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FinTech and its relationship to SMEs financing: a systematic literature review and future research agenda

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Abstract
This paper presents a systematic review of the literature, the state of the art and a future research agenda on the relationship between FinTech and the financing of small and medium-sized enterprises (SMEs). Digitalization and technological evolution have transformed access to financial resources, challenging SMEs in obtaining adequate financing. The emergence of FinTech offers new perspectives and opportunities, potentially revolutionizing how SMEs access and use financial services. Against this backdrop, 26 papers were extensively examined to analyze the relationship between the FinTech industry and its relationship with SMEs financing, possibilities, difficulties, and expectations in the current market in different parts of the world. Exploratory Research was found to be the most applied perspective to analyze the relationship between FinTech and SMEs.

Keywords: financing; fintech; small and medium-sized enterprises.

Fintech y su relación con el financiamiento de Pymes: una revisión sistemática de literatura y una agenda de investigación futura

Resumen
Este artículo presenta una revisión sistemática de la literatura, el estado del arte y una futura agenda de investigación sobre la relación entre Fintech y el financiamiento de Pequeñas y Medianas Empresas (Pymes). La digitalización y la evolución tecnológica han transformado el acceso a los recursos financieros, desafiando a las Pymes a obtener financiación adecuada. El surgimiento de Fintech ofrece nuevas perspectivas y oportunidades, revolucionando potencialmente la forma en que las Pymes acceden y utilizan los servicios financieros. En este contexto, se examinaron exhaustivamente 26 artículos para analizar la relación entre la industria Fintech y su relación con el financiamiento de las Pymes, las posibilidades, dificultades y expectativas en el mercado actual en diferentes partes del mundo. Se descubrió que la investigación exploratoria es la perspectiva más comúnmente aplicada para analizar la relación entre Fintech y las Pymes.

Palabras clave: financiación; fintech; pequeñas y medianas empresas.

1 Introduction

The acronym FinTech is a compound term, which literally means Financial Technology. In a broader context, it is a company or part of a company that combines modern financial services with innovative technology, characterized by their focus on user experience, the use of advanced technologies such as Machine Learning (ML) and Artificial Intelligence (AI), as well as their ability to adapt quickly to changing market demands [1]. They represent a group of companies that provide financial services using digital platforms, merging innovative business models with advanced technology to provide a diversity of products and services [2]. This term not only encompasses technological advances, but also reflects transformations in banking and finance. Among the new technologies are applications for mobile devices, while innovations such as exclusive online banking and crowdsourcing allow people to manage their

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finances differently from traditional banking [3].

The FinTech revolution is driven by a wave of startups that adopt innovative business models, transforming existing services to meet the demands of contemporary customers [4]. Financial innovation known as FinTech is characterized by generating new business models, applications, processes, or products that have a substantial impact on markets, financial institutions, and the provision of financial services [5]. Innovation in the financial sector that results in the creation of new services more aligned with customer needs plays a significant and positive role in fostering Financial Inclusion [6]. This concept entails the availability of useful and affordable products and services to individuals and businesses, satisfying their requirements through secure and effective transactions, which in turn are delivered in a responsible and sustainable manner [6,7]. The concept of financial inclusion translates into access to and use of high-quality financial services by various sectors of the population, thus laying the foundations for a more equitable and accessible financial system [8]. The application of information and communication technologies has boosted financial innovation, streamlining processes, reducing costs, and making it possible to reach new users [9].

Banks, by staying at the forefront of these technological trends, have managed to explore and adopt these business models [10]. Thus, the definition of FinTech has evolved over the years. The concept has expanded to include a variety of companies that offer innovative financial solutions [11]. Thus, innovation has become an increasingly important part of FinTech, where innovation is a means to improve financial services [12]. Finally, in recent years, the user experience and how these companies can offer more accessible and personalized financial solutions has occupied the central role [13].

Two major trends are emerging in this context. The first relates to the acceleration of change brought about by Big Data, Machine Learning, the commoditization of technology and AI. The second trend is the fact that non-financial companies have entered and invested in financial services, in key areas in the development of Industry 4.0 [14]. Following this line, significant growth is observed worldwide. In 2020, global FinTech investments reached a record $105 billion, up 10.9% compared to 2019 [15].

Within the business world, one of the most important players in the economic market, globally, are SMEs; a survey conducted by the World Bank reveals that SMEs represent on average around 96% of all registered businesses in the world and approximately 50% of the workforce [16]. Thus, SMEs tend to dominate the business community in all countries and cover more than 96% of all enterprises in developed countries. They also provide around 75% of jobs in these types of regions [17]. By 2030, it is projected that around 600 million jobs will be required to meet the needs of the global workforce. Consequently, the growth and nurturing of SMEs becomes essential, as they will play a key role in providing most of these job opportunities [18].

The adoption of FinTech solutions by SMEs has been significant due to the accessibility to a wide range of digital services and the presence of an established entrepreneurial and investment ecosystem [19]. In Europe, the adoption of FinTech by SMEs has been variable across countries and the maturity of the regional FinTech ecosystem. In countries such as the UK and Sweden, SMEs have widely embraced FinTech solutions to access finance and improve the efficiency of their operations [20]. Asia has witnessed rapid growth in FinTech adoption in recent years. In countries such as China, India, and Singapore, SMEs have been favored by online financing platforms and digital payments, which have facilitated access to capital and the conduct of business transactions [21]. In Africa, the process has been slower compared to other regions. However, efforts to foster financial inclusion and access to FinTech services are underway in countries such as Kenya and Nigeria, where mobile payment platforms have had a significant impact on local SMEs [22].

Latin America has experienced an increase in the development of FinTech solutions aimed at SMEs. In countries such as Mexico, Brazil, and Colombia, SMEs are adopting digital payment solutions and online financing platforms to boost their growth and competitiveness in the market [23]. These companies, which contribute to the economic development of countries, face numerous obstacles related to their activity and access to sources of financing [24]. In general, one of the central challenges facing this type of enterprise is financing. The main sources of financing are their own or those provided by suppliers, with bank financing or other less conventional sources being relegated and limited [25]. This significant mismatch between the economic impact of SMEs and their access to financing is observed, for example, in Asian SMEs, which receive only 18.7% of total bank credit [26].

The limited involvement of SMEs in obtaining credit from the private sector, as well as their difficulty in accessing appropriate financial conditions, is a challenge that impacts various economies globally, regardless of their level of development. It has been shown that, as the size of companies decreases, the complexity of accessing financial resources increases [27]. In other words, it is potentially riskier and more expensive to provide credit to SMEs [28]. One of the limitations for access to credit for this type of companies is the different criteria for the selection of debtors by the entities [29]. Over time, it is observed that the owner-manager experiences a change in his attitude towards risk and in his goals in relation to the company. These goals evolve from growth or profitability-oriented approaches to more personal goals, such as securing the family's standard of living and income [30]. SMEs face constraints due to high interest rates, resulting in increased financial expenses and the need to provide greater guarantees to financial institutions to obtain approval on their loan applications [31]. Although the SMEs sector is a crucial contributor to employment, diversification, and productivity in any country in the world and especially in developing countries, they still face significant credit constraints through traditional lending institutions. However, the trend is changing and modern digital technologies in the FinTech area are providing new alternatives [32]. Despite advances in research on FinTech and SMEs finance, it is imperative to chart a future research agenda that is based on a bibliometric approach. This involves identifying promising research areas and formulating unresolved questions by

analyzing the existing literature. Bibliometric sources reveal the need to explore the following areas:

Regional and Sectoral Case Studies. Using a bibliometric approach, gaps in specific case studies have been identified in various regions and industry sectors. Further analysis of these areas may shed light on the effects of FinTech on SMEs.

Regulatory and Legal Challenges. The bibliometric review points to the paucity of research on the regulatory and legal challenges faced by SMEs when adopting financial technologies. A detailed exploration of this topic is suggested to better understand its impact.

Risk Assessment and Management Strategies. According to bibliometric trends, there is a gap in the assessment of risk associated with the use of FinTech in SMEs financing. Further bibliometric research is proposed to develop effective risk management strategies.

Innovative and Sustainable Business Models. Based on the bibliometric analysis, the need to explore the integration of innovative and sustainable business models that combine FinTech with traditional financial services is highlighted. This area can offer valuable insights for the benefit of SMEs.

This research agenda proposal is based on the bibliometric review, which provides a comprehensive view of current trends and gaps in knowledge related to FinTech and SMEs. Finally, it is necessary to mention that the work will be approached by applying the Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement methodology, which provides a systematic and transparent approach for conducting systematic reviews and meta-analyses [33]. In the context of this bibliometrics on FinTech using the PRISMA methodology, it is expected to achieve a comprehensive and rigorous review of the scientific and academic literature related to the topic. Key steps in the application of the PRISMA methodology will include identifying relevant literature, selecting studies in a systematic manner, extracting data in a standardized way, and transparently presenting the results [34]. The use of the PRISMA Methodology will allow obtaining a complete and structured view of the current state of research in the FinTech field, identifying trends, gaps, and areas of focus [35]. It will also facilitate the comparison and synthesis of the results of different studies, thus contributing to the advancement of knowledge in this specific area. In summary, this bibliometrics will serve as an essential tool for assessing the current state of knowledge in a specific field, highlighting areas of opportunity, defining research directions, and providing a solid basis for decision making.

2 Method

The methodology was approached through documentary research using the Systematic Literature Review technique [36-44], following guidelines established in previous studies. This involved the formulation of a review protocol and research questions, based on the PICOC (Problem, Intervention, Comparison, Outcome, and Context) format. These questions were designed to address critical aspects of the functioning of FinTech Companies that provide services to SMEs, their differentials, future challenges, and the current landscape of the FinTech Industry as a provider of financing solutions for SMEs. The following questions are considered relevant, as they focus on key aspects of the phenomenon studied, such as how FinTech companies operate, how they differ from other financial alternatives, the challenges they face and the role they play in SMEs financing. By addressing these questions, a comprehensive understanding of the dynamics between FinTech and SMEs can be obtained, which contributes to the development of more effective financial solutions tailored to the specific needs of this business sector.

1. How do FinTech companies that provide services to SMEs work? Are there determinants? Are there limiting factors?
2. What are the differentials that FinTech companies provide SMEs?
3. What are the future challenges for FinTech to continue growing and establishing themselves as a source of financing for SMEs?
4. What is the current outlook of the FinTech industry and how does it affect its role as a provider of financing solutions for SMEs, considering aspects such as financial inclusion, digitalization, and access to capital?

In the context of bibliometrics, it was crucial to conduct exhaustive searches in recognized academic databases such as Scopus and Web of Science. These platforms offer broad coverage of the academic literature, allowing a comprehensive collection of relevant studies around interest. In addition, by employing specific search equations, accuracy, and completeness in the identification of relevant documents is guaranteed. Consulting the thesaurus in databases such as STW Thesaurus for Economics helped refine the search terms and ensured the inclusion of relevant vocabulary in the literature search. This rigorous approach was essential to obtain a complete and up-to-date picture of the state of research in the field of study, which in turn allows for the identification of trends, knowledge gaps, and promising areas of research. The search equations used in each are included in Table 1. The observation window covered the initial term of the report in the databases until April 2023.

Table 1.
Utilized search equations.

Resource	Equation	Results
Scopus	(TITLE-ABS-KEY (sme OR startup OR entrepreneur*) AND TITLE (financ* OR insurance OR payment OR bank* OR credit) AND TITLE (technology OR fintech OR digital OR embeddedness OR bigdata OR {big data} OR crowfunding OR {sharing economy} OR mobile OR ai OR {artificial intelligence} OR blockchain))	355
Web of Science	sme OR startup OR entrepreneur* (Topic) AND financ* OR insurance OR payment OR bank* OR credit (Title) AND technology OR fintech OR digital OR embeddedness OR bigdata OR "big data" OR crowfunding OR "sharing economy" OR mobile OR ai OR "artificial intelligence" OR blockchain (Title)	261

Source: Own elaboration.

The refinement criteria initially applied were based on the guiding questions, the researchers' experience on the subject matter and the articles containing the key interrelated concepts, among which the following stand out: FinTech, SMEs, Financing, Innovation, Financial Inclusion and Technology. Documents that did not have a direct relationship with the guiding questions were excluded to ensure the research focus. Above all, those that mentioned specific problems of certain regional economies or that were exclusively related to topics such as crowdfunding, entrepreneurs, blockchain or venture capital.

It is important to indicate that the systematic review protocol reported here was the one that was executed, its previous versions were tested by 3 professionals, whose profile was selected for meeting at least two of the following conditions: researcher with experience in literature reviews, academic in the area of Economics, Finance and Administration, and professional experience in FinTech and SMEs; the review performed by these experts included the structure of the PICOC question, keywords, syntagms, thesauri, prototype equations and selection criteria (inclusion and exclusion). This stage of the exercise allowed fine-tuning the protocol with the intention of not losing sight of any relevant detail for a successful execution of the review.

Subsequently, the execution of the final equations in both databases resulted in 616 documents, of which, eliminating duplicates, a total of 373 were submitted to the article selection process. At this stage, the titles, and abstracts of the 373 articles were reviewed independently by two reviewers to avoid selection bias, differences were resolved by consensus. The Flowchart (Fig. 1) was illustrated using the methodology Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement [32]. The supporting tool for this process was the Rayyan web application for systematic review [45].

Consequently, the full text of 86 documents was reviewed with the same inclusion and exclusion criteria of the initial selection by title and abstract, this process was also supported by two reviewers who evaluated the documents independently; the information was extracted using a Matrix for RSL in Excel, which involved the review of aspects such as article identification (title, year of publication, journal, authors, language and abstract); in addition, aspects such as: scope, objectives, methodological strategy, results, conclusions, managerial implications, limitations of the study and future research, as suggested by [37].

It is worth mentioning that, in the 86 documents, a deeper analysis of them was carried out again, taking as central variables: the relationship between the FinTech industry and its relationship with SMEs financing, possibilities, difficulties and expectations in the current market in different parts of the world. The number of documents that were related to the central topics to be studied, and complied with the initial agreement, was 26. Within these selected files, the key variables they contained were analyzed and classified according to 3 specific categories. Table 2 presents the categories and key variables in the articles analyzed in relation to quantity.

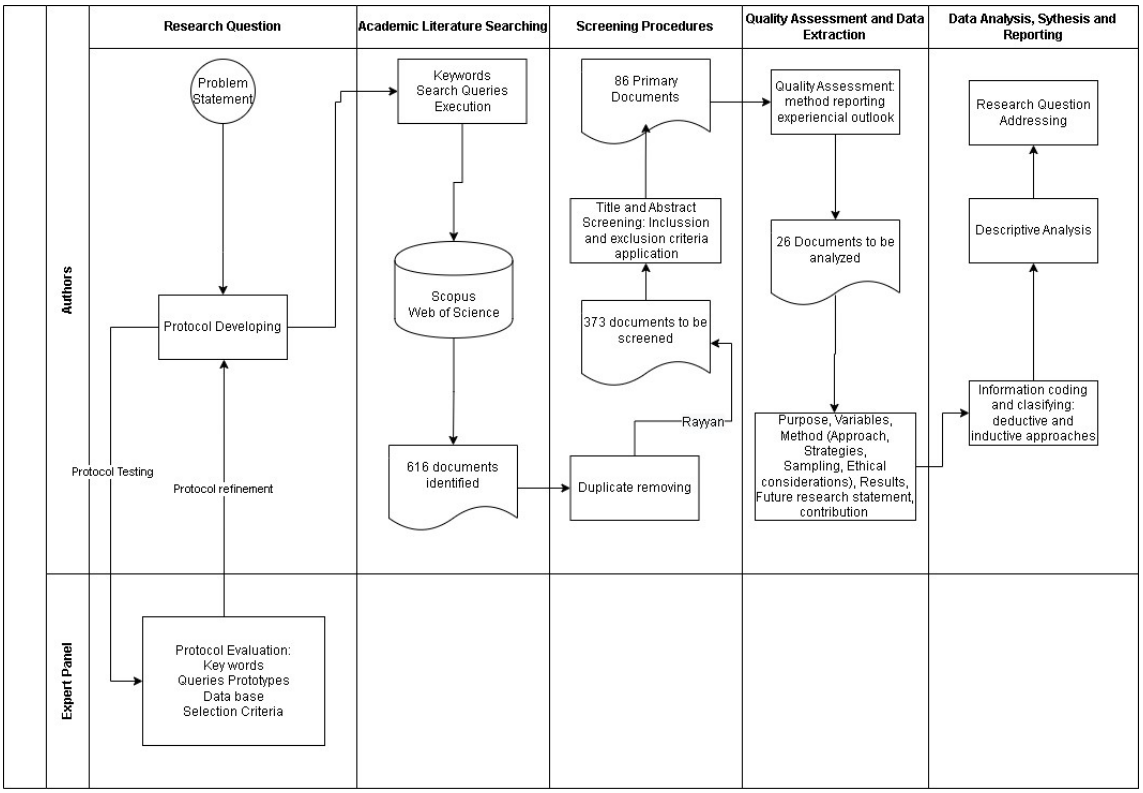

Figure 1. Selection process of the studies included.
Source: Own elaboration.

1 Results

Bibliometrics revealed a growing trend in research on the relationship between FinTech and SMEs finance. The main topics of study were found to include access to finance, financial inclusion, the adoption of financial technology by SMEs and the impact of FinTech on business innovation.

3.1 Primary articles overview

To provide a descriptive overview of the articles reviewed, it is crucial to highlight the growing academic interest in addressing the issue of alternative financing for SMEs. This interest has gained remarkable momentum in recent years, reflected in a significant increase in the number of publications on this topic. Specifically, there has been a marked increase in the number of articles published in the most recent years, with the highest publication rate recorded in 2022 (12 papers), followed by 2021 (5 papers) and 2020 (3 papers). This pattern reveals an emerging trend toward exploring and understanding the evolution of alternative financing for SMEs in academia. This approach reflects the growing recognition of the importance of this area of research and its relevance in the current economic context.

Table 3 summarizes titles, authors, years of publication, main characteristics of the scope and methodological approach that are evidenced as predominant in the designs used at the time of approaching the research fieldwork.

Within the 26 texts chosen and analyzed, the variety of topics related to the impact of financial technology on SMEs is wide. As central axes, the following can be highlighted:

Table 2.
Key variables in the articles analyzed.

Categories	Key variables	Quantity
Financing and SMEs	Financial Instruments, SMEs Financing, Financing, Constraints, Digital Financing, SMEs, Economic Growth, Entrepreneurship, Sources of Financing, Startup Growth, Startup Life Cycle, Technology Startups, Credit Rationing, Information Asymmetry, Mobile Payments, Big Data, Financial Industry, Financial Disintermediation, Online Credit.	16
Technology and Digital Finance	Crowdfunding, Platforms, Inclusive Finance, Digital Marketing, Local Banks, Digital Financial Inclusion, Use of Technology, Use of Technology, Financial Technology, Online Internet Banking, Mobile Internet Banking, Debt, Credit, Inclusive Finance.	19
Innovation and Vision for the Future	Business Innovation, Mediation Effect, Artificial Intelligence, SMEs Credit Rating, Solvency, Digital Lending, Developing Countries, Corporate Entrepreneurship, Business Performance, Structural Equation Modelling, Information Quality, Service Quality, System Quality, Perceived Usefulness, Perceived Ease of Use, Actual Use of Services, Financial Performance, Risk Management, Utilization of Financial Services, Use of Technology.	11

Source: Own elaboration.

Table 3.
Main characteristics of the research articles.

Authors	Year	Scope of Research	Methodological Strategy
[46]	2021	Exploratory Research	Quantitative
[47]	2022	Exploratory Research	Mixed
[48]	2018	Exploratory Research	Qualitative
[49]	2019	Exploratory Research	Qualitative
[50]	2022	Exploratory Research	Mixed
[51]	2022	Exploratory Research	Qualitative
[52]	2022	Correlational Research	Quantitative
[53]	2021	Correlational Research	Quantitative
[54]	2022	Exploratory Research	Quantitative
[55]	2022	Correlational Research	Quantitative
[56]	2007	Exploratory Research	Qualitative
[57]	2020	Literary Research	Qualitative
[58]	2021	Exploratory Research	Mixed
[59]	2020	Exploratory and Descriptive	Qualitative
[60]	2022	Exploratory Research	Quantitative
[61]	2022	Exploratory and Correlational	Qualitative
[62]	2021	Exploratory Research	Qualitative
[63]	2022	Correlational Research	Qualitative
[64]	2022	Exploratory Research	Quantitative
[65]	2020	Correlational Research	Mixed
[66]	2022	Exploratory Research	Qualitative
[67]	2023	Exploratory Research	Qualitative
[68]	2021	Exploratory Research	Quantitative
[69]	2019	Exploratory Research	Qualitative
[70]	2022	Literary Research	Qualitative
[71]	2018	Exploratory Research	Quantitative

Source: Own elaboration.

The role of FinTech finance in supporting SMEs during the COVID-19 pandemic.

The relationship between access to digital financial services and entrepreneurship in East Africa.

The process of SMEs financing in technology-based business incubators.

The impact of digital finance on SMEs innovation, especially in companies listed on the Chinese GEM exchange.

The influence of blockchain technology on startup financing.

The relationship between FinTech financing, crowdfunding, and customer retention in Islamic banks.

The role of FinTech in the democratization of entrepreneurial financing.

The bibliometric review of digital financing for SMEs turnaround in the Post COVID-19 Era.

The adoption of Financial Technology in the manufacturing industry and the impact on access to financial services for SMEs.

The influence of digital financial inclusion on business creation in a Chinese province.

The effects of financial digitization and literacy on SMEs performance.

The role of AI in access to finance for SMEs.

The impact of digital financial inclusion on China's economic development.

The use of Big Data and analytics in SMEs credit risk assessment.

The adoption of digital payment technology by SMEs and its effect on financial performance.

The relationship between access to digital finance and SMEs innovation.

As can be seen, although the sphere of analysis is predominantly focused on the relationship between FinTech and SMEs finance, some approaches diverge in the type of assessment and characteristics. In summary, research in this area has approached the relationship between FinTech and SMEs finance from multiple perspectives, including financial technology adoption, digital financial inclusion, and financial entrepreneurship practices. These approaches have contributed to a deeper understanding of how FinTech can influence SMEs access to finance and innovation in an ever-changing economic environment.

To systematically organize and present the relevant information extracted from the articles reviewed during the research, the following table is constructed to summarize in a concise and structured manner the topics covered in each article, the purposes of the research conducted, the results obtained and the authors responsible for each study. By organizing the information in this way, it facilitates the comparison and analysis of the different approaches, findings and contributions of the different works reviewed. In addition, it provides an overview of areas of interest and recurring themes within the field of study, which helps to identify trends, knowledge gaps and possible directions for future research. In summary, Table 4 serves as a useful tool to synthesize and visualize the diversity and richness of the literature reviewed in relation to the topic of study.

Table 4.
Research topics in the research FinTech and SMEs.

Topic	Purposes	Authors
Financing and SMEs	Explore and analyze various aspects related to access to finance for Small and Medium Enterprises (SMEs). These articles investigate how SMEs obtain and manage the capital needed to operate, grow, and innovate in a constantly changing business environment.	[46] [50] [51] [54] [55] [56] [57] [60] [61] [62] [63] [53] [64] [67] [68] [70]
Technology and Digital Finance, SMEs	To investigate and explore the intersection between Information Technology and finance, particularly in the context of Digital Transformation in the financial industry. These articles analyze how technology is reshaping and revolutionizing the way financial services are delivered and consumed, as well as its impact on individuals, businesses, and society at large.	[47] [48] [49] [51] [52] [55] [58] [59] [60] [61] [62] [64] [65] [66] [67] [68] [69] [70] [71]
Innovation and Vision for the Future	Explore the future challenges faced by FinTech to continue growing and strengthening their position in the SMEs finance business. Address topics such as the impact of artificial intelligence, information quality, data security and sustainability of financial practices. In addition, examine how to measure, evaluate, and improve the quality of financial services to ensure that they meet the needs and expectations of customers and users.	[50] [52] [57] [59] [64] [65] [66] [67] [70] [71] [69]

Source: Own elaboration.

1.1.1 Key trends and knowledge gaps

The objective is to analyze key trends in the relationship between FinTech and SMEs finance, highlighting areas of research that require further attention and exploring potential future directions for academic inquiry and policy formulation. Through a comprehensive analysis of the relevant scientific literature, this study seeks to shed light on the most recent developments in the field and provide a solid basis for identifying opportunities and challenges at the intersection between FinTech and SMEs finance support.

The Financial inclusion is a crucial issue today, and its impact on SMEs has been the subject of research by several experts. [46] suggests that digital financial inclusion can promote innovation in SMEs, alleviating the financial constraints they face. This idea is supported by findings from [50], who examine GEM-listed Chinese firms and find evidence that digital finance can boost innovation by reducing financing constraints.

However, despite these advances, there are significant knowledge gaps in current research. One challenge is to understand in depth how specific FinTech solutions, such as blockchain-based finance [49], can drive creativity and technology adoption in SMEs. This area needs further research to identify the precise mechanisms through which these solutions affect innovation in SMEs.

In addition, the acceptance of financial technology in the SMEs manufacturing sector, as addressed by [47], raises additional questions about how these firms adopt financial technologies and how this adoption may affect their market performance. Differences across industries and regions in terms of FinTech uptake and usage are not yet fully understood and are an area requiring further research.

Taken together, these studies underscore the importance of financial inclusion and financial technologies for the development and growth of SMEs. The availability of big data, blockchain technology and digital finance have become key tools to ease financial constraints, drive innovation and improve access to finance for these companies, which in turn has a positive impact on economic growth at the regional and national level.

Access to Finance is another key aspect. The uptake of financial technologies in SMEs [47] shows a potential to improve access to finance. However, there is a need to investigate in depth FinTech solutions, such as financing through digital lending [46], can overcome traditional constraints and provide access to SMEs that would otherwise be excluded.

Digitization of financial services can influence the development of SMEs, as illustrated in the study by [54] on local start-ups. However, more research is needed to explore how FinTech solutions can optimize the growth and expansion processes of SMEs.

The integration of AI in the field of financial inclusion and its relationship with SMEs has emerged as a topic of growing interest and research. Advances in financial technology, supported by studies such as [46,50], have shown that financial digitization can play a key role in promoting innovation and alleviating the financial constraints faced by SMEs.

AI has emerged as a powerful tool in this context. As [62] points out, AI is becoming a magic pill that improves SMEs' access to financing. The ability of AI to analyze large volumes of

data, identify patterns, and make automated decisions has proven to be instrumental in assessing credit risks [53] and improving the accuracy of financing decision making [48].

Nevertheless, despite promising developments, there are still knowledge gaps that require further research. One critical area is to understand how AI can be more accessible and adaptable for SMEs, especially in rural or disadvantaged regions, as suggested by [69]. Furthermore, the relationship between the growth of FinTech and the adoption of AI by SMEs is an area that needs further research to identify the precise mechanisms of this interaction.

In summary, AI is proving to be a valuable tool for driving financial inclusion and improving SMEs' access to finance. However, understanding how to maximize its potential and overcome barriers to its adoption in diverse contexts is an area that deserves continued attention in future research.

Equity Crowdfunding and Collaborative Finance as noted by [61] are also important areas that require more attention. Studies are needed to understand how crowdfunding platforms can influence SMEs investment and how regulatory and security challenges can be addressed.

Risk Assessment and Security remain key concerns for SMEs, despite advances in FinTech. Future research could explore how FinTech solutions address these challenges and how effective security measures can be implemented [52]. In addition, it is important to understand the broader Socioeconomic Impact of digital financial inclusion on SMEs and how these solutions can overcome geographic barriers to provide access to finance in rural and remote areas [63,69].

Despite the potential of FinTech solutions, there is still a lack of complete understanding of the optimal business models for providing financial services to SMEs. Research is needed to analyze how these solutions can be designed and tailored to meet the specific needs of SMEs. In summary, research on FinTech and SMEs finance is constantly evolving and presents numerous opportunities to explore. It is crucial to address these trends and knowledge gaps to better understand how innovations in financial technology can support the growth and development of SMEs, thus contributing to economic growth and financial inclusion at the regional and national level [51].

1.2 Statistical analysis

In terms of the scope of research conducted by the different types of papers, the following stand out: exploratory research articles (65.4%), correlational research articles (19.2%), literature research articles (7.7%) and mixed research articles (7.7%). which suggests a predominant interest in understanding and exploring new areas of knowledge or understudied phenomena related to FinTech Companies and SMEs. On the other hand, "correlational research articles" suggest an interest in establishing relationships between different variables within the topic. In summary, this reflects the breadth and variety of approaches used by scholars to investigate and understand the field of FinTech firms and their impact on SMEs.

The frequency of each unified keyword was calculated. Table 5 shows the 20 most common keywords with their frequency.

Table 5.
Most common keywords.

Keywords	Frequency
SMEs	15
Financing	8
Finance	8
Digital Finance	5
Restrictions	4
Innovation	4
Technology	4
Financial inclusion	3
Fintech	3
Growth	3
Information	3
Digital	3
Banks	2
Performance	2
Digital Marketing	2
Digital payments	2
Quality	2
Covid-19	1
Subsidy	1
Credit reasoning	1

Source: Own elaboration.

Regarding the geographic contexts of observation, the geographical distribution of the studies is mostly concentrated in Asia (65.4%), with predominantly empirical validations coming from China (64.7%) and Thailand (17.6%). In Europe, there is participation from Italy (33.3%). Other research focuses on Colombia, Korea, Indonesia, Lithuania, Poland, United Kingdom, Sri Lanka, South Africa, Switzerland, and Tanzania.

The number of studies published on FinTech and SME financing has shown an increasing trend in recent years. A highest with 12 publications was observed in 2022, indicating a growing interest in this topic. Correspondence analysis using PCA (Principal Component Analysis) provides a visual representation of the relationships between keywords in study titles. This helps to identify groupings and patterns in the literature reviewed. This methodological approach, which combines descriptive statistical analysis and textual data analysis, transforms qualitative findings into quantitative data, strengthening the validity and justification for publication of the work.

The keywords “financial”, “digital”, and “medium-sized” are recurring, which is consistent with the focus on FinTech and the impact on SMEs. The word “credit” suggests a particular interest in the credit aspects of financing. The presence of keywords such as “internet” and “board” may indicate topics related to digital infrastructure and corporate governance. The keyword analysis reinforces the qualitative findings of the paper by identifying the most recurrent terms in the literature on FinTech and SME financing. The highlighted keywords are indicative of trends and areas of interest in the field of study, underlining the relevance and topicality of the topic under investigation.

2 Discussion

One of the key discussion points is the positive impact of FinTech on SMEs financial inclusion. Research highlights how the adoption of financial technologies can expand access to financial services for companies that previously had difficulty obtaining financing [66]. However, it is recognized that there are still barriers that limit the participation of some SMEs in this new financial paradigm [47]. This debate raises the need to address specific challenges, such as the lack of financial education and insufficient technological infrastructure in certain regions and sectors [51].

The discussion also focuses on the balance between convenience and security. While FinTech offer greater agility and accessibility in SMEs financing, they also raise concerns in terms of cybersecurity and data privacy [49]. The need to strike a balance between innovation and the protection of SMEs' financial and personal information is a hot topic in the discussion on the widespread adoption of FinTech in the business sector [63].

Another relevant issue is how FinTech can interact with existing regulatory frameworks. Regulators play an essential role in the advancement of the FinTech industry and in realizing their main objective of ensuring the stability of the financial system [9]. Effective collaboration between FinTech firms and regulators is crucial to ensure the stability and integrity of the financial system [59]. For example, the Bank for International Settlements (BIS) plays a key role in regulating and supervising the activities of financial institutions worldwide. In the context of the interaction between FinTech and SMEs, the BIS has established guidelines and recommendations that influence the coordination, cooperation, and support of these activities.

The BIS has been instrumental in maintaining financial stability in the digital age and in the expansion of FinTech. It works closely with regulators in each nation to establish appropriate regulations for SMEs and FinTech companies. Collaboration between regulators, financial institutions and FinTech is essential to ensure the effectiveness and security of digital financial solutions for SMEs [72].

In addition, the impact of FinTech on building trust between SMEs and investors is discussed. Transparency, effective communication and ensuring a secure financial environment are essential elements in building trust in FinTech solutions [62]. The discussion focuses on how FinTech can address these issues and establish lasting trust relationships in an increasingly digital financial environment.

In summary, the discussion around the relationship between FinTech and SMEs finance encompasses several crucial issues, from financial inclusion and cyber security to regulatory collaboration and trust building. These debates reflect the complexity and importance of the interplay between FinTech and SMEs finance support and point to areas for continued research and development in this evolving field.

3 Conclusions

There are several key determinants driving the operation of FinTech firms in the SMEs space. First, the growing adoption of mobile devices and Internet penetration have expanded the potential customer base for these companies. In addition, the quest for efficiency and agility in financial transactions has led to an increase in demand for FinTech services [46,53]. However, there are also significant constraints facing FinTech companies. One of the most important challenges is government regulation and supervision. Financial authorities are grappling with creating adequate regulatory frameworks to ensure consumer protection and the stability of the financial system. In addition, competition is intense in the FinTech space, which may make it difficult for some companies to stand out and gain market share [52].

Technology also enables greater transparency in financial transactions, which helps build trust. SMEs can better track and understand their cash flows and assets, which is essential for making informed financial decisions [65].

As FinTech companies continue to expand, they face crucial future challenges. One of the main challenges is the issue of cyber security. With a growth in the use of digital financial services, data protection and fraud prevention become even more critical [49]. Collaboration with regulators and governments is another important challenge. FinTech need to work together with authorities to ensure that their operations comply with financial regulations and to address money laundering and terrorist financing concerns [59]. In addition, access to long-term financing for FinTech firms themselves is an obstacle they must overcome to continue growing. Investment and financing are essential for the expansion of these companies [68,70].

The state of the art in the FinTech industry reveals a constantly evolving landscape. Research and practice have shown that FinTech have contributed significantly to SMEs financing, driving innovation, financial inclusion, and economic development, these companies have had a positive impact on the business economy [46,53].

Nonetheless, the outlook is not without challenges. According to [52], it is essential to address the challenges and risks associated with these technologies to ensure their long-term sustainability. Collaboration with regulators, risk management and trust building have become critical areas of research and development. Innovation in funding models, such as crowdfunding and blockchain, is also emerging as a promising trend [61]. These research opportunities offer a path toward developing more effective and sustainable solutions that will drive the growth and development of SMEs in the future [67,68,70].

3.1 Towards the future

In today's dynamic environment, a transformational process has been unleashed that promises to reshape the way SMEs access finance and manage their financial operations. Through a rigorous analysis of the 26 studies reviewed, we have explored significant trends emerging from the convergence between FinTech and SMEs finance. In addition, we have identified areas for future research that require further attention.

The evidence accumulated in these studies provides us with a clear vision of the potential impact of FinTech. They

emerge as crucial enablers of SMEs financial inclusion, drivers of innovation and catalysts for economic growth. However, as we explore this terrain, questions arise that merit further reflection and exploration. How can we ensure that FinTech solutions are truly inclusive, overcoming existing regional and sectoral barriers? What is the right balance between agility and security in the adoption of financial technologies? How can SMEs take full advantage of technology, including AI and other emerging innovations?

In addition, the relationship between FinTech and regulation emerges as a crucial aspect that requires closer examination. How can regulators promote innovation while protecting the interests of SMEs and consumers? What is the role of collaboration between stakeholders such as governments, FinTech companies and traditional financial institutions? Building and maintaining trust emerge as fundamental elements in this new financial era.

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