South Korea, Taiwan and Vietnam.

The yellow cluster, consisting of 5 items, has the longest distances between nodes, interpreted as the weakest correlation between these nodes. Pakistan has the most publications (782), second overall, followed by France, Saudi Arabia and Tunisia.

Cluster five has 4 items: Cameroon, Ghana, Nigeria and South Africa, and the last cluster (turquoise) has 3 items: Bangladesh, Canada and India.

From this analysis we can conclude that the countries with the most publications in the field of interest are China, Pakistan USA and Turkey.
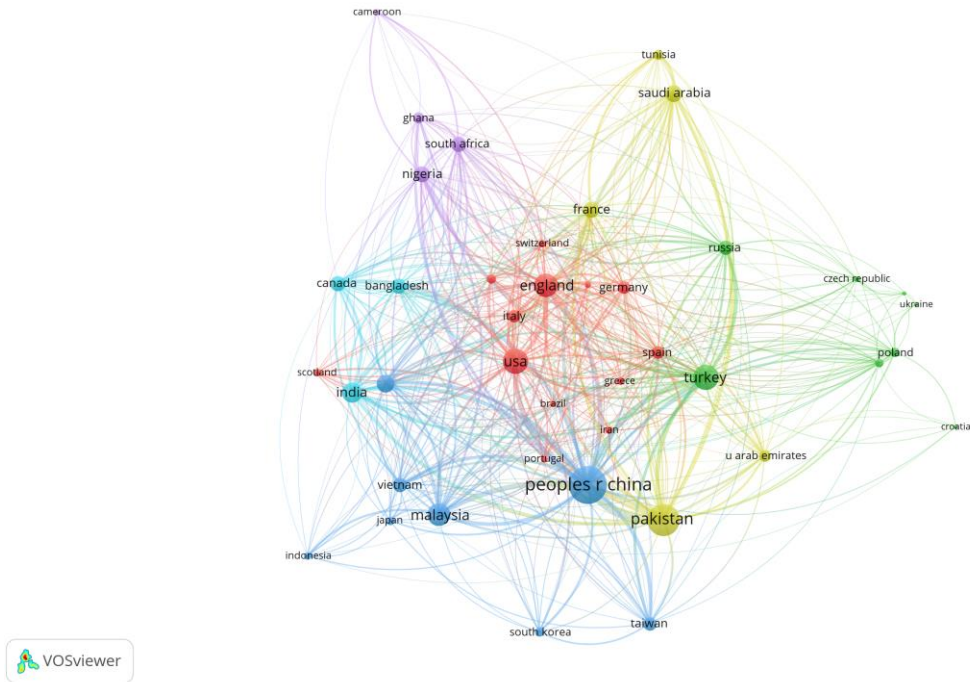
Figure 3. Countries' co-authorship network regarding financial development and economic growth
Source: own processing in VOSviewer

3.4. Institutional co-author analysis

In this analysis, according to figure 4, the most important institutions can be observed regarding the number of published documents and researches carried out. From the total of 5013 institutions, applying a threshold of 50 published works (to highlight the most important institutions that publish studies on financial development and economic growth), a ranking of 22 institutions was obtained, divided into four clusters. The first cluster (red) consists of 9 items with the highest weights as well as the smallest distances between the nodes, indicating a strong relationship between the institutions. At the head of the cluster is Beijing Institute of Technology, with 174 publications in the field and with 86 total link power, being also the most important institution in the analysis, having the most publications. The green cluster is composed of 6 items, and the most representative institution is Cag University in Turkey, with 68 publications and a total number of strong links of 26. And this cluster has shorter node distances, indicating a strong relationship between these institutions. The blue cluster consists of 4 items, consisting of: Istanbul Gelisim University, Cyprus International University, South Ural State University and Eastern Mediterranean University. And the

last cluster is represented by the World Bank with 55 publications and the University of International Business and Economics with 58 publications.

If we relate figure 4 to figure 3, it allows us to identify which are the most representative centers in the countries with the most publications in the field of interest. Thus, we see that China is represented by Beijing Institute of Technology, and Turkey by Istanbul Gelisim University.
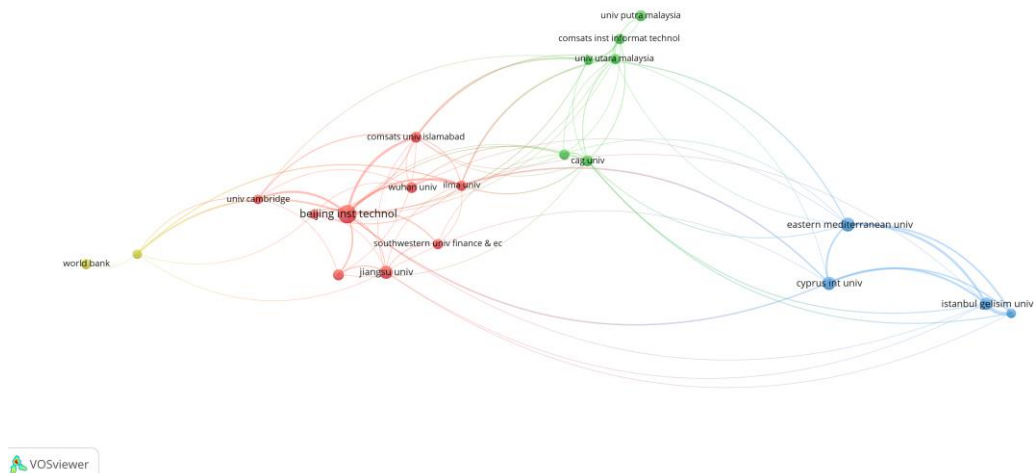
Figure 4. Institutions' co-authorship network regarding financial development and ecoomic growth
Source: own processing in VOSviewer

4. Conclusions

The aim of this bibliometric analysis, on financial development and economic growth, was to note whether this topic is of interest to researchers over the period 2000-2023, where 7839 articles were selected from the WoS database. Through the maps created with the VOSeviews software, we can outline the following conclusions. The analysis of the keywords used by the authors, through co-occurrence, allowed highlighting the most frequently used notions. Thus, taking into account the large number of works, we used a minimum threshold of 50 co-occurrences of a keyword, and the map was obtained with the 75 words that meet the condition. The most relevant keywords for our research topic are: "economic growth", "financial development", "co2 emissions", "energy consumption", "renewable energy", "trade openness", "urbanization", "globalization", "foreign direct investment" and "ardl". Among the 4 formed cloisters, numerous connections are observed between them, which allow us to state that the research theme is closely related to other research fields.

Through author co-citation analysis, where the minimum threshold of 50 co-occurrences was kept, we were able to identify the most important authors in the research area represented by the largest nodes. As they stated (Ball and Tunger 2005), through this analysis we can check the reputation of the author Thus, the authors with the highest reputation from the perspective of the most citations are: M. Shahbaz, Mh. Peseran, R. Levine, T. Beck, and E. Dogan. Therefore, these authors have the most significant contributions to the debate on the topic of analysis.

Regarding the co-author analysis of the countries in the field of interest, through

a minimum threshold of 50 published documents of a country, 41 countries out of 143 were identified that meet the threshold. The top 5 countries are: China, USA, Pakistan, Turkey and UK. And the most important institutions/universities according to the number of publications are: Beijing Institute of Technology, Eastern Mediterranean University and Istanbul Gelisim University.

This bibliometric analysis concludes that financial development and economic growth are closely related to other extensive areas, such as: political, environmental, social and others. We see that the degree of financial development and economic growth of a country is based not only on economic-financial indicators but also on a range of social, political and environmental indicators. Also, the large number of studies and the significant interest given to financial development and economic growth indicate the importance of this topic and prompt us to investigate this area in a much deeper way.

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