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MONIKA KLIMONTOWICZ

mklimontowicz@ue.katowice.pl
University of Economics in Katowice. Faculty of Finance
ul. 1 Maja 50, 40-287 Katowice, Poland
ORCID ID: https://orcid.org/0000-0001-9215-1938

FinTechs Contribution to Sustainable Development

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Abstract

Theoretical background: The FinTechs phenomenon is worth discussing as its multidimensional character causes difficulties not only with defining it but also with assessing the impact of its development on the economy and society. The impact of FinTechs on sustainable development is a relatively new field of research. Thus, the paper presents exploratory research aiming to analyse the current areas of FinTechs activity, the state of their development in Europe, and the state of the art in European research on their impact on sustainable development goals (SDGs) achievement. The study applied both inductive and deductive research methods, together with comparative analysis.
Purpose of the article: The paper aims to analyse the European FinTechs landscape in the context of their impact on sustainability reflected by SDGs and prepare the framework for further research in this field.
Research methods: The theoretical analysis conducted in the paper for defining FinTechs was based on an in-depth literature review, including scientific papers, documents and reports. In this section, the inductive method and comparative analysis were mostly applied. The empirical part of the paper includes the analysis of quantitative data published by the European Commission and Eurostat. This analysis is primarily based on comparative analysis. The framework for further research in this field is based on a systemic literature review (SLR). In this section, the PRISMA methodology was applied.

Main findings: There is no doubt that FinTechs have already influenced the financial systems worldwide. In Europe, their disruptive development motivated the traditional market players to adapt their offerings, strategies and business models. They were perceived as market disruptors at the beginning of their operational activity. Today, the vast majority of authors notice their huge potential as sustainability enablers. The systemic literature review proved the worldwide systematically increasing scientific interest in surveying the FinTechs and their contribution to SDGs achievement. This trend has not yet been observed in Europe. Only a few papers directly refer to the relationship between FinTechs and SDGs achievement in European countries. The results have shed light on existing academic literature embracing both Fintech and SDGs issues in Europe, explored emerging trends in current research, and identified the main areas for further investigation.

Introduction

During the last decades, the financial sector has been constantly transformed due to the emergence of digital technologies. The digital revolution has led to the development of new financial products and services offered by traditional banking institutions, financial technology companies (FinTechs), start-ups operating in financial markets (for example, as a payment gateway, a money transfer service, or an integrative payment processing platform) and fully digital banks. The innovative and distinctive value propositions of new market players have gained popularity and acceptance among consumers. This digital disruption has posed significant challenges for traditional banking institutions, motivating them to adapt their operating models to the new digital reality. The scale and scope of FinTechs development have a significant impact on the financial ecosystem. Unlike previous transformations, the current adjustments cannot take years. The paper is based on the belief that FinTechs potential can be used for enhancing social development and supporting sustainable development goals (SDGs) achievement.

The FinTechs phenomenon is worth discussing as its multidimensional character causes difficulties not only with defining it but also with assessing the impact of its development on the economy and society. The FinTechs impact on sustainability reflected in SDGs is a relatively new field of research. Thus, the paper presents exploratory research aiming to analyse the current areas of FinTechs activity, the state of their development, and the state of the art in the research on their impact on SDGs achievement. As a result, the following research questions were formulated:

Q1: How do the current areas of FinTechs activity refer to the sustainability reflected in SDG goals?

Q2: What is the relationship between FinTechs development and SDGs achievement in Europe?

Q3: How is FinTechs impact on sustainable development analysed in scientific research focusing on European countries?

Answering research questions enables the preparation of further research framework proposals searching for the assessment of FinTechs contribution to SDGs goals

accomplishments. The foundation for the framework will be based on the review of FinTechs definitions, the scope of their activities, and the scale of their development, as well as the systemic literature review concerning their impact on sustainability reflected in SDGs.

The study applied both inductive and deductive research methods, together with comparative analysis. The theoretical analysis conducted in the paper for defining FinTechs was based on an in-depth literature review, including scientific papers, documents and reports. In this section, the inductive method and comparative analysis were mostly applied. The empirical part of the paper includes the analysis of quantitative data published by the European Commission and Eurostat. This analysis is primarily based on comparative analysis. The systemic literature review (SLR) applied the PRISMA methodology.

The paper is structured as follows: the first section presents the FinTech phenomenon and taxonomy with special attention paid to the scope of their activity, the second section refers to the scale of FinTechs activity and shows the evidence for their development in Europe and potential sustainability fields which may be influenced by their operational activity, the third section analyses the scientific research on FinTechs impact on sustainable development reflected in SDGs goals and includes the foundation of the framework for further research in this field. The paper finishes with some concluding remarks.

FinTech phenomenon and taxonomy

FinTech is one of today's buzzwords that escapes the definitional framework. Since the early beginning, the term has evolved and taken on new meanings. Primarily, it was used as an acronym for financial technology, which combines bank expertise with management techniques and the use of computers (Schueffel, 2016) or for the bank's technological cooperation with players outside the financial sector (Kerényi & Molnár, 2017). Today, broad and narrow approaches to this concept can be distinguished.

The broad approach refers to the different combinations of finance and technology (Arner et al., 2015; KPMG, 2018). Some definitions stress the results of technology implementation in financial services, such as changes in financial products, services and financial innovations (Dimler et al., 2018; FSB, 2019) and eliminating or reducing costs in financial intermediation (Das, 2018). Among other results, new business models, applications, and processes in the area of financial services are usually listed. Following the broad approach, FinTechs can also be defined as entities using technology, operating and offering products in the financial system. They include both banking and non-banking institutions which can compete, cooperate or have a competitive relationship. As a result, the FinTech definition is universal and capacious but may leave too much space for individual interpretation. Applying this approach in research causes the necessity to specify its scope to avoid misunderstandings.

The narrow approach to FinTechs emphasises the new market players (entrants) involved in financial markets that rapidly reshape how financial products are structured, provisioned and consumed (World Economic Forum, 2017). They are usually understood as market participants outside the traditional financial system that recently entered a market, use innovative technologies and change financial providers' business models. This approach excludes maturing firms that enable, enhance and disrupt financial services using innovative technology (EY, 2017), which makes the FinTech definition incomplete. As a result of the shortcomings of both approaches, there is a lack of a commonly accepted definition in both theory and practice. Table 1 presents the sample definitions of FinTechs.

Table 1. The selected definitions of FinTech

Author	FinTech definition
Arner et al. (2015)	the application of technology to finance
McAuley (2015)	an industry consisting of many companies that improve the efficiency of financial systems.
Arner et al. (2016)	the term covers not only individual sectors but the entire spectrum of financial services and products
Micu and Micu (2016)	new sector in the finance industry that incorporates the whole plethora of technology that is used in finance to facilitate trades, corporate business or interaction and services provided to the retail customer
Kim et al. (2016)	the service sector, which uses mobile-centred IT technology to enhance the efficiency of the financial system; as a term, it is a compound of "finance" and "technology" and collectively refers to industrial changes forged from the convergence of financial services and IT
World Economic Forum (2017)	new entrants (understood as market participants outside the traditional financial system that recently entered a market, use innovative technologies and change financial services business models) that promised to rapidly reshape how financial products were structured, provisioned and consumed
Das (2018)	any technology that eliminates or reduces the costs of financial intermediation
Dimler et al. (2018)	the industry in which financial services are changed with technology
KPMG (2018)	a portmanteau of finance and technology
FSB (2019)	technology-enabled innovation in financial services, which could lead to new business models, services, products, applications, and processes in the area of financial services
Chueca Vergara and Ferruz Agudo (2021)	refers to the latest technologies used in innovative financial products and services, it is one of the most important new markets in recent times, and this cutting-edge business model has great potential for the collaboration of different types of institutions, both public and private
Feyen et al. (2021)	digital technologies that have the potential to transform the provision of financial services spurring the development of new – or modify existing – business models, applications, processes, and products. In practice, the term "fintech" is also broadly used to denote the ongoing wave of new DFS. Examples of these technologies include web, mobile, cloud services, machine learning, digital ID, and application programming interfaces (APIs).

Source: Author's own study based on: (Arner et al., 2015; McAuley, 2015; Micu & Micu, 2016; Kim et al., 2016; World Economic Forum, 2017; Das, 2018; Dimler et al., 2018; KPMG, 2018; Financial Stability Board, 2019; Błach & Klimontowicz, 2021; Chueca Vergara & Ferruz Agudo, 2021; Feyen et al., 2021).

In the research on FinTechs contribution to SDGs achievement conducted in Europe, FinTechs are defined from both perspectives. Some authors refer to products and services offered by them as green finance (Siemionek-Ruskań et al., 2022). Most authors analysed them from the organisational perspective as entities operating in the financial market which use financial technology and offer new ways of doing business (Arner et al., 2020; Michael & Latkovska, 2021; Chueca Vergara & Ferruz Agudo, 2021), also referred to as a part of the Fintech industry (Pauliukevičienė & Stankevičienė, 2021, 2022). Similarly, in this paper, the narrow approach is applied and FinTechs as new market participants (new entrants) are analysed. FinTechs operate in all main areas of financial services offering an expanding category of financial services and products (Stamegna & Karakas, 2019). Table 2 shows the examples of those categories.

Table 2. The categories of products and services in selected areas of finance

Area	Products and services categories	
Financing	P2P lending Loan Marketplace SMB Lending Supply Chain Finance Student Lending Real Estate and industry-specific originators Marketplaces	Reward-based crowdfunding Crowd-donating Crowdlending Crowdinvesting Angel Networks
Money transfers and payments	Online payments Mobile payments e-Wallets Processing/acquiring	Recurring International P2P Merchant acquiring B2B
Insurance	Online distribution Policy management Claims Management Data & Analytics	P2P Insurance Employee benefits IoT / Sensors / Tele
Wealth Management	Robo advisory Brokers White-label trading platforms Predictive analytics	Market research Quantitative trading AI assistants, bots Personal Finance Management (PFM)
Blockchain and Cryptocurrencies	Blockchain tech for finance Blockchain tech for others	Cryptocurrencies Smart contracts
Big Data and Scoring	Credit scoring Big Data Risk management	Regtech Machine learning and AI Security
Banking	Neo banks Challenger banks	Bank as a Service (BaaS) Bank as a Platform (BaaP)

Source: Author's own study based on (King, 2017; Pesin, 2017; Feyen et al., 2021; Laidroo et al., 2021).

Spreading fields of FinTech activities causes the emergence of new terms used for describing entities' specialisation, for example, PayTech, InsurTech, PropTech, WealthTech, RegTech, LegalTech, BigTech, etc. (BBVA, 2018), or the special focus on the specific customer segments as GrandTechs which offer financial services and

support for seniors. Products and services listed in Table 2, as well as FinTechs specialisations, have not referred directly to sustainability reflected in SDG goals yet.

Still, the scale and scope of their activity have created a completely new financial ecosystem. This changing financial system and its stability can impact the everyday lives of individuals, companies, and authorities. Offering financial services by start-ups and mature companies, regulated and supervised companies, and those out of such control which compete and/or cooperate changes not only the business landscape but may have a huge impact on the economy and society. As a result, a question arises whether this impact can be assessed as positive or negative around the world and how FinTechs potential can be used to enhance social development.

FinTech development and SDGs in Europe: A cross-country analysis

FinTechs have evolved due to technological development, increasing digitalisation and better response to customer needs. The other drivers supporting their growth include e-commerce development, customer demand for fast, convenient, low-cost financial services, the COVID-19 pandemic, and a more friendly and proactive approach to FinTech by financial regulatory and supervisory authorities and governments in many countries (Gromek, 2018; FSB, 2017). Their growth is observed worldwide, but there are significant differences between particular regions.

One of the most important factors influencing FinTechs development is digitalisation. The analysis of the Digital Economy and Society Index (DESI) – a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU Member States, shows that Europe is not coherent in this field. The only comparable index dimension across Europe is connectivity.[1] The level of other dimensions differs significantly between countries. Figure 1 shows a huge difference between the Scandinavian and Western eurozone countries and the Middle East and South Europe. Despite all European initiatives, the division into West and East, as well as North and South, of the continent can still be observed. The main differences between European countries refer to human capital, integration of digital technology, and digital public services.

[1] The other DESI Index dimensions are Human Capital, Integration of Digital Technology and Digital Public Services. Connectivity includes fixed broadband take-up and coverage, mobile broadband and broadband prices, Human Capital – Internet user skills and advanced skills and development, Integration of Digital Technology – digital intensity, digital technologies for business and e-commerce, and Digital Public Services – e-Government. The methodology and data are available at https://digital-strategy.ec.europa.eu/en/policies/desi

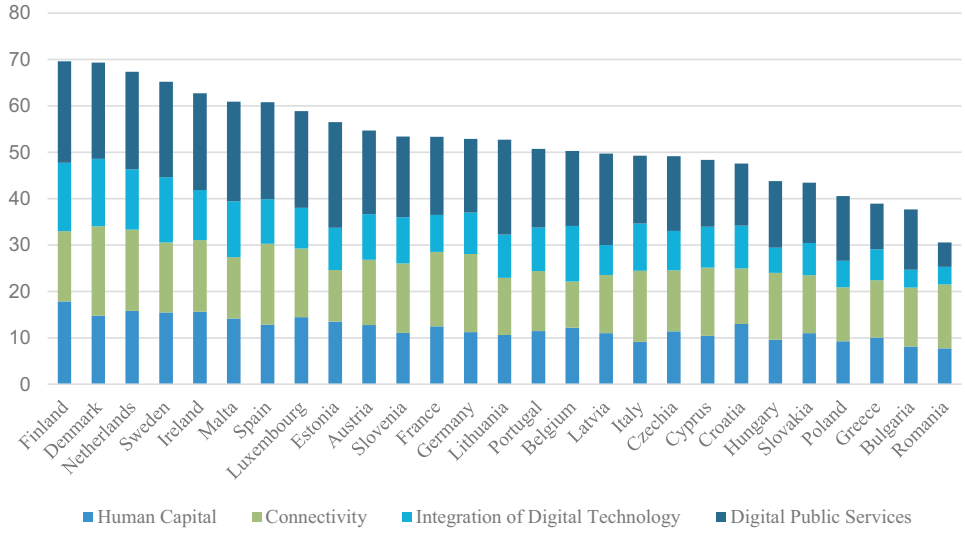

Figure 1. The DESI Index for EU countries for 2022

Source: (EU, 2022).

It is worth analysing if any relationship between the DESI index level and FinTechs development can be found. Following McKinsey & Co. (2022), the assessment of FinTechs development, should include five indicators: the number of FinTechs founded per million capita, FinTech funding per capita, the number of deals per million capita, the number of FinTech unicorns per capita, the size of the FinTech workforce as a percentage of the total workforce. Similarly to the analysis of the DESI Index, this analysis also highlights a huge variance across European FinTech ecosystems. The strong FinTech sectors across most of the dimensions characterise Sweden, Ireland, the Netherlands and Denmark. According to the report, countries in northern Europe tend to significantly outperform other geographies. Central Europe and the Mediterranean countries are in the midfield, and Eastern Europe has a significant gap compared with the leaders. Switzerland, a leader despite its location in Central Europe, is a geographic outlier to this pattern. Those findings are generally in line with the results of the DESI Index analysis. Table 3 presents the ranking by the relative strength of those dimensions for analysed countries.[2] The McKinsey ranking also included countries that are not EU members, like the United Kingdom, Switzerland and the USA.

[2] For the analysis McKinsey ranked the EU-27 countries, the United Kingdom, and Switzerland based on the five indicators reflecting the three growth stages: founding, funding, and scaling. To obtain an overall score, the countries' rankings were averaged across the five indicators and classified as top, middle, or bottom third, according to their score. McKinsey acknowledges that these indicators do not in themselves constitute a comprehensive analysis of all factors that can contribute to overall FinTech development. Nonetheless, they are indicative of the key strengths and weaknesses of FinTech performance.

Table 3. The ranking of FinTech performance in EU countries

Country	The number of FinTechs per million capita	FinTech funding per capita	The number of deals per million capita	The number of fintech unicorns* per capita	The FinTech workforce size as a percentage of the total workforce
Finland	12	13	12	n/a	18
Denmark	10	5	9	6	14
Netherlands	11	7	14	5	6
Sweden	7	2	8	2	2
Ireland	4	9	7	7	5
Malta	3	1	6	1	11
Spain	20	16	18	12	19
Luxembourg	1	12	2	n/a	4
Estonia	2	6	1	15	8
Austria	18	10	19	9	15
Slovenia	15	23	26	n/a	n/a
France	19	14	16	10	12
Germany	17	11	15	11	9
Lithuania	14	17	5	n/a	16
Portugal	21	15	20	n/a	26
Belgium	16	19	17	n/a	17
Latvia	13	24	13	n/a	13
Italy	26	20	22	13	22
Czechia	23	21	21	n/a	24
Cyprus	8	22	11	n/a	10
Croatia	25	26	25	n/a	20
Hungary	22	18	23	n/a	21
Slovakia	28	30	30	n/a	28
Poland	27	25	24	n/a	23
Greece	30	28	29	14	25
Bulgaria	24	27	28	n/a	28
Romania	29	29	27	n/a	28

* FinTech unicorns are defined here as fast-growing, technology-based companies with a valuation exceeding USD 1 billion (based on recent funding rounds)

Source: Author's own study based on (McKinsey & Co., 2022).

Comparing the DESI Index level and FinTechs performance leads to the conclusion that is coherent with McKinsey's report that European countries can generally be divided into three clusters. The top cluster includes countries with a DESI index higher than 55 and ranked in the top third (1–10 position in the ranking). The countries in the middle third have reached the middle level of the DESI index (from 54 to 49) and were ranked in the 11–20 position. The DESI Index level in countries ranked in the bottom group was 48 or less. Table 4 presents the comparison of both rankings. All countries ranked in the top third concerning FinTechs development also have the highest DESI scores. In the middle third group in the ranking, most of the countries also have the middle DESI Index score. There are only two exceptions. This group

also includes Finland and Spain, which have high DESI scores, and Cyprus, which is in the bottom third concerning DESI Index. Similarly, the majority of countries ranked in the bottom third are also in the bottom third group ranked based on the DESI Index (despite Czechia, Italy, and Slovenia).

Table 4. The EU countries clusters based on the DESI Index and FinTechs development ranking

		FinTechs development		
		Top	Middle	Bottom
DESI index	Top	Denmark Estonia Ireland Luxembourg Malta Netherlands Sweden	Finland Spain	
	Middle		Austria Belgium France Germany Latvia Lithuania Portugal	Czechia Italy Slovenia
	Bottom		Cyprus	Bulgaria Croatia Greece Hungary Poland Romania Slovakia

Source: Author's own study based on data retrieved from (McKinsey & Co., 2022; EU, 2022).

Addressing the paper's research questions requires analysing which fields can be influenced by them in the relationship to achieving SDGs' goals. The examples of SDGs' indicators directly or indirectly related to FinTechs activity are as follows (Le et al., 2019; Alfiani & Akbar, 2020; Gálvez-Sánchez et al., 2021; Glavina et al., 2021; Dziatkovskii et al., 2022; Susilowati et al.; 2022; Úbeda et al., 2022; Baker, 2023):

– people at risk of poverty or social exclusion (SDG 1 – No poverty),

– adults with at least basic digital skills (SDG 4 – Quality education / Digital skills),

– real GDP per capita and investment share in GDP (SDG 8 – Decent work and economic growth / Sustainable economic growth),

– employment rate and young people neither in employment nor in education and training (SDG 8 – Decent work and economic growth / Employment),

– gross domestic expenditure on R&D, patent applications, and R&D personnel (SDG 9 – Industry, innovation and infrastructure / R&D and innovations)

– purchasing power adjusted GDP per capita (SDG 10 – Reduced inequalities / Inequalities between countries),

– material footprint and energy productivity (SDG 12 – Responsible consumption and production / Decoupling environmental pressures from economic growth),
– financing climate action (SDG 13 – Climate action),
– access to technology (SDG 17).

The FinTechs can also contribute to the gender employment gap and position held by women in senior management (SDG 5), energy consumption (SDG 7), sustainable mobility (SDG 11), green economy and waste management (SDG 12), climate mitigation (SDG 13), trust in institutions (SDG 16). Some authors add to this list SGD 2 (zero hunger), referring to the role of microfinance in the agricultural productivity and income of small-scale food producers (e.g. Ferrata, 2019; Trimulato, 2022).

Table 5. The SDG achievement in European countries in 2022

	SDG achievement	
Cluster	Country	Score
Top	Finland	86.5
	Denmark	85.6
	Sweden	85.2
	Austria	82.3
	Germany	82.2
	France	81.2
	Ireland	80.7
	Estonia	80.6
Middle	Poland	80.5
	Czechia	80.5
	Latvia	80.3
	Slovenia	80.0
	Spain	79.9
	Netherlands	79.9
	Belgium	79.7
	Portugal	79.2
	Hungary	79.0
Bottom	Croatia	78.8
	Slovakia	78.7
	Italy	78.3
	Romania	77.7
	Greece	76.8
	Malta	76.8
	Luxembourg	75.7
	Lithuania	75.4
	Bulgaria	74.3
	Cyprus	74.2

Source: (Sachs et al., 2022).

Similarly to digitalisation and FinTechs development, European countries face different challenges and, as a result, have other priorities concerning SDGs (Eurostat, 2023). The overall performance of analysed countries, interpreted as a percentage of SDGs achievement, is presented in Table 5. Following the previous logic, they were divided into three groups. In this case, the top group includes countries that reached

over 80.5, the middle group includes countries with a score from 79 to 80.5, and the bottom group includes countries with a score lower than 79.

Unlike the previous dimensions, dividing the analysed countries into three clusters does not precisely cover digitalisation and FinTechs development. Among the top countries are Denmark, Sweden, Ireland and Estonia, which were also in top clusters concerning other dimensions, as well as Finland, Austria, Germany, and France (the middle cluster referring to digitalisation and FinTechs development). Despite the countries classified as the middle cluster before (as Spain, Belgium, Latvia and Portugal), the second group surprisingly includes the Netherlands (at the top in the previous analysis) and some bottom countries are Poland, Czechia, Hungary and Slovenia.

Similarly to previous results, the bottom group is Bulgaria, Croatia, Greece, Romania, and Slovakia. Interestingly, it also contains top (Malta and Luxemburg) and middle (Cyprus and Lithuania) countries. Thus, the relationship between FinTechs development and SDGs achievement in European countries is ambiguous and requires further research. Still, the huge potential and creativity related to FinTechs operating activity should be used to contribute to SDGs achievement. It is important to survey and assess their role in this field.

FinTechs impact on sustainable development in scientific research

During the last decade, the scientific interest concerning FinTechs has been systematically increasing. The number of articles, books, book chapters, conference papers and proceedings referring to this phenomenon in all fields has been systematically increasing in all selected databases. Their role and importance are discussed from different perspectives and the question arises those perspectives refer to SDGs achievement in European countries. To find the answer to this question the systemic literature review followed the PRISMA methodology was applied in this paper. This methodology includes five stages defining the review concept and strategy, specifying the SLR methodology, data collection, data analysis, discussion, and conclusion. In the first stage, the scope of the analysis and search strategy were defined, and the databases were selected. The scope of the analysis covers all papers referring to FinTechs defined as new market participants (new entrants), and their activity related to SDGs achievement. The search strategy defined the eligibility criteria. The first inclusion criteria included "FinTech*", open access and language (English). Then, the results were narrowed down by two criteria: "SDG*" and "European countries". The 17 Sustainable Development Goals (SDGs), with 169 targets and over 240 indicators to measure performance and progress, were approved by the United Nations (UN) within the 2030 Agenda on September 27, 2015 (UN, 2015). As the SDGs were implemented in 2015, "SDG*"was exchanged into "MDG*" for 2014 and 2015. Still, the first publications concerning FinTechs and their impact on

sustainability appeared in 2017. As the research has an exploratory character the key five databases were selected as Scopus, Web of Science, Springer, ProQuest and Emerald. The final database includes only relevant, open-access manuscripts papers. SDG as a criterion was also understood by searching machines as a Sign Directed Graph. All manuscripts focusing on this field were excluded. Similarly, manuscripts not referring directly to SDGs but to general FinTechs impact on the economy and society or particular technological solutions, for example, using AI, machine learning, and robo-advisors within investing and their applications in different fields, or not referring to European countries, were excluded from a database prepared for qualitative analysis. The search results are presented in Table 6.

Table 6. The number of publications concerning European research on FinTechs and SDGs in selected databases

Database*	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Searching criteria: FinTech or FinTechs										
Scopus	16	23	82	263	711	1282	2392	3474	5184	3032
Web of Science	1	6	36	79	940	417	551	741	956	357
Springer	2	5	48	143	310	561	645	1376	1953	1204
ProQuest	0	12	89	213	446	677	1036	1468	1752	615
Emerald	0	3	13	38	103	132	231	324	513	359
Total	19	49	268	736	2510	3069	4855	7383	10358	5567
Searching criteria: FinTech or FinTechs and SDG or SDGs										
Scopus	0	0	0	0	1	6	22	36	100	67
Web of Science	0	0	0	0	1	1	2	3	4	2
Springer	0	0	0	1	1	16	36	125	200	143
ProQuest	0	0	0	1	4	9	19	40	70	39
Emerald	0	0	0	0	0	0	8	12	31	12
Total	0	0	0	2	7	32	87	216	405	269
Searching criteria: FinTech or FinTechs and SDGs or SDGs and Europe										
Scopus	0	0	0	0	0	0	0	1	0	0
Web of Science	0	0	0	0	0	0	0	1	1	0
Springer	0	0	0	0	0	0	1	0	0	0
ProQuest	0	0	0	0	0	0	1	1	2	0
Emerald	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	2	3	3	0

* the number refers to publications in English

Source: Author's own study.

Data presented in Table 6 proves the increasing interest in the FinTech phenomenon. Since 2014, the number of publications indexed in selected databases has increased remarkably (from 19 in 2014 to 5,567 in September 2023). The two first manuscripts analysing FinTechs in the relationship to SDGs were published in 2017, but the increase in authors' interests in this field started two years later. Thus, it is a relatively new field of research. The majority of authors discuss the relationship generally. Authors conclude that FinTechs have a huge potential to support SDGs

achievement, but they analyse their role differently. Some papers refer to selected SDGs as financial inclusion (Ferrata, 2019; Le et al., 2019; Arner et al., 2020; Gálvez-Sánchez et al., 2021; Chu et al., 2023), the role and potential of a particular technology (Jiang et al., 2022; Dziatkovskii et al., 2022; Cao & Nguyen, 2023) or investments (Chueca Vergara & Ferruz Agudo, 2021; Siemionek-Ruskań, Lepczyński & Fanea-Ivanovici, 2022; Kurnoga et al., 2022). It is necessary to mention that a considerable amount of literature has focused on innovative financial tools such as crowdfunding, green bonds, social bonds, and catastrophe bonds, which were not the subject of this research. Furthermore, financial inclusion and microfinance were also explored as financial tools to overcome gender inequalities and social exclusion in developing countries (Rizello & Kabli, 2020).

Among the publications presenting FinTechs impact on sustainable development referred to by SDGs, only a few analyse the European cases. After deleting the duplication, those manuscripts were the subject of further qualitative analysis. They present evidence for the importance of external factors (a favourable environment) influencing the sustainable development of the FinTech industry and some SDGs achievements in European countries (Pauliukevičienė & Stankevičienė, 2021, 2022). Michael and Latkovska (2021) try to estimate FinTechs potential in raising funds to contribute to SDGs achievements. They concluded that FinTechs activity could impact three sources of funds – taxes, SDG-related ventures, and traditional funding through innovations and new business models. Kurnoga et al. (2022) focus on the relationship between equity indices and SDG indices. They just mentioned FinTechs as one of the possible factors but applied a quantitative methodology that may be an inspiration for analysing the relationship between FinTechs indices and SGD indices. On the other hand, Chueca Vergara and Ferruz Agudo (2021) analyse two FinTechs case studies – Clarity AI and Pensumo. They concluded that FinTechs show consistency and continuity with ESG criteria through the use of tools such as crowdfunding, big data analytics, blockchain technology, and artificial intelligence. According to them, sustainable finance and FinTech have many shared aspects, and FinTech can make financial business overall more sustainable, as it promotes green finance. Another approach to the topic is taken by Siemionek-Ruskań et al. (2022) who survey the Polish and Romanian students' awareness in this field. Unfortunately, the sample of 363 cannot be treated as representative of this generation (even if the authors present the rationale that it is representative for their universities). Table 7 includes the scope of the research presented in those papers.

Table 7. The scope of the research on FinTechs and SDGs in Europe

Author/s	Paper's purpose	Scope of the research	Methodology
Pauliukevičienė and Stankevičienė (2022)	Examining the contribution of SDGs indicators to the sustainable development of the FinTech industry, indicate the main drivers and provide recommendations for further FinTech industry development in terms of sustainability for the sustainable development of the economy.	SDG4, SDG8, SDG9, SDG16	The pilot study on the contribution of selected SDG indicators to the sustainable FinTech industry development using experts, opinions (questionnaire).
Kurnoga et al. (2022)	To identify performance differences between conventional European equity indices and ESG indices.	S&P Global BMI Index and ESG Index	Cluster analysis and multivariate analysis of indices
Siemionek-Ruskań et al. (2022)	To investigate the scope of awareness in terms of green finance in Poland and Romania	The awareness of green deal among business students and fresh graduates	A comparative analysis based on the survey
Pauliukevičienė and Stankevičienė (2021)	Assessing the statistical link between the FinTech PEST environment and achievement of SDGs and explain the interface to facilitate its useful application within government and financial regulations, as well as administration of the state and municipal financial entities	SDG4, SDG8, SDG9, SDG16	Correlation analysis
Michael and Latkovska (2021)	Analysing how much money FinTechs are likely to mobilise for sustainable development	SDG funding and spending	Estimation and econometric analysis of provisions and investments
Chueca Vergara and Ferruz Agudo (2021)	Analysing the relationship between FinTech and sustainability and the different areas of collaboration between FinTech and sustainable finance from both a theoretical and descriptive perspective.	The analysis of selected FinTech initiatives aimed at aligning financial portfolios with ESG criteria	Literature review and case study approach
Arner et al. (2020)	Analysing how the digital financial transformation in support of financial inclusion and financial development can support the UN SDGs achievement	Conceptual framework	Cross-disciplinary analysis following a practical approach

Source: Author's own study.

The summary of the analyses shows that FinTechs contribution to the SDGs achievement can be analysed from the perspective of subject (entity) and objective (technologies, services, tools, platforms). Further research can apply different approaches. Still, they should take into account the external factors moderating the relationship between FinTechs and SDGs achievement. The potential research framework is presented in Figure 2.

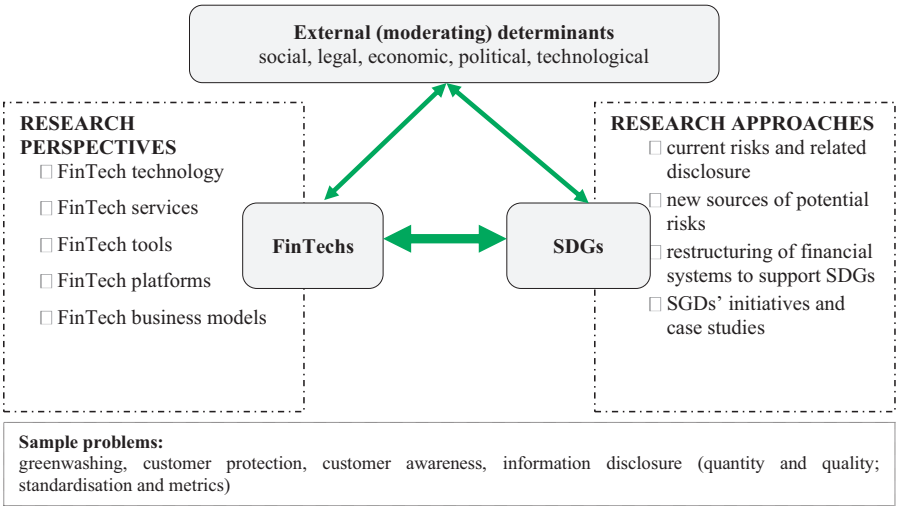

Figure 2. FinTechs contribution to SDGs achievement – research framework

Source: Author's own study.

Comparing the number of manuscripts focusing on Europe with the total number of manuscripts referring to FinTechs and SDGs leads to the conclusion that there is a huge need for further exploration. Most authors refer to the general SDGs score. The analysis of particular targets seems to be interesting. Especially important in reference to those targets that are not met and/or countries that were classified as the third (bottom) group.

Conclusions

There is no doubt that FinTechs have already influenced the financial systems worldwide. In Europe, their disruptive development motivated the traditional market players to adapt their offerings, strategies and business models. They were perceived as market disruptors at the beginning of their operational activity. Today, the vast majority of authors notice their huge potential as sustainability enablers. Such an assumption became the foundation of this study which aimed to analyse the current areas of FinTechs activity, the state of their development, and the state of the art in the research on their impact on SDGs achievement. The study defined FinTechs as new market players and analysed their development in Europe. The literature review included all manuscripts referring to FinTechs and their contribution to the achievement of SDGs.

The review of current areas of FinTechs activity led to the conclusion that they cover all areas of financial services offerings but do not directly reflect the SDG goals. Still, the scale and scope of their activity create a new financial ecosystem.

The cross-country analysis proved the importance of digitalisation for FinTechs development. Based on the DESI Index and the FinTechs development ranking, European countries were divided into three groups – top, middle and bottom. The evidence for the relationship between FinTechs development and SDGs achievement in these three groups of European countries was shown partly. Due to some outliers, this relationship should be explored in further research.

The systemic literature review presented the evidence for the worldwide systematically increasing scientific interest in surveying the FinTechs and their contribution to SGDs achievement. The majority of authors discuss this contribution generally. Some papers refer to particular SDGs as financial inclusion and the role of selected technologies or investments. This trend has not yet been reflected in European studies. Only a few papers directly refer to the relationship between FinTechs and SDGs achievement in European countries. They analyse the role of external factors in FinTech industry development and some SDGs achievement in Europe, the relationship between SDGs and equity indices, FinTechs contribution to funding, students' awareness in this field or present selected cases of their market activity. The results have shed light on existing academic literature embracing both FinTech and SDGs issues in Europe, explored emerging trends in current research and identified the main areas for further research. It led to the conclusion that there is a need to conduct further research in this field. Undoubtedly, revealing FinTechs potential and using it for supporting SDGs will change the business landscape in Europe and the rest of the world.

As a result of this study's exploratory character, it has some limitations characteristic for research conducted in this field. They mostly result from the lack of available statistical data that influence the research methodologies. Additionally, the research refers to general SDG scores, which may be less informative than particular targets. Exploring the relationship between them and FinTechs seems to be an interesting field of further research.

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