

SCIENTIFIC RESEARCH PERSPECTIVES ON THE RELATIONSHIP BETWEEN FINTECH AND EDUCATION

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ABSTRACT

The overall perspective of the last decades on the economy and society evolution brings to the fore the undoubted influence of the technological progress on the two interconnected key spheres. Digital transformation ensured the transition to new models in almost all fields of activity, being recognized over the years as a real competitive advantage. Moreover, the characteristic circumstances of the modern world lay the groundwork for new directions that support the digitalization, aiming to enhance the quality and performance of processes mediated by specific providers, as well as to satisfy the needs and requirements of final consumers.

The financial spectrum, including its all-related activities, was naturally subjected to the digitalization process, thus ensuring the transition from traditional financial services to financial technology. Gaining an increased interest from companies, financial technology, well-known nowadays as FinTech, has certainly gone beyond the limitation to the banking services. In the current context, with a narrow but significant view, FinTech can be defined as the cluster of digital financial services carried out without the intermediaries' intervention.

Even though the implementation of FinTech has become an objective for many entities, the process itself can be influenced by various factors. Among the conditions preceding the overall digital transition facilitation, education has often been identified. Under these considerations, the existence of a causal relationship or, at least, of a direct connection between the adoption of financial technology and education can be called into question.

Providing a better understanding of the addressed subject requires, as a preliminary step, the analysis of the two considered concepts, namely FinTech and education, from the perspective of existing scientific research. Thus, the purpose of the current research was to identify some notable aspects regarding the potential relationship, at conceptual level, between financial technology and education. Achieving the predefined goal involved performing a bibliometric analysis, based on the scientific publications indexed in the Web of Science database. The obtained results reveal both the growing interest on the research topic, but also the existence of a direct or indirect cause-effect association between FinTech and education.

Keywords: Education, Technology, Financial Technology, FinTech

JEL: A10, F65, I25, M21, O30, P34

DOI: 10.5937/intrev2302028S

UDC: 001.895:336.71

COBISS.SR-ID 121797641

INTRODUCTION

In the context of sustained digital evolution, given the indisputable advantages of the process itself, the financial services industry, among many other key action areas specific to the contemporary society, gains new perspectives. Under the imminent influence of technology, the financial industry unquestionably evolved, thus ensuring the emergence and development of what is called nowadays *financial technology* or simply *FinTech*.

Although the above-mentioned terms are not new, FinTech can be considered a rapidly changing industry, which determines the interest in the subject in question, both from the perspective of the scientific research and of actors directly involved in practice. The relatively recent perspective presented by Puschmann [1] characterizes the digitalization process of the financial field as the fundamental reorganization of the value chain of financial services through new business models and the entry of new actors into the market. Maintaining the idea of fundamental reorganization, Goldstein et al. [2] referred to the way technology is revolutionizing the financial industry, describing the phenomenon as the fusion between technology and finance.

Per se, the FinTech concept does not only refer to the digital shift of banking services, although this was one of the first influential directions of modern technologies. Currently, we distinguish between FinTech banking and FinTech companies. Therefore, the term FinTech could be considered representative for all the economic entities that use digital services and products with the aim of improving their financial processes, thus including the banking environment and companies. Taking into account the current reality related to the FinTech phenomenon, we cannot strictly consider the digitized or automated banking services, but a much wider range of services, such as investment applications, cryptocurrency applications, e-commerce transactions, aid in government assistance efforts and other.

Presently, the FinTech industry is huge and constantly expanding, as the digital transformation of financial services opens up opportunities for new and various types of projects, which definitely leads to the attraction of investors. In fact, in the modern world, the adoption of FinTech is described as a necessity, also part of the digital progress, representing a competitive advantage regardless of whether we refer to a state, a community or an individual. However, the influencing factors are numerous, and the total benefit from the digital progress in the financial industry remains a topic often brought up in discussion.

The awareness that education represents one of the basic pillars for the good development of the individual and, consequently, of the society and the economy, determines the involuntary association between it and the ability to adopt modern technologies, including FinTech. According to Foster and Rosenzweig [3] the specialized literature issued three hypotheses concerning the relationship between education and technology adoption, referring to: (1) the income effect perceived by more educated agents (who are considered wealthier as a result of the increased level of education), determined by the education - technology adoption relationship, (2) better access to information by more educated agents and (3) the increased ability of more educated agents to learn and decode new information with increased speed and efficiency.

On the other hand, analyzing the role of educational interventions in improving economic rationality, the results obtained by Kim et al. [4] suggest that the quality of economic decision-making represents a process enhanced by education. Therefore, the transition to the use of FinTech, representing an economic decision, can be influenced by the level of education.

In addition to the previously mentioned research, the study recently carried out by Horobet et al. [5] aiming to analyze the interaction between three key variables in the current European context, namely *digitalization*, *education*, and *financial development*, reveals similar findings, of real importance. Summarizing, the results of the mentioned research emphasized, among others, the existence of a general positive association between education, digitalization, and financial development. In addition, it was shown that education represents a leading variable, while digitalization and financial development are laggards.

Within the existing scientific literature, reference is also often made to financial education and the need for its constant improvement, under the influence of numerous factors, among which the digital evolution can be mentioned. As per Bratu [6], financial education contributes to increasing the capacity of individuals to use complex financial services and products. The same study notes the fact that, in order to use modern, intensively developed financial products, financial education must be constantly developed, with an emphasis on self-education using technology.

In view of the previously mentioned aspects and many other similar scientific perspectives, the existence of a causal relationship or, at least a direct connection between the adoption of technology and the individual level of education was often questioned. As a direction of interest within the scientific research, even direct reference to the link between the financial development, including its digital progress, and education, can be observed. Therefore, the purpose of the present research is to highlight the results of a bibliometric study, providing an overall perspective on the last decade's scientific literature, regarding the relationship between Fintech and education.

RESEARCH METHOD

In general terms, being characterized as a quantitative study, the bibliometric analysis involves the evaluation of the scientific publications on a certain subject, with the aim of computer-assisted revision of them. The bibliometric study can be focused on several directions, such as analyzing the relationship between authors, carrying out an analysis based on citation rates, undertake an analysis based on the keywords occurrences and so on, according to the purpose of the research.

Thus, by carrying out the bibliometric analysis of academic publications, these becoming the actual data source, information can be provided on how the research in the targeted subject area was performed, organized, and interconnected. However, it can be stated that a comprehensive understanding of the research field, through the lens of existing publications, involves a direct evaluation of the scientific papers used as a data source, through their direct exploration.

In order to achieve the predefined goal of the current research, focused on the relationship between FinTech and education from the perspective of the scientific research, the following research questions were established:

RQ1. *How has the scientific literature on the subject evolved in the last decade?*

RQ2. *Which is the distribution of publications by research area?*

RQ3. *Which are the main topics/directions of research targeted by the authors?*

RQ4. *How could the main perspectives highlighted in the scientific literature on the addressed topic be described?*

Answering the defined research questions involved performing a bibliometric analysis based on the keywords' occurrences frequency, this being considered a preliminary step to the disclosure of more in-depth information about the approached subject. The database used to identify and extract the scientific publications to serve the purpose of the research was Web of Science, and the computer-assisted analysis was carried out through the VOSviewer software tool.

Intending to query the database, the following Boolean elements were included in the initial phase: $TS = ("FinTech" OR "financial technology") AND TS = ("education" OR "training" OR "learning" OR "teaching" OR "instruction")$. Hence, the use of the synonymous terms *FinTech* or *financial technology* could be observed, as well as the addition of the term *education* or its main alternative words. Running the query in question considering the last decade resulted in obtaining 268 existing scientific publications in the Web of Science database, the first being published in 2015, while the period 2015 - 2017 summing up only ten scientific papers on the subject concerned.

Nevertheless, running the previously mentioned query led to the decision to refine it, a large part of the resulting scientific publications being focused on specific terms, often derived from synonyms chosen for the word *education*, for example *machine learning* or *deep learning*. Under these circumstances, the resulting research would have deviated from the purpose of the present study, not referring to the concept of *education* in general.

Therefore, the final query was narrowed as follows: $TS = ("FinTech" OR "financial technology") AND TS = ("education")$. The chosen field tag, i.e., TS, allowed searching the terms in the titles, abstract and author keywords. For the present study the advanced search Web of Science feature was used, while the considered timespan included the last ten years.

To provide a better understanding of the subject addressed in this paper, after carrying out the bibliometric analysis in light of the previously mentioned considerations, it was necessary to review the

specialized literature. The process of direct review of manuscripts was focused on the first ten scientific papers resulting in the number of citations, these being considered the most appreciated among researchers.

RESULTS AND DISCUSSIONS

In order to establish a better understanding of the bibliometric study obtained results, their dissemination in two distinct parts was considered favorable. Therefore, the first part of the current section is focused on the general quantitative results regarding the analyzed scientific publications, intended to answer the first two formulated research questions (RQ1 and RQ2). Subsequently, reference will be made to the graphical representation of the relationship between the main keywords, providing an answer to the third research question (RQ3).

GENERAL INSIGHTS OF THE BIBLIOMETRIC STUDY

As a result of the database querying, 64 relevant scientific publications were returned, the search terms being found in titles, abstracts, or author keywords. In response to the first research question (RQ1), a growing interest in the association between FinTech and education was observed in the last five years of the analyzed period (Figure 1). Considering the date on which the present study was performed, to obtain relevant results for the last ten years, only the last four months of 2011, respectively the first eight months of 2022 were taken into account. However, among the publications identified, the first result based on the addressed query was published in 2017.

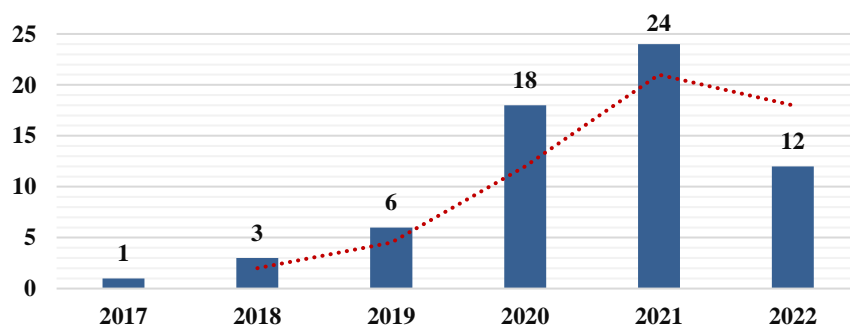


Figure 1. The evolution of the scientific publications' number during the analyzed period
Source: Results obtained from data processing after querying the Web of Science database

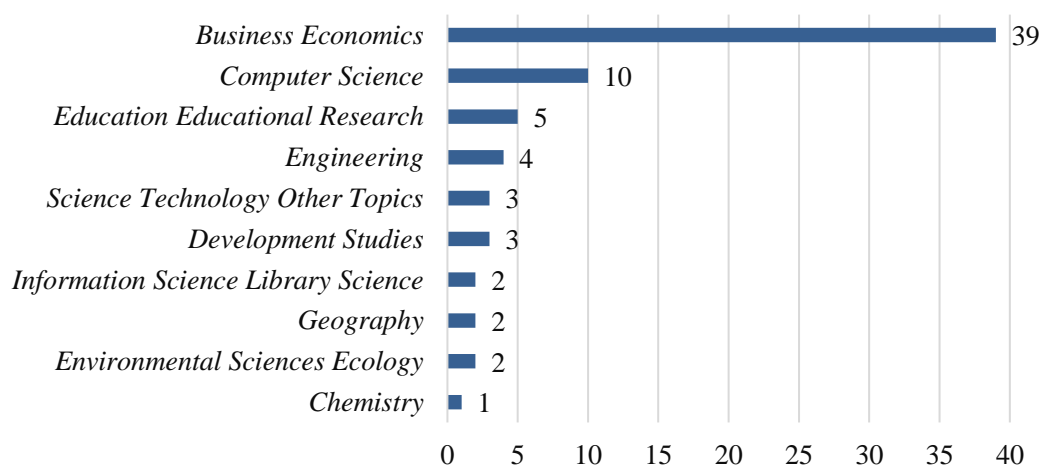


Figure 2. The top ten Web of Science research areas including the identified scientific publications
Source: Results obtained from data processing after querying the Web of Science database

Inherently, the association between FinTech and education has been scientifically analyzed predominantly within the research areas in the field of business economics. The top ten Web of Science research areas in which the identified papers were included can be easily observed in Figure 2, which also depicts the number of manuscripts, offering a clear answer to the second question of the research (RQ2).

Besides, the interest in the research topic was found by authors from all over the world, the main scientific contributions coming from the China (12) and USA (11). In the figure below (Figure 3) the countries contributing to scientific research can be noticed, the geographical locations with the highest number of publications being highlighted in dark blue, respectively lighter as the number of publications is lower, or zero where grey is observed.

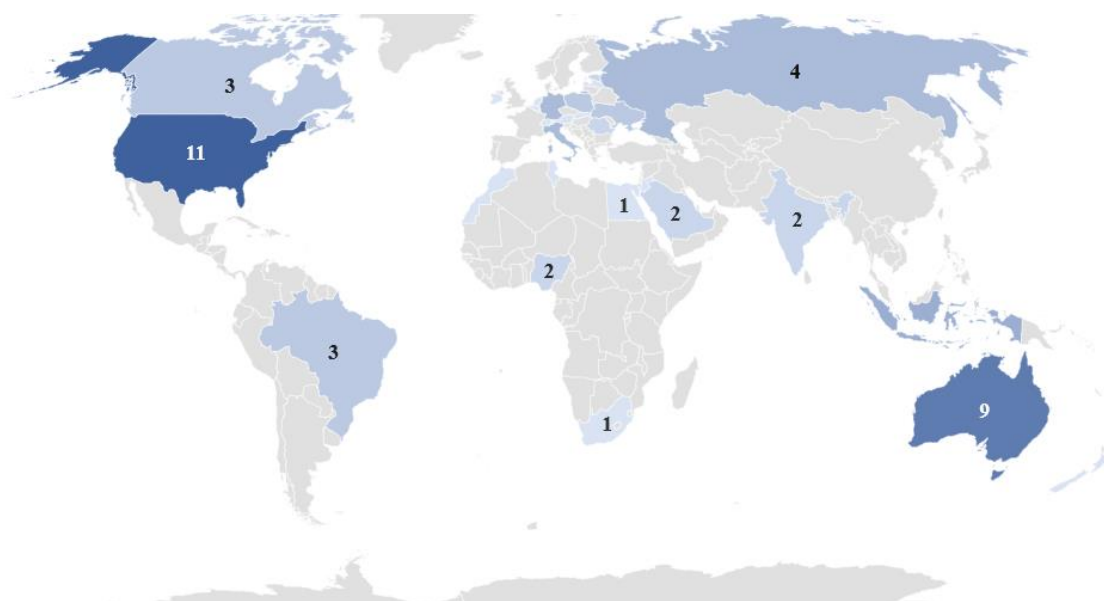


Figure 3. Contributing countries by geographical location

Source: Results obtained from data processing after querying the Web of Science database

The raw results obtained and briefly presented above indicate some notable aspects, which suggest the idea of a global interest in the research topic. In fact, reference can be made to the relationship between the two considered concepts, namely *FinTech* and *education*, as a research topic of growing interest in various research areas.

KEYWORDS NETWORKS ANALYSIS

Data processing via VOSviewer software led to the extraction of 2076 terms, of which only 42 meet the threshold of 10 as the minimum number of occurrences. Based on the analyzed terms, the relationship between the concepts *FinTech* and *education* is, in the framework of scientific research, closely related to terms such as *development*, *finance*, *financial inclusion*, *financial literacy* and *bank*. These keywords are, in fact, the top 5 terms associated with research publications resulting from the query of the Web of Science database. The table below lists the top 10 terms used, also showing the total number of occurrences of each, but the terms registering the same occurrences number have been additionally included.

Table 1. The most used terms associated with the analyzed research publications

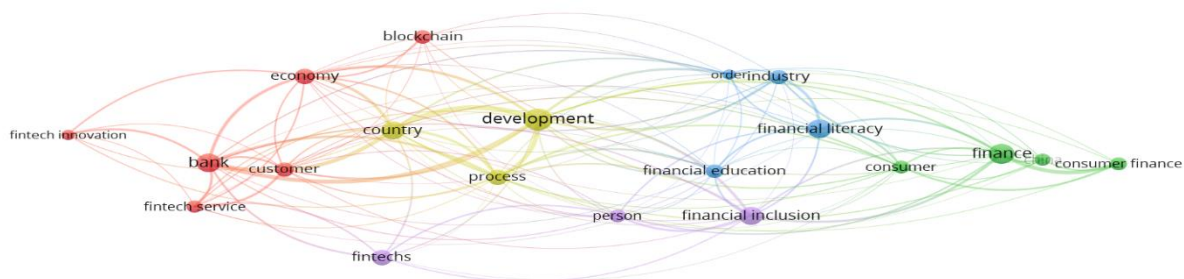
No.	Term	Occurrences
1.	Development	44
2.	Finance	31
3.	financial inclusion	28
4.	financial literacy	28
5.	Bank	27
6.	Country	25
7.	Economy	20
8.	Fintechs	18
9.	Process	17
10.	financial education	16
11.	Industry	16
12.	Blockchain	15
13.	Customer	15

Source: Results obtained from data processing via VoSviewer

According to the analysis performed, it can be stated that the most frequently appearing terms vary in meaning. We notice in the foreground the use of the key term *development*, which induces the idea of innovation and evolution, when referring to the relationship between FinTech and education. However, for most of the resulting terms, the almost natural usage cannot be disputed. They are either specific to the economic field, or to the financial field in particular. However, the association of financial technology with education can be easily observed, through the frequently used terms *financial literacy* and *financial education*.

The observations previously made represent, to some extent, only assumptions, not based on the individual and direct review of the quantitatively analyzed publications. Additional information of interest was determined based on the keywords' association, following the processing performed through VOSviewer. Thus, five clusters of key terms were obtained, of which cluster 1 being considered the most comprehensive.

The figure below (Figure 4) depicts the five clusters, which can be distinguished based on the associated colors of the terms' nodes, as follows: cluster 1 - red, cluster 2 - green, cluster 3 - blue, cluster 4 - yellow, cluster 5 – purple.

**Figure 4.** The Keywords Co-Occurrence Map

Source: VoSviewer export after data processing

Dividing the elements by clusters allowed the cluster density to be pictured (Figure 5), which ensures that they can be easily distinguished. According to the VoSviewer manual [7], in the graphic visualization of the cluster density, the weight given to the color of a certain cluster is determined based on the number of elements that belong to the cluster in the neighborhood of the point.

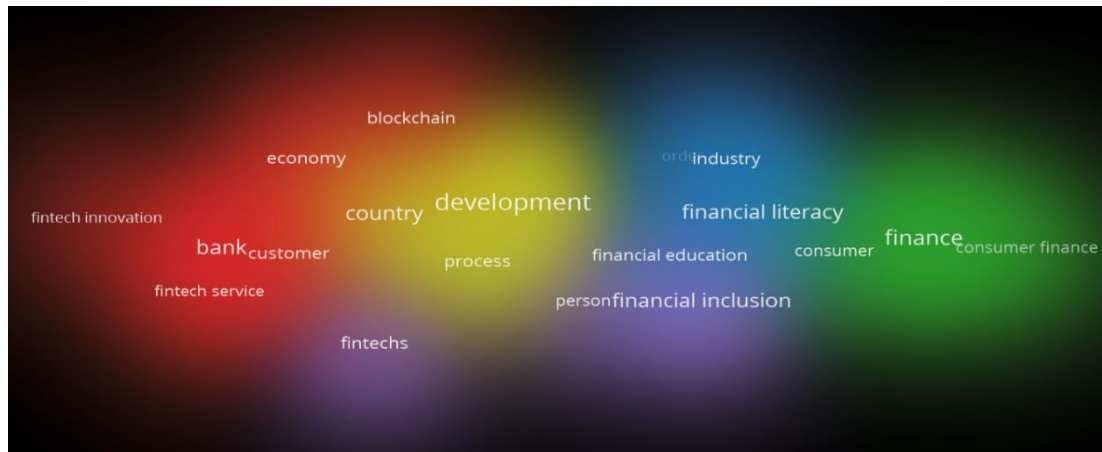


Figure 5. The cluster density visualization
 Source: VoSviewer export after data processing

Referring to the first cluster (red), the key term with the highest number of occurrences is *bank* (27 occurrences), with 13 links and 301 total link strength, related, in turn, to *economy*, *blockchain* and *customer*, all keywords having over 10 occurrences in the analyzed cluster. The other key terms, such as *FinTech innovation* and *FinTech service* registered a number of occurrences below 10. We thus assume that the relationship between FinTech and education was particularly associated with aspects related to the banking field, and generally to the overall economic area and its recent developments. At the same time, the linked terms *FinTech innovation* can be observed, which leads, as a general idea, to the perspective that FinTech and education are closely related to the innovative process.

Cluster 2 (green) shows a strong association with the terms *finance*, *consumer*, and *consumer finance*. It can thus be assumed the existence of an increased interest on the part of scientific research on the consumer, by considering the relationship between financial technology and education.

Within the third cluster (blue), it can be observed that the main two terms, depending on the number of occurrences, are representative for education, but with specificity in the financial field. Besides, *financial education* and *financial literacy*, the keywords with the highest number of occurrences within the group in question, are joined to the term *industry*.

The fourth cluster (yellow) highlights the key term *development* in the foreground, with the highest number of appearances, followed by *country* and *process*. The clear association between the most used mentioned term within the yellow cluster with FinTech is extremely often addressed in the specific literature or by other interested actors. Financial technology itself is specific to development, but it is interesting to note the association with the terms: *country* and *process*. The related concepts determine the premise according to which the FinTech - education relationship is more often analyzed from the perspective of development at the state level, there being unquestionably the possibility of the existence of other valences in the association, depending on the notional and semantic content of the terms.

Cluster 5 (purple) focuses on the *financial inclusion*, which brings to the fore the idea of adoption. Therefore, the potentially causal relationship between FinTech adoption and education can be assumed.

Even though the links between the keywords are much more numerous on the map shown in Figure 5, based on the clusters, referring to the main highlighted terms, we can summarize by mentioning the hub of main words associated in the scientific research related to FinTech and education, consisting of: *bank*, *finance*, *financial education*, *development*, and *financial inclusion*. Exposing a broad view, the previously mentioned terms could be considered the main directions of interest regarding Fintech and education, addressed in the scientific literature of the last decade, fact that answers the third research question (RQ3) defined in the current study.

REVIEW OF THE TOP TEN SCIENTIFIC PUBLICATIONS BASED ON THEIR CITATIONS NUMBER

The number of citations related to a scientific publication reflects both the degree of trust within the scientific sphere given to the obtained results, as well as their popularity. Thus, a paper whose number of citations is increased can be considered a benchmark to the detriment of a manuscript with few or no citations. Undoubtedly, the time span that has passed since the publication of the respective paper, as well as other exogenous factors, can influence its visibility and, in turn, the number of resulting citations.

To increase the relevance degree of the current research results, and to answer the fourth research question (RQ4), the review of the first ten scientific publications resulting from the database querying, as part of the bibliometric study, has become compulsory. The review of the scientific literature in question also aims to highlight the main perspectives of the existing research, to which the following studies should be related.

The scientific publication with the highest number of citations, registering, at the time of analysis, 39 in Web of Science and over 140 in Google Scholar, is entitled *Data security and consumer trust in FinTech innovation in Germany* [8].

Approaching the concepts of data security and consumer trust as a central theme related to FinTech, the research in question focuses on the study of the key influencing factors on the adoption of financial technological innovation. Although the publication is considered relevant to the query addressed in the present research, the relationship between FinTech and education was not directly analyzed, this aspect being recognized as a limitation even by the authors, stating that, within the study in question, the variables of moderation such as education were not included.

Therefore, although the terms used in the defined query can be found in the text content of the first scientific paper reviewed, they are not necessarily associated, from which a first limitation of the bibliometric study can be observed. The simple association of keywords does not represent the relation of the concepts themselves.

The identified article named *Banking goes digital: The adoption of FinTech services by German households* [9] ranks second in terms of the number of citations i.e., 36 in Web of Science at the time of the analysis. Aiming to provide notable information regarding the adoption of new technologies and services in the financial industry, by particularly reporting to German households, the results obtained from the study in question reveal the fact that households having, among other, a good level of financial education are more expected to adopt FinTech. Therefore, a first demonstration of the causal relationship between education and FinTech adoption can be observed.

Further, the third publication from the perspective of the number of recorded citations, namely 31 in Web of Science, is entitled *The Global Findex Database 2017: Measuring Financial Inclusion and Opportunities to Expand Access to and Use of Financial Services* [10]. As it can easily be understood from the title of the paper and through subsequent verification, the research in question aims to analyze the data provided by the World Bank through the Global Findex database. The analyzed paper relates financial technology to education from two perspectives. Firstly, it is stated, with a general perspective, that financial services have the potential to stimulate development, reference being made to the facilitation of investments in education. At the same time, the presented results reveal specific aspects, such as the fact that less educated individuals have a lower potential to have an account at a financial institution or that access to digital technology tends to be lower among them. Therefore, similar to the second revised scientific research, a causal relationship is recognized, at least between education and the use of financial services.

The fourth scientific publication analyzed, entitled *Consumer finance / household finance: the definition and scope* [11] with 17 citations in the Web of Science at the time the current research was conducted, was classified as a review. Focused on discussing the differences and similarities between several terms specific to the financial area, the research results do not directly or indirectly relate Fintech to education. During the review, however, several topics referred to by the authors as non-traditional were considered, such as fintech and financial capacity or literacy, from which the relevance of the scientific publication in the addressed query results, at least at the level of character strings.

Summing up 14 citations recorded in the database used and more than 80 in Google Scholar, the paper “*Financial literacy and responsible finance in the FinTech era: capabilities and challenges*” [12] ranks fifth. Focused on the analysis of existing research, the editorial material, as it was registered in Web of Science database, emphasizes, among other aspects of interest, the importance and necessity of financial education and literacy in the current context, *called the FinTech era*.

The study ranked sixth in the analyzed top, titled *How does financial literacy impact on inclusive finance?* [13], relates Fintech and education through the lens of financial literacy. However, the authors suggest the need to deliver comprehensive and long-term education programs among the rural population aiming to support the financial inclusion.

Entitled *The role of location in FinTech formation* [14] the seventh scientific publication analyzed reveals, along with other aspects, the fact that the establishment of FinTech benefits from an increased intensity in countries with high enrollment rates in tertiary education. As in most of the previously reviewed research, the FinTech - education causality relationship is highlighted.

With the main objective of analyzing the impact of inclusive digital finance on urban-rural income differences in China, Ji et al. [15] have presented, in the eighth revised paper based on the top considered in this research, some aspects that can indirectly relate FinTech to education. Among the exposed conclusions, it is mentioned that the impact of digital inclusive finance on the urban-rural income gap tends to be more favorable as the education is weaker.

Having as the central point of the research the effect of financial education on the tendency to delegate financial decision-making to a digital asset management tool, known as a robo-advisor, the article “*Financial education and digital asset management: What's in the black box*” [16] is found on the ninth position in the top subject to review. The results obtained by the authors indicate the potential of indirect influence of financial education on investment results, by supporting the use of financial advice.

Being focused on the business environment, particularly considering the companies in the FinTech sector, the tenth revised paper [17] investigates the demographic characteristics of corporate leaders (CEOs), referring to them as facilitators of sustainable business models. Attempting to outline the reference profile of the executive directors, the authors took into account, among many other aspects, specifications related to education. The findings reveal that some of the demographic characteristics related to the CEO are relevant, but the presence of an MBA is also mentioned as a significant impact for LEADING companies.

Following the review of the first 10 publications classified according to the number of recorded citations, the fact that relatively recent publications tend to directly relate the concepts FinTech or financial technology, and education can be observed. The relationship between the targeted concepts is outlined in direct or indirect associations, conveying different views, but the dominant perspective on the causality between the FinTech and education, referring to the key terms meaning in real life, is noteworthy.

CONCLUSIONS, LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The main purpose of the study carried out in the present paper was to increase the degree of awareness regarding the association between FinTech and education, subject to the approaches of the scientific research area. The analysis was performed using the Web of Science database, for the time span 2011 - 2022, the data source consisting of 64 resulting scientific publications, relevant to the addressed query.

The digitization of financial services represents a process in continuous expansion, which determines, along with other important aspects, new business models, characterized by a shift from traditional to automated or, at least, improved developments. The last decade has shown that FinTech is not only related to common banking services and their progress but represents an adaptation trend among companies.

Intended to bring modern solutions to both consumers and providers of financial services, the implementation of the financial technology can be influenced by many factors, education being one of them. The mentioned association progressively attracts attention in the scientific literature, and the results obtained from the presented study can be summarized as follows:

- The relationship of financial technology or FinTech with education represents, at least at the level of concepts, a current trend in the scientific literature, the interest on the topic being more visible starting from 2017.
- As expected, considering the significance of the key terms based on which the search was carried out in the database, the most popular targeted research areas are in the field of business economics.
- The findings highlight the fact that the relationship between the two concepts is not only one of local interest, but represents a global phenomenon, with countries contributing to the scientific literature covering points from around the world, as a geographical position.
- The key concept of *education* has been related in the scientific research of the last ten years with *financial technology*, mainly in publications within which the focus was on concepts such as *bank*, *finance*, *financial education*, *development*, and *financial inclusion*. The previously listed terms can thus be considered directions or topics of scientific interest related to FinTech and education.
- The review of the top ten scientific publications from the perspective of the number of recorded citations, resulted through querying the Web of Science database, reveals, in addition to other notable aspects, the fact that financial technology and education are related directly or indirectly, through the derivatives of the concepts in question, either as a cause-effect duo, or as aspects associated with the development of the economy as a whole.
- The relationship between FinTech and education can still be considered a novelty subject in scientific research, an aspect demonstrated through the present study. Although the time interval analyzed took into account the last ten years, the resulting scientific publications date from 2017, while their number in Web of Science does not exceed 100. Thus, we can conclude by emphasizing the growing interest from the perspective of the scientific area on the addressed phenomenon in the last five years.

The limitations of the research can be disseminated into endogenous, related to the internal factors of the study and exogenous, beyond the direct control of the authors, determined rather by the chosen research method. Thus, as endogenous limitations, we can refer to the fact that for the bibliometric analysis carried out, a single database was used, namely Web of science, while the terms included in the addressed query may not be the most relevant for the subject addressed. The main exogenous limitation is specific to bibliometric studies and was also found in the current research, referring to the fact that the resulting scientific publications are not necessarily accurate and representative of the phenomenon under analysis, but may simply include combinations of characters strings.

Considering the recognized research limitations, future research directions aim to expand the bibliometric study by performing the analysis on several databases, such as Scopus and others. Also, refining the Boolean query, by including more relevant terms is considered, to increase the degree of relevance of the results obtained. Moreover, different research methods are intended for combined or individual use.

REFERENCES

- [1] Puschmann, T. (2017). Fintech. *Business & Information Systems Engineering*, 59(1), 69-76.
- [2] Goldstein, I., Jiang, W., & Karolyi, G. A. (2019). To FinTech and beyond. *The Review of Financial Studies*, 32(5), 1647-1661.
- [3] Foster, A. D., & Rosenzweig, M. R. (2010). Microeconomics of technology adoption. *Annual review of Economics*.
- [4] Kim, H. B., Choi, S., Kim, B., & Pop-Eleches, C. (2018). The role of education interventions in improving economic rationality. *Science*, 362(6410), 83-86.
- [5] Horobet, A., Mnohohitnei, I., Zlatea, E. M., & Belascu, L. (2022). The Interplay between Digitalization, Education, and Financial Development: A European Case Study. *Journal of Risk and Financial Management*, 15(3), 135. DOI: <https://DOI.org/10.3390/jrfm15030135>
- [6] Bratu, R. D. (2020). Contemporary Aspects of Financial–Banking Responsibility. *KnE Social Sciences*, 481-495. DOI: <https://DOI.org/10.18502/kss.v4i1.6007>

- [7] van Eck, N. J., & Waltman, L. (2018, April 27). VOSviewer Manual - Manual for VOSviewer version 1.6.8.
- [8] Stewart, H., & Jürjens, J. (2018). Data security and consumer trust in FinTech innovation in Germany. *Information & Computer Security*, 26(1), 109–128. DOI:10.1108/ICS-06-2017-0039
- [9] Jünger, M., & Mietzner, M. (2020). The adoption of FinTech services by German households. *Banking goes digital: Finance Research Letters*, 34, 101260. DOI: 10.1016/j.frl.2019.08.008
- [10] Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2020). The global Findex database 2017: measuring financial inclusion and opportunities to expand access to and use of financial services. *The World Bank Economic Review*, S2-S8. DOI:10.1093/wber/lhz013
- [11] Xiao, J. J., & Tao, C. (2021). Consumer finance/household finance: the definition and scope. *China Finance Review International*, 1-25. DOI:10.1108/CFRI-04-2020-0032
- [12] Panos, G. A., & Wilson, J. O. (2020). Financial literacy and responsible finance in the FinTech era: capabilities and challenges. *The European Journal of Finance*, 26(4-5), 297-301. DOI:10.1080/1351847X.2020.1717569
- [13] Hasan, M., Le, T., & Hoque, A. (2021). How does financial literacy impact on inclusive finance? *Financial Innovation*, 7(1), 1-23. DOI:10.1186/s40854-021-00259-9
- [14] Laidroo, L., & Avarmaa, M. (2020). The role of location in FinTech formation. *Entrepreneurship & Regional Development*, 32(7-8), 555-572. DOI:10.1080/08985626.2019.1675777
- [15] Ji, X., Wang, K., Xu, H., & Li, M. (2021). Has digital financial inclusion narrowed the urban-rural income gap: the role of entrepreneurship in China. *Sustainability*, 13(15), 8292. DOI:10.3390/su13158292
- [16] Litterscheidt, R., & Streich, D. J. (2020). Financial education and digital asset management: What's in the black box? *Journal of Behavioral and Experimental Economics*, 101573. DOI: 10.1016/j.socec.2020.101573
- [17] Sannino, G., Di Carlo, F., & Lucchese, M. (2020). CEO characteristics and sustainability business model in financial technologies firms: Primary evidence from the utilization of innovative platforms. *Management Decision*, 58(8), 1779-1799. DOI:10.1108/MD-10-2019-1360

Article history:

Received 12 December 2022

Accepted 25 February 2023