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Academic Research Papers

Academic Research Papers

The future of Wealth Management: A systematic review about the use of financial technology in the wealth management sector

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Abstract

Fintech is widely used as an umbrella term for various areas within the financial service sector. The research field of financial technology is vast and ranges from practical business model innovations to sophisticated technical coding and programming research. Although a growing body of research looks at the general impact of financial technology (fintech) on the financial services sector, there is a lack of deep insight into the actual impact of technologies on the wealth management sector. This study aims to synthesize the dispersed literature about financial technology and provide a thorough perspective on the various research perspectives related to financial technology and its development and progression over time. Thereby fostering an understanding of its applicability within the wealth management sector. Furthermore, it aims to show the impacts of technological change alongside the wealth management process to illustrate the effects on each process step. Thereby putting in context the current stage of knowledge while providing the basis for further research regarding wealth management technology (WealthTech).

The research is based on a two-step approach: (i) a systematic literature review including 173 articles published in *Web of Science* between 2019 and 2024. Secondly, (ii) a bibliographic map generated via VSOviewer to summarize the different fintech applicability in wealth management. Being still at an early stage within the financial technology research, the study suggests that the current research in WealthTech can be grouped into four main research areas: The automation of client interaction through AI chatbots and avatars while collecting significant client data; Provision of tailored financial advice through Big Data analytics from various data sources; Investment portfolio automation based on Rob-advisors; and Just-in-time reporting of financial statements for clients and authorities alike. Above all, holistic risk management through the use of Big Data, AI, and the interconnection with external data sources.

While this paper is written, new technologies and use cases are emerging at a fast pace. Thus, making it a current snapshot of the research stage in 2024. The dedicated focus on the applicability of financial technology in wealth management limits the available literature significantly. In addition, the novelty of the topic and the focus on review articles leads to neglect potentially relevant grey literature publications. By understanding the current literature, practitioners can better grasp the latest

developments and anticipate the potential of technology to improve the wealth management process. Thus, the review aims to guide practitioners when evaluating and implementing new technology solutions for their wealth management needs. Furthermore, it shows the insufficiencies and unaddressed gaps for which further research is needed in order to be of practical use. This review synthesizes the prevailing state of wealth tech research and establishes a trajectory of its research development. As such, it comprises the most recent development and guides academics and practitioners alike while drawing upon the latest stage of research.

Keywords – Financial Technology; Fintech; Wealth Management; WealthTech.

Paper type – Literature Review

Sommario

Il futuro del Wealth Management: una revisione sistematica sull'uso della tecnologia finanziaria nel settore della gestione patrimoniale. – Fintech è ampiamente utilizzato come termine generico per varie aree del settore dei servizi finanziari. Il campo di ricerca della tecnologia finanziaria è vasto e spazia dalle innovazioni pratiche dei modelli di business alla sofisticata ricerca tecnica sulla codifica e sulla programmazione.
Sebbene un numero crescente di ricerche esamini l'impatto generale della tecnologia finanziaria (fintech) sul settore dei servizi finanziari, mancano informazioni approfondite circa l'effettivo impatto delle tecnologie sul settore della gestione patrimoniale. Questo studio mira a sintetizzare la letteratura dispersa sulla tecnologia finanziaria e a fornire una prospettiva approfondita sulle varie prospettive di ricerca relative alla tecnologia finanziaria e al suo sviluppo e progressione nel tempo, promuovendo così la comprensione della sua applicabilità nel settore della gestione patrimoniale. Inoltre, mira a mostrare gli impatti del cambiamento tecnologico insieme al processo di gestione patrimoniale per illustrare gli effetti su ciascuna fase del processo, contestualizzando così lo stato attuale delle conoscenze e fornendo, nel contempo, le basi per ulteriori ricerche sulla tecnologia di gestione patrimoniale (WealthTech).
La ricerca si basa su un approccio in due fasi: (i) una revisione sistematica della letteratura comprendente 173 articoli pubblicati su *Web of Science* tra il 2019 e il 2024; (ii) una mappa bibliografica generata tramite VSOviewer per riassumere le diverse applicabilità di fintech in ambito patrimoniale gestionale. Pur essendo ancora in una fase iniziale, lo studio suggerisce che l'attuale ricerca in WealthTech possa essere raggruppata in quattro aree principali: automazione dell'interazione con i clienti attraverso chatbot e avatar AI durante la raccolta di dati significativi sui clienti stessi; fornitura di servizi finanziari mirati attraverso l'analisi dei Big Data da varie fonti di dati; automazione del portafoglio di investimenti basata su Rob-advisor; rendiconti finanziari just-in-time sia per i clienti che per le autorità. Soprattutto, una gestione olistica del rischio attraverso l'uso di Big Data, AI e l'interconnessione con fonti di dati esterne.
Mentre questo articolo viene scritto, nuove tecnologie e casi d'uso stanno emergendo a un ritmo rapido: si tratta quindi di un'istantanea attuale della fase di ricerca nel 2024. L'attenzione dedicata all'applicabilità della tecnologia finanziaria nella gestione patrimoniale limita in modo significativo la letteratura disponibile. Inoltre, la novità dell'argomento e l'attenzione agli articoli di revisione portano a trascurare pubblicazioni di "letteratura grigia" potenzialmente rilevanti. Comprendendo la letteratura attuale, i professionisti possono cogliere meglio gli ultimi sviluppi e anticipare il potenziale della tecnologia per migliorare il processo di gestione patrimoniale. Pertanto, la revisione mira a guidare i professionisti nella valutazione e nell'implementazione di nuove soluzioni tecnologiche per le loro esigenze di gestione patrimoniale. Inoltre, mostra le carenze e le lacune irrisolte per le quali sono necessarie ulteriori ricerche per avere un utilizzo pratico. Questa revisione sintetizza lo stato prevalente

della ricerca sulla tecnologia della ricchezza e stabilisce una traiettoria del suo sviluppo più recente, utile sia agli accademici che ai professionisti.

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1 Introduction

Financial technology (Fintech) has become a widely used term to describe any technology used in finance (Al-Sartawi, Al-Okaily, Hannoon, & Khalid, 2022). Thereby it is also used in finance research to describe technology-enabled innovation in financial services (Rupeika-Apoga & Thalassionos, 2020). Its rise is strongly linked to standardisation and automation, as it is perceived to make processes less error-prone, faster, more secure and, above all, cheaper (Ashta & Herrmann, 2021). Thus, fintech can eradicate insufficiencies from unstandardised and labour-intensive processes (Matousek & Xiang, 2021). With these new technologies emerging, also new market players arise and move into the financial industry while shaping and disrupting it significantly (Chiu, 2016). Inevitably the financial service sector undergoes a significant transformational shift. Alt, Beck and Smits (2018) assert in their research that FinTech will transform the entire industry in the years to come. Thereby, reducing traditional jobs while even creating new job profiles, whereby technological knowledge will play a significant role in the labour market (Ashta & Herrmann, 2021). Furthermore, as the industry changes, so do the interactions between the market players and their clients. While banks relied on a dense branch network just a decade ago, most direct client services nowadays moved online (Carbó‐Valverde, Cuadros‐Solas, & Rodríguez‐Fernández, 2020; Zhou, Geng, Abhishek, & Li, 2020).

For existing market players, this rapid development is difficult to grasp and increasingly challenging to navigate, as indicated by Elsaid (2023). To recognize the key trends and to identify potential challenges and opportunities, wealth and asset managers are required to have fundamental know-how about the new technologies. Despite the ever-growing field of financial technology publications, which includes very specialised and highly technology-introduced publications, it becomes increasingly challenging to comprehend its developments. While a significant amount of literature deals with financial technology's impact on the entire financial industry (Thakker & Japee, 2023; Elsaid, 2023) very little literature provides detailed applicability for the wealth management sector. Most of the research covers financial technology in general for the entire financial industry. Even studies conducting systematic literature reviews, such as in Varma et al. (2022), Ghandour (2021) and Giglio (2021) provide a very broad picture. However, their research dominantly covers the entire financial industry and falls short in addressing specific fields in finances, e.g. the highly specialized wealth management sector. This present study in contrary to the above-named ones, addresses the problem for wealth management companies of missing out on the latest developments. Using a systematic literature review this study ensures that the latest developments are addressed and synthesized. Thereby, it identifies relevant Fintech publications, specifically relevant for the wealth management sector and summarizes them into a conceptual framework alongside the wealth management process. In addition, it identifies the potential impact of the identified technologies on wealth management businesses and derives

potential trends, implications and research gaps. It serves as a guide for practitioners with valuable and condensed insight on the latest research trends; allowing them to make more informed decisions. Furthermore, this review acts as a starting point for further research by uncovering unaddressed research gaps.

2 Background

The market for financial technology is moving rapidly and shows an ever-growing importance in the financial industry (Branzoli & Supino, 2020; Zavolokina, Dolata, & Schwabe, 2016). While the term FinTech is widely used and often used as a synonym for every technical development in the financial service sector, it needs to be defined and explained at first and set in contrast to WealthTech. While FinTech is used to generalise every technological enhancement in finance, the research develops and becomes more sophisticated and defined in each of its sub-fields.

2.1 FinTech

As the abbreviation of Financial Technology, FinTech is described widely by numerous authors in different ways. The use of technology in the financial industry is, according to Taherdoost (2023), the main driver of revolutionising the financial sector. Financial technology drives innovation in the financial services industry and enables new business models, products, and services (Jarvis & Han, 2021). Fintech has enabled wealth management firms to increase operational efficiency (Varma, Nijjer, Sood, Grima, & Rupeika-Apoga, 2022), reduce costs (Agarwal & Chua, 2020), and provide personalised financial advice (Malladi, Soni, & Srinivasan, 2021). Thereby the underlying technologies such as artificial intelligence (AI) and machine learning (ML) are used to automate financial processes and analyse data more quickly and accurately (Wasserbacher & Spindler, 2022*)*.

Financial Technology (FinTech) has led to new ways financial institutions conduct business and interact with clients (Gomber, Koch, & Siering, 2017; Pollari, 2016). Another definition – which should function as the working definition for this paper – comes from the financial stability board. It defines FinTech as a "technology-enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services" (Rupeika-Apoga & Thalassionos, 2020, p.3). Even this definition is not concluding, as the technologies subjected to FinTech are not named explicitly. However, for this research, we generalise and consider any technological novelties in account which can be used to change existing

processes in the financial sector. These technological novelties could be AI, Big Data etc. but are not limited to those. As the research in FinTech intensifies, new terminologies are introduced constantly.

2.2 WealthTech

In general, wealth management is a practice that helps individuals or families achieve their financial aims and utilise their existing financial resources (Dew, Dean, Duncan, & Britt‐Lutter, 2020). Thereby it aims to help them make informed financial decisions in order to reach the defined financial goals (Brayman, Grable, Griffin, & Finke, 2017). Wealth management is a comprehensive approach to managing individuals' financial resources and comprises, but is not limited to the following processes: financial planning (Duska, 2022), investment management, tax planning (Horan & Adler, 2009), estate planning (Jennings, Horan, Reichenstein, & Brunel, 2011), risk management, retirement planning (Madhani, 2009), insurance planning (Jennings et al., 2011), and cash flow as well as debt management (Maude, 2010). Thus, it is similar to corporate finance management but focuses instead on private individuals and families. With the emergence of new technologies, these processes can be structured in different ways and potentially made more efficient in terms of time spent on several tasks and cost reduction. To understand finance and technology in conjunction with wealth management, these terms have to be defined to set the frame of this paper. The term FinTech can include a wide range of technologies, such as cloud computing, blockchain technology, robot advisers, artificial intelligence, and machine learning (Varma, Nijjer, Sood, Grima, & Rupeika-Apoga, 2022; Hendershott, Zhang, Zhao, & Zheng, 2021; Cai, 2018). It is utilised in the wealth management industry to increase wealth management service – efficiency, cost-effectiveness, and transparency (Sonawane & Motwani, 2023; Cao, Yang, & Yu, 2021). In order to automate portfolio management and offer customers individualised investment advice, robo-advisors, for instance, make use of pre-defined algorithms. To increase the security and transparency of transactions, blockchain technology is leveraged, while artificial intelligence and machine learning are used to offer clients customised recommendations and guidance. Dziawgo (2021, p.146) describes WealthTech as "Technological developments and services created to transform existing investing solutions (wealth management, trading) across all asset classes".

In Schueffel (2016), FinTech is described as a new field within the financial industry that improves financial services using technology. Applying this definition to the sub-sector of FinTech (here WealthTech), the description for WealthTech, therefore, is "the improvement of wealth management services by making use of technology".

With the emergence of new technological advancements, more tailored research becomes increasingly important to address the latest trends and make the best use of the available technologies in

every area of the financial sector. Wealth management firms must be prepared and adapt to the changing landscape as these technologies become more widespread. The systematic review of the literature provides a condensed analysis of the current research stage and uncovers potential benefits and inconsistencies within the wealth management sector. While from a practical perspective, cost-saving and efficiency reasons are prevailing, from a research perspective, this systematic review contributes to the ever-growing specialisation within the financial sector. It applies FinTech research to the more granular wealth management sector.

3 Method

This systematic literature review explores the current research stage regarding financial technology and wealth management. It comprises of primarily academic sources from peer-reviewed journals. Industry publications are used to add the latest practical view on the topic, which might not yet be included in the latest review articles. The review draws upon the techniques outlined in Lacey, Matheson, and Jesson (2011) and Vom Brocke et al. (2015), including a bibliographic map to identify additional themes and links among them as in Tamala, Maramag, Simeon, and Ignacio, (2022). To grasp the latest trends, the focus will be primarily on articles published in the last five years due to the topic's novelty. Therefore, only literature published from 01.01.2019 to the first quarter of 2024 in the academic database Web-of-Science is considered in the analysis.

3.1 Search terms

The search terms used include "wealth management", "fintech", "digital wealth management", and "AI in wealth management". The search terms are specifically used to identify the research conducted regarding technology in the wealth management sector. An exception is the search term "AI in wealth management", which is used to consider the latest AI developments fostered by the emergency of ChatGpt and large language modes. This study will then analyse the literature to identify common themes and trends of technological applicability in wealth management. The following search term combinations were used to tailor the search results:

TS = ("Wealth management" and "Technology" or "FinTech" or "Financial Technology" or Wealth management and Technology*)

3.2 Exclusion criterion

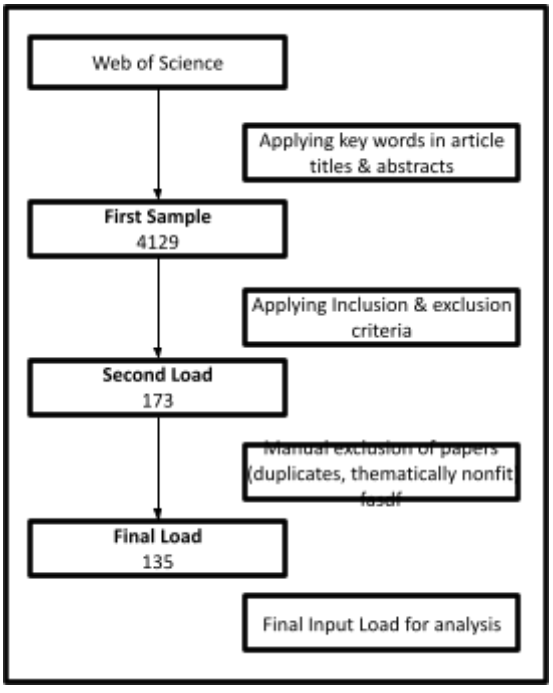
Based on the novelty of financial technology in the wealth management sector, the actual number of academic works is relatively small. Thus, making it necessary to widen the search term while applying elimination criterion to further narrow down the extended results. To grasp the latest stage of research all articles older than 5 years are excluded. The chosen literature comprises predominantly of reviewed articles to maintain a high standard of the research quality.

Table 1 – Criteria selection

Inclusion criteria	Exclusion criteria
English texts	Non-English texts
Peer-reviewed	Non-peer reviewed
Papers in the last 5 years (01.01.2019/2024, today)	Papers before 2019
Paper type: article, review article, early access article	Other

Source: our elaboration

Figure 1 – Paper selection process



Source: our elaboration

Without the elimination criterion, the search result comprised 4129 articles. The exclusion of non-peer-reviewed articles significantly reduced the number of results, thus eliminating also early-stage articles with interesting findings. To fully comprehend the stage of research, these documents were re-added to the literature review.

The chosen selection process, as outlined in Figure 1, reduced the number of publications significantly. After the application of the inclusion and exclusion criterion, only 173 remained. The manual exclusion of all non-relevant articles and the addition of wrongly excluded articles led to the total of 135 articles.

3.3 Analysis

The literature analysis comprises the total number of publications per year, the geographic distribution, the Journals publishing the papers and the used theories and methods.

The number of publications per year provides an indicator of the growing interest in the topic and further provides a hint about the maturity stage of the research. Thus, allowing to demonstrate an interest in the topic and its growing importance. The geographic distribution of the publications allows to derive the growth markets interested in the topic. The applied theories and methods provide insights into the conducted research. It furthermore allows to identify flaws in the research, which could open up the discussion and lead to more profound studies fostering further research.

4 Results

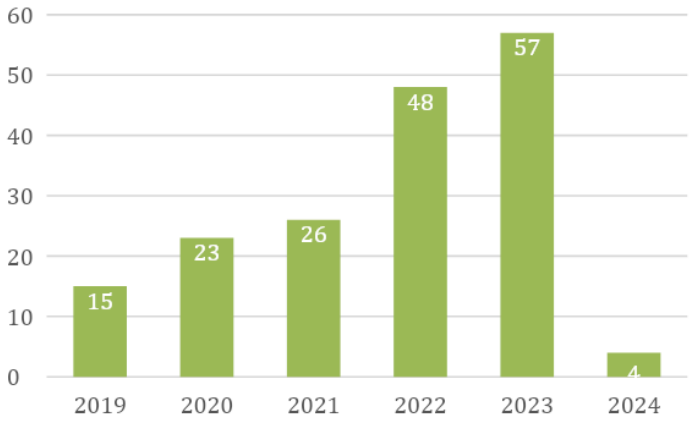
This section outlines the findings of this study by referring to the four objectives researched in this systematic review. It starts with the general analysis including the increasing number of publications in that field, their geographical distribution, journals in which they are published, and the applied theories and methods used in these papers. In the second step, these research areas are analysed, providing insights into the most recent developments in each field. The section concludes with technology's impact on the wealth management sector, providing a controversial outlook that serves as a gate to further research in each of the corresponding fields. Thus, contributing to drawing upon the summary of this systematic literature review.

4.1 Descriptive analysis

4.1.1 Number of publications variables

Despite being still at the lower end of all FinTech publications, WealthTech research increasingly gets more traction. The number of publications in the last four years tripled, as shown in Figure 2.

Figure 2 – Number of articles published in the period 2019-2024 covering wealth management and technology



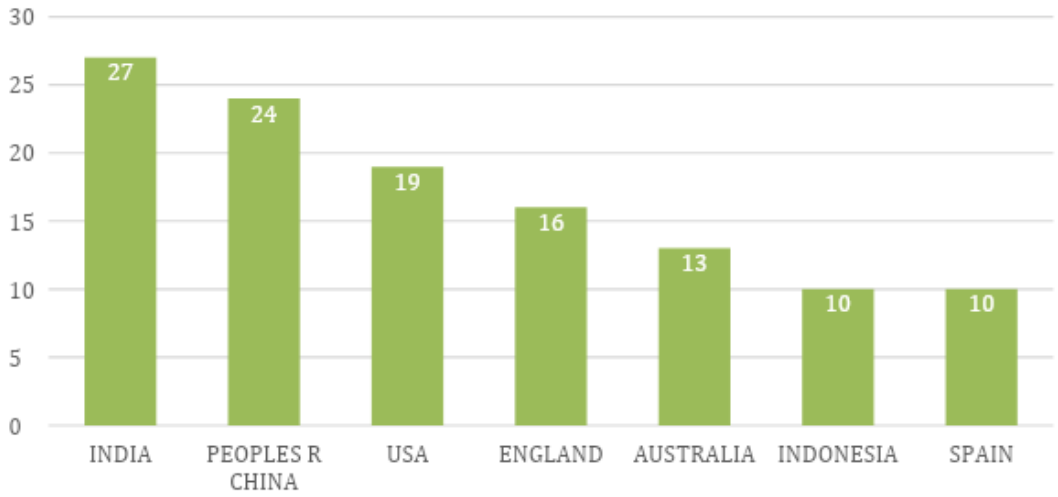
Source: our elaboration

The number of articles concerning wealth management and technology increased over the course of the last five years as revealed in Figure 2. It shows that in 2019 the number of publications in the field was only fifteen and the number of research papers increased significantly to 57 in 2023. The increase in the number of publications can be explained by different aspects, e.g. the intensified research, which does not only cover FinTech in general but also gets more detailed; additionally including categories such as AI, Blockchain, and Metaverse. Furthermore, the increasing industry awareness and the constant digitalisation push bolstered during the COVID-19 pandemic might positively impact the number of research (Naz, Karim, Houcine, & Naeem, 2022). Despite the increasing number of scientific papers, the literature about financial technology in conjunction with wealth management is rather small. The figure also reveals that the research of Wealth-Tech appears to be at an early stage with great potential for more research to come.

4.1.2 Geographic distribution

The geographic distribution is unsurprisingly represented by the largest economies and countries defined by a number of people and universities. India followed by the People's Republic of China has the most publications in the field, which might also be due to the significant wealth growth in these economies over the last years.

Figure 3 – Geographical distribution of the publications



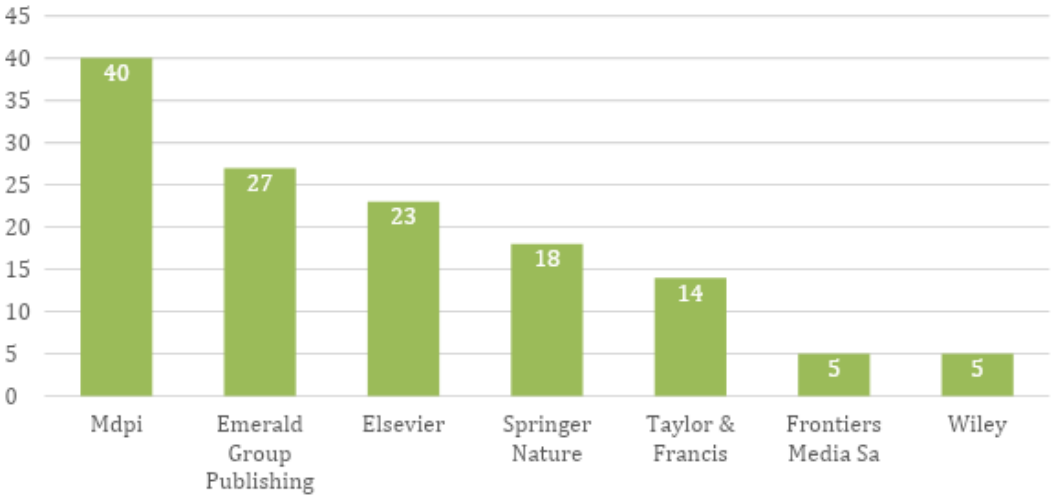
Source: our elaboration

4.1.3 Main Publishers & Journals

This systematic literature review attributed the analysed publications to 10 leading publishers. 24 were published in Mdpi, while 18 originated from Emerald Publishing, followed by 17 Elsevier and 10 Springer articles. Furthermore, also 4 articles each were published by Taylor & Francis, Frontiers Media and Willey.

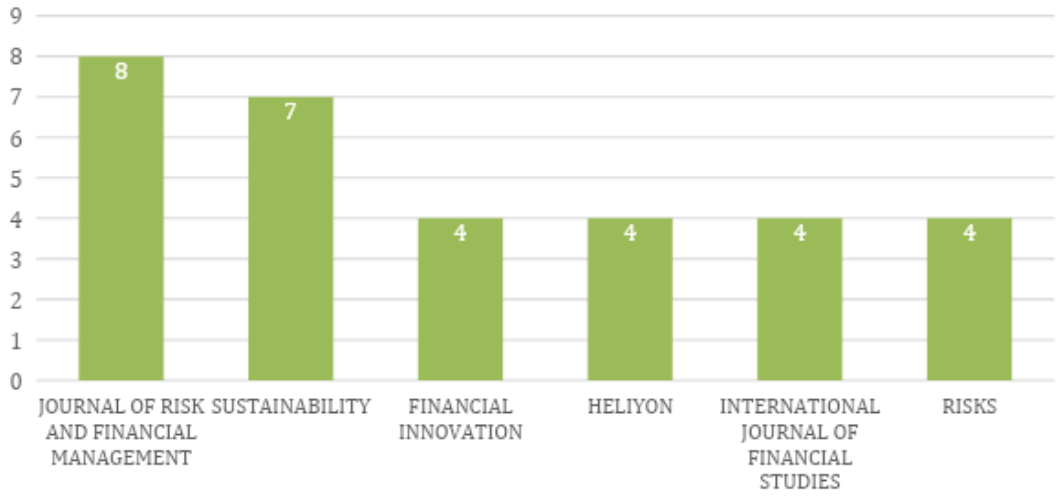
The leading journals identified during the analysis are shown in Figure 5. The first three Journals belong all to Mdpi. They count for 8 publications in the Journal of Risk and Financial Management, 7 publications for *Sustainability* and 4 publications in *Risk*. The reason for the dominance of Mdpi Journals among the first places might be that they allow an easier publication process. Furthermore, the are open-access, contributing to a more widespread access.

Figure 4 – Publishers covering the topic of technology



Source: our elaboration

Figure 5 – Journals covering the topic of technology and finance



Source: our elaboration

4.1.4 Research methods used in Wealth Tech research

The analysed articles used different approaches in the research designs and methods. The methodological designs used in the WealthTech research at the current stage comprised primarily of two main research approaches (Table 2/3). Qualitative research methods appeared dominantly in the form of interviews. Quantitative research design appears not to be available on a widespread scale. The only exception is the combination of interview and survey data. The reason for that might be the novelty of the topic and the limited available longitude data at the current stage.

Table 2 – Research designs

Methodological design	Number	%
Qualitative	53	40
Quantitative	10	7
Mixed method	72	53

Source: our elaboration

As for the methods used for data collection, the findings show that the data collection is based on third-party information in 95% of the cases. This includes the reference of pre-conducted user acceptancy studies as in Seiler and Fanenbruck (2021) and above all, literature reviews and bibliographic studies based on data from Web-of-science, Scopus or related databases as in Ghandour (2021) and Varma et al. (2022). The significant amount of review articles compared to qualitative and quantitative articles is recognisable and can be explained through different factors. These might be due to the topic's novelty, whereby actual first-hand data is limited, as well as the lack of longitudinal studies and historical data. Furthermore, the access to the discreet wealth management sector makes it difficult to acquire insights and data. This might be why most of the articles cover Fintech and its implications on a general level without putting it into context to actual areas within finance.

Table 3 – Data collection

Data collection method	Frequency
Case study	1
Interview	2
Survey	2
Questionnaire	2
Database	129

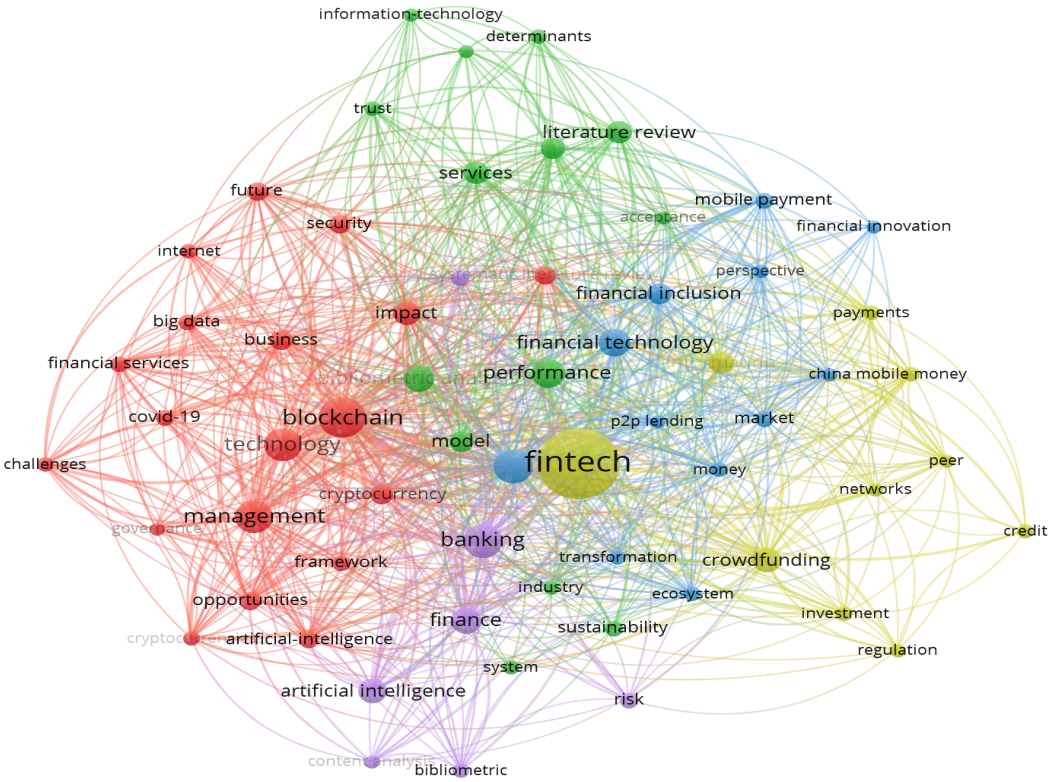
Note: differences occur due to multiple selection possibilities.

Source: our elaboration

4.2 Bibliometric mapping

By using the bibliometric mapping of VOSviewer, key themes and trends are visualised, establishing the links between the main themes and their interrelations to other research fields & topics. The network structure in Figure 6 displays the result of the used search term for this review. Thus, it reveals additional keywords of related topics used in the analysed publications.

Figure 6 – Sub-themes network structure of technology in wealth management research



Source: produced with VOSviewer based on Web-of-Science data analysis

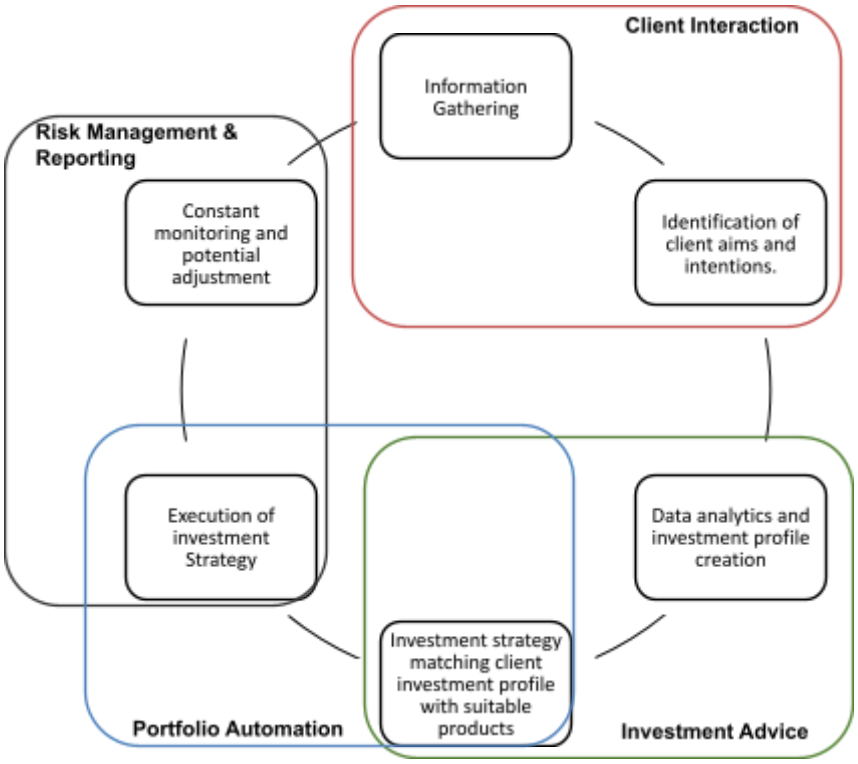
Fintech builds the key centre of the theme network structure functioning as the overarching umbrella Term. Thereby, the cluster reveal the technological topics around Fintech, namely blockchain, cryptocurrency, artificial-intelligence, mobile payments, and big data. Thus, it allows to identify the actual technologies that are currently of interest. Furthermore, it unveils topics which might be of additional interest in the research community, such as the security aspects around blockchain, its impact as well as the management of the technology and uses a cryptocurrency. Other clusters appear to be

around the banking in general linking several aspects to it such as funding and payments. The bibliographic mapping in Figure 6 provides a hint about the actual technologies the current research is focusing on, such as blockchain, AI, cryptocurrencies-bitcoin. In addition, further topics relevant around financial technology such as management, information and sustainability are mentioned. Linking them to each step of the simplified wealth management process (Figure 7) provides an indication about which technology might be incorporated for each of the steps in the process. In essence it also hints towards processing steps which are more susceptible to these new technologies.

4.3 Research topics within the wealth-tech research (Framework)

As the VOSviewer analysis of the articles revealed, there are several topics which appear more frequently in the literature. These topics did not explicitly target wealth management in general but can be clustered instead in several sub-areas alongside the wealth management process. Thereby, the identified keywords can be clustered among topics focusing mainly on labour-intensive processes and the focal points between technology and human interaction. The research names several areas being significantly shaped alongside the simplified wealth management process through new technologies (Figure 3). These are technological-enabled automation (Scherer & Lehner, 2023) big-data analytics (Nobanee, 2021) i.e., data science, cloud sharing (Singh & Kumar, 2014) and storing, as well as artificial intelligence (Bisht et al., 2022).

Figure 7 – Framework of the wealth management process (WM) and its key areas of technological impact



Source: adjusted from Evensky, Horan, and Robinson (2011)

Table 4 – Key literature topics and WM process

Client Interaction **Keywords:** process automation, chatbots, virtual assistants, advisor access, information, performance, data collection
As financial service providers aim to provide the best service to the clients while also cutting costs, it is likely that over the next decade, the automation of client and advisor conversations will become more automated and less human-based (Haberly, MacDonald-Korth, Urban, & Wójcik, 2019). Based on the collected data of the client – which can also be from third databases, e.g., credit-scorings, insurance requests etc. – the client's potential needs can be assessed. The pre-collected data, such as the clients, age, its credit history, or amount of children, can influence the investment assessment (Mogaji & Nguyen, 2022). Thus, allowing to offer the most suitable products to the client, corresponding to its current investment situation and intended goals (Königstorfer & Thalmann, 2020). Furthermore, the introduction of augmented reality as a new form of client interactions is raised by several authors. Chong, Keeling and de Ruyter (2021) predict using augmented realities as avatars, which can assist in client request handling.
Investment Advice **Keywords:** networks, bigdata, AI
As the current research predicts, tailored investment advice will factor in various aspects, such as the risk tolerance of the client (Tertilt & Scholz, 2018) or the clients' financial needs. Furthermore, parameters which are already researched in other financing fields, such as the forecast of future cashflows in prediction modes on life expectancy (Moro Visconti, Montesi, & Papiro, 2018), spending habits (Zheng, Zhu, Li, Chen, & Tan, 2019) and required funding can be put into the analysis to conduct tailored investment advice to the client. Thereby, using AI reduces manual labour, costs, and analysis time. This makes investment advisory processes cheaper and more accessible for a broader spectrum of clients (Jarvis & Han, 2021).
Portfolio Automation **Keywords:** blockchain, bitcoin, cryptocurrency, AI
The integration of big data analytics allows the use of predictive models, which would take up significant time for a human portfolio manager to comprehend. Adding additional features, such as the automated market news analysis can significantly enhance the performance. Ferreira, Gandomi, and Cardoso (2021) elaborate in their research on AI capabilities to evaluate emerging market information just in time when they are released to the market.
Risk Management & Reporting **Keywords:** risk, security, information technology, impact, financial inclusion
Boreiko and Massarotti (2020) state that using new risk models or even several risk models combined can lead to a better overall risk assessment. The aggregation possibilities of scenario analysis, or sequential stress testing allows, due to Janabi (2021), a better understanding of the associated risk and their potential impacts. On the contrary, Kurshan, Shen, and Chen (2020) state that the widespread use of stress test models has yet to exist for AI. Furthermore, as stated by Dvorski, Kovsca and Lacković (2020), financial institutions can use different data sources for their risk reporting if the required standards are being met.

Source: our elaboration

4.4 Discussion of the findings

4.4.1 Descriptive Analysis

Based on the findings in the descriptive analysis, it can be concluded that research specifically targeting technology advancements in wealth management is still at a very early stage. This is indicated by the rather small number of publications and its continuously growing number over the last few years. The large number of review articles and the reliance on third-party data indicates that the topic appears to be diffuse and not well-defined yet. Thereby, only the essence of the current research stage is delivered in this paper. More detailed research is required to provide a concise picture in which direction the trend of technological applications in wealth management is heading. The geographical distribution of the articles provides a hint in which countries the research is of growing importance. The domination of articles published in India and China indicates the significant importance of the topic in these countries. Thus, more research in these countries could be expected. However, as trends are shifting rapidly and research narratives can change quickly, regional trends and outlooks provide merely a hint then a reliable prediction. The limitation of this paper comes from the search terms which refer primarily to wealth management and technology. As most of the current research is bundled under FinTech, some topics which could have been clustered under wealth management research might had been neglected. Thus, leading to the potential need of extending the search terms and clustering existing FinTech research under more define categories.

4.4.2 Research Topics

The identified research topics are a snapshot of the current research trend which could change as the technology evolves. While the perceived advantages are widely addressed, the majority of research falls short addressing the risks and disadvantages.

The key research areas alongside the wealth management process circle – client interaction, investment advice, portfolio automation and risk management – benefit hugely from technological advancements. As presented in the findings above, these advancements, such as automation, increased analysis and processing time, and interconnection through data sharing, make the whole wealth management process perceivable easier. However, as the underlying technology becomes more sophisticated, it also adds to an increasing complexity. While at one end the processes become easier, on the technological end, it becomes increasingly more difficult and harder to grasp. This development is widely neglected in academic research. Thus, research is required on system limitations and technological statuary stages. Furthermore, overreliance on technology could lead to missing out on the fundamentals and understanding the bigger picture. What is perceived nowadays as cutting-edge could

change in the future. The continuing trend of automated processes could lead to a statuary stage. At one point, the revival of human interaction could become a competitive advantage again.

5 Conclusion

Compared to the widespread term FinTech and the under-it accumulated studies, WealthTech is only at an early stage of research within the financial technology research. As most of the research focuses on financial technology in general, not many papers conduct more profound research on the impact of technology on the sub-fields within the financial service sector. This might be due to the understanding that technological novelties impact the entire industry and can be assumed to have a universal importance for all the sub-fields.

Wealth management and technology have become a crucial topic in recent years as demographic change impacts the future of an entire sector. This bibliographic shows that certain developments have significant importance for the wealth-management sector. The interaction with clients at any time has significant importance on how they perceive the service quality of the financial service provider. The 24/7 availability enabled through human like Chatbots and avatars is predicted to become the state-of-the-art client interaction. At the same time, Big-Data analytics combined with AI will fundamentally change the data quality and potentially has a positive effect on the investment output. Collecting various data points from un-connected data-sources will lead to better prediction models and risk profiling of the clients as well as their investments. While the traditional financial advisor becomes less important, guidance through the abundance of new analysis methods and the interpretation of the generated output will become more critical. Thus, leading to the reduction of workforce and the significant cost-cutting in front areas of financial service providers. As AI models become more complex, increasingly sophisticated calculations and predictive models can be created. Thus, leading to more informed clients resulting in potentially better investment outcomes. While all these advancements can bring huge benefits regarding data quality and output generation, they can have negative social impacts. With increasing automation and the use of AI, it will become a matter of “who has the better technology” and predictive models. While services might become more cost-efficient initially, in the long run, it will be the question of who can afford the better systems and infrastructure. Thus, leading to questions on how to generate fair access to technology and how to provide inclusive services. In addition, cyber security aspects need to be addressed and appropriate measures put in place to avoid exploiting private data. Above all, the acceptance by the user is the most crucial factor. As the latest

research reveals, human-to-human interaction is still the preferred option when it comes to difficult and complex questions, as they cannot be performed by AI-powered and virtual advisors yet.

As this study comprises mainly of review articles, it neglects grey literature and working papers, which might include even more recent research. Furthermore, this review revealed a limited amount of quantitative research papers. This might be due to limited data access due to the topic's novelty but also based on the industry being discreet and not publicly sharing internal research data. Also, this review is limited to the publicly available informant and relies on third-party information. Thus, the current research exhibits several limitations which should be addressed in further research. At first, the non-existence of longitudinal studies allows only vague predictions about technology development in the wealth management sector. It should be addressed in user acceptance studies and performance analysis to identify the actual effectiveness and adaption rates. Furthermore, ecological, societal and ethical aspects might be of further research interest as on how to enable fair and general accessibility and affordability of technology.

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Bibliometric analysis of Sustainable Business Models: Emerging trends and future developments

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Abstract

This research investigates the trends in sustainable business models (SBMs), tackling the existing lack in comprehensive literature analysis despite huge amount of studies related to this topic. By analysing 1085 publications on SBM from 2002 to 2021 using Elsevier's Scopus database, the research provides an empirical overview of the field, highlighting key contributions, authors, and journals. This approach not only ensures the creation of a rich, multidimensional dataset across different fields but also unveils the intricate networks of research clusters that define the SBM domain. Advanced network analysis using VOSviewer software identifies main research clusters in the SBM literature. The analysis includes citation analysis, bibliographic coupling, and keyword co-occurrence. Findings indicate that many studies concentrate on innovations and value creation at the heart of SBMs. Moreover, the research trends identified in SBMs encompass several crucial areas: the integration of circular economy principles into business models, innovative approaches in sustainable supply chains, the intersection of entrepreneurship with corporate social responsibility, and the role of new technologies and artificial intelligence in enhancing environmental management. Finally, this work not only synthesizes the current state of SBM research but also identifies gaps and suggests directions for future investigations, emphasizing the importance of a multidisciplinary approach to developing SBMs that are economically viable, environmentally sustainable, and socially responsible. Through this enhanced understanding, the paper aims to inspire continued exploration and innovation in the field, supporting the global transition towards more sustainable business practices and operations.

Keywords – Sustainable Business Model; Bibliometric Analysis; Bibliographic Coupling; Co-citation Analysis; Clusters Analysis.

Paper type – Bibliometric Review

Sommario

Analisi bibliometrica dei modelli di business sostenibile: tendenze emergenti e sviluppi futuri. – La ricerca indaga le tendenze dei modelli di business sostenibile (Sustainable Business Models – SBMs), a fronte della carenza di un'analisi completa della letteratura nonostante l'enorme quantità di studi relativi a questo argomento. Prendendo in esame 1085 pubblicazioni in materia di SBM, dal 2002 al 2021, e utilizzando il database Scopus di Elsevier, la ricerca fornisce una panoramica empirica del campo, evidenziando contributi-chiave, autori e riviste. Questo approccio non solo consente la creazione di un set di dati ricco e multidimensionale in diversi campi, ma ricostruisce anche i principali cluster di ricerca nella letteratura SBM mediante l'impiego del software VOSviewer. Il lavoro include l'analisi delle citazioni, l'accoppiamento bibliografico e la ricorrenza delle parole chiave. I risultati indicano che molti studi si concentrano sulle innovazioni e sulla creazione di valore. Inoltre, le tendenze di ricerca identificate negli SBMs comprendono diverse aree cruciali: l'integrazione dei principi dell'economia circolare nei modelli di business, gli approcci innovativi nelle catene di fornitura sostenibili, l'intersezione tra imprenditorialità e responsabilità sociale delle imprese e il ruolo delle nuove tecnologie e dell'intelligenza artificiale nel migliorare la gestione ambientale. Infine, il lavoro non solo sintetizza lo stato attuale della ricerca, ma identifica le lacune e suggerisce le direzioni per le indagini future, sottolineando l'importanza di un approccio multidisciplinare allo sviluppo di SBM che siano economicamente ed ambientalmente sostenibili nonché socialmente responsabili. Attraverso questa migliore comprensione, l'articolo mira a sollecitare la continua esplorazione e innovazione nel campo, supportando la transizione globale verso pratiche e operazioni aziendali maggiormente sostenibili.

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1 Introduction

In recent years, there has been a growing interest in sustainable business models (SBMs) within both academic and economic sectors. Initially, SBMs aimed to guide firms toward a sustainable economic structure and circular approaches (Stubbs & Cocklin, 2008). The importance of SBMs has grown, with many businesses adopting them to enhance sustainability and performance (Nidumolu et al., 2015; Porter & Kramer, 2011). This shift is reflected in the increasing volume of scholarly studies, marking a departure from earlier times when sustainability was often overlooked in business model innovation (Schaltegger et al., 2012). Research has identified various subtypes and practices of sustainable and circular business models (Bocken et al., 2014; Geissdoerfer et al., 2018).

The concept of 'business models' evolved into SBMs during the late 1990s with the internet's rise, altering traditional financial and economic rationales (Boons & Lüdeke-Freund, 2013). Developing new business models, rather than just products or services, became seen as a pathway to competitive advantage (Zott & Amit, 2010). Business models serve multiple purposes, including performance assessment and innovation (Osterwalder et al., 2010; Zilia et al., 2023). Traditional models focused on efficiency and profit, but recent shifts have emphasized social and environmental impacts (Yip & Bocken, 2018; Lewandowski, 2016). This change aligns with growing awareness of corporate social responsibility and the circular economy (White et al., 2019).

Innovations in business models can facilitate significant shifts in business goals and value creation (Evans et al., 2017; Hernández-Chea et al., 2021). Sustainable models help manage and communicate a firm's value proposition, balancing ecological, societal, and economic aspects (Schaltegger et al., 2012). However, Upward and Jones (2016) noted that decision-making attributes in business models often do not align with holistic sustainability. SBMs,[1] incorporating a triple bottom line approach, address a range of stakeholder objectives, including community and environmental concerns (Geissdoerfer et al., 2018; Joyce and Paquin, 2016; Zilia et al., 2021) and are instrumental in integrating sustainability into corporate strategies (Bocken et al., 2014).

Recent reviews in the field have been numerous. Bocken et al. (2014) and Boons and Lüdeke-Freund (2013) explored sustainable business model archetypes and contexts, respectively. Upward and Jones (2016) developed a theoretical model of SBMs, while Geissdoerfer et al. (2018) identified a research gap in the application of business model innovation. Schaltegger et al. (2012)

[1] The evolution from traditional BM to SBM signifies a shift towards integrating environmental, social, and economic considerations into the core of business operations. An SBM not only aims for financial profitability but also seeks to address societal needs and environmental sustainability, creating value across multiple dimensions. This transformation is extensively discussed in the works of Schaltegger et al. (2016) and Bocken et al. (2014), who define SBMs as frameworks for businesses to operate in a manner that ensures long-term ecological balance and social equity alongside economic viability.

discussed the history and future directions of SBMs. Despite many high-quality reviews, bibliometric analyses in this field are limited (Bilan et al., 2020; Marczewska & Kostrzewski, 2020; do Carmo et al., 2023; Pan, 2023).

This study aims to understand SBM literature's conceptual interpretations, current state, and future directions using bibliometric analysis. It examines 1085 publications from Scopus' between 2002 and 2021, identifying influential articles, authors, journals, and study trends in SBMs. The research focuses on the pace of scholarly publications, influential sources and authors, significant research trends, and future directions in SBM research.

The research employs bibliometric analysis for an objective review of the literature, contributing to sustainability and SBM fields by identifying major articles, frequently used keywords, pioneers in the field, and key emerging sub-fields (Wallin, 2005; Nosratabadi et al., 2019; Pilarczyk, 2018).

The manuscript is organized as follow: Section 2 discusses the study methodology and data, and Section 3 describes the application of bibliometric approaches and graphically shows network results. Finally, Section 4 discusses the managerial implications of SBMs and Section 5 underlines the study's conclusion with future perspective and limitations of the work.

2 Methods and data

2.1 Search strategy

The strategy for conducting bibliometric analysis in our study was meticulously planned to ensure a comprehensive and precise understanding of the research progression in SBMs. This method aligns with the management research approach, as outlined by Donthu et al. (2020), focusing on understanding the social, cognitive, and conceptual structures of specific domains.

We began by selecting the appropriate resources database, a crucial step in effective bibliometric analysis. Our choices included Google Scholar, Web of Science (WoS), and Scopus, each with its unique strengths and limitations. Google Scholar, noted for its extensive archives (Levine-Clark & Gil, 2008), was considered less suitable due to its inability to distinguish true scholarly matches effectively, as critiqued by Jacsó (2010). WoS, while being a principal bibliometric source in many universities (Harzing & Alakangas, 2016), was compared against Scopus for its broader journal coverage. As observed by Marczewska and Kostrzewski (2020) and supported by Baier-Fuentes et al. (2019) and Mongeon and Paul-Hus (2016), Scopus emerged as a viable alternative to WoS, offering a comparable range of literature retrieval and citation analysis capabilities.

Our analysis procedure, as detailed in Table 1, involved specific retrieval conditions. The initial step was selecting relevant keywords, derived from a pre-research literature review. This process led to the identification of "sustainable business model" as a key term. To refine our search, we tested various keyword combinations in Scopus and WoS, eventually settling on "sustainable business model*" OR "business model AND sustainability" OR "business model* for sustainability" as our final search query.[2]

The comparative analysis of search results from both WoS and Scopus databases highlighted Scopus's superior journal coverage and volume of publications, largest citations, and abstract database covering (Alharthi et al., 2022), leading us to choose it for further analysis. Following this selection, we applied filters based on language, source type, and subject area, resulting in 1065 documents initially retrieved from Scopus. This number was further refined to 962 English language references. These references were predominantly articles, conference papers, reviews, and conference reviews, indicating their relevance to our research focus.

In terms of subject area classification, we discovered that the majority of pertinent SBM research fell within the Scopus topic categories of Business, Management, and Accounting; Environmental Science; Energy; Economics, Econometrics, and Finance. Indeed, in Scopus, papers are divided into broader and multidisciplinary categories, posing a risk of encompassing more general articles that only marginally address the topic under investigation. From a comparison between databases, it was discovered that searching for the topic 'sustainable business model' in Scopus reveals articles across 25 categories, whereas in WoS, it extends to 105 categories. Moreover, in Scopus, all these categories are grouped into four broad areas: Health, Social, Physical, and Life Sciences (see Baas et al., 2020). Consequently, we only considered categories that fall within the Social Sciences class.

For this reason, most of the articles analysed in this study are categorized in this class we identified as relevant, leaving out articles that merely mention the topic indirectly in fields not related to our goal (e.g. Nursing, Chemistry, Pharmacology etc.).

Accordingly, we selected studies from these domains, yielding a final sample of 692 records. The timeframe for our research spanned from December 2002, marking the inception of SBM research (Saeed et al., 2002), to December 2021. This period was chosen to capture the evolution and current state of SBM research comprehensively.

[2] For the execution of our query, we utilized the 'TITLE-ABS-KEY' search field in Scopus, targeting the titles, abstracts, and keywords of documents to identify relevant articles. Conversely, in WoS, we employed the 'Topic field' search criterion, which similarly encompasses the examination of document titles, abstracts, and keywords, ensuring a comprehensive coverage and retrieval of pertinent studies.

Table 1 – Sample data retrieval conditions

Retrieval condition category	Retrieval condition setting
Keyword	"Sustainable business model"
Retrieval strategy	"Sustainable business model*" OR "Business model AND sustainab*" OR "Business model* for sustainability"
Time span	December, 2002 – December, 2021
Database	Scopus (a total of 1085 valid studies were retrieved from the literature)
Publication stage	Final
Source type	Article, Conference Paper, Review, Conference Review
Subject areas	*i.* Business, Management and Accounting *ii.* Environmental Science *iii.* Energy *iv.* Economics, Econometrics and Finance
Code applied in Scopus	*TITLE-ABS-KEY ("Sustainable business model*" OR "Business model AND sustainab*" OR "Business model* for sustainability") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "cr") AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ENVI") OR LIMIT-TO (SUBJAREA, "ENER") OR LIMIT-TO (SUBJAREA, "ECON") AND (LIMIT-TO (LANGUAGE, "English")*

Source: Authors elaboration based on the data retrieval, 2022

2.2 Method of analysis

Section 2.2 of our study describes the bibliometric analysis methods used to examine sustainable business models. Bibliometrics involves managing and analysing bibliographic data from various publications using statistical techniques to enhance literature reviews (Ganzaroli et al., 2013). This approach helps identify key publications and analyses citation patterns through methods like author citation analysis, citation network mapping, and co-citation analysis (Ganzaroli et al., 2013; Gmür, 2003; Schildt & Mattsson, 2006).

We employed science mapping to understand the thematic focus within sustainable business models. Science mapping provides insights into a topic's scope, emerging themes, and evolution over time,

offering a comprehensive perspective with minimal researcher bias (Singh et al., 2022; Bhattacharyya & Verma, 2020).

The study utilized three primary methods of analysis: direct citation, co-citation, and bibliographic coupling (Belussi et al., 2019; Boyack & Klavans, 2010). Direct citation involves one paper citing another, co-citation occurs when a third paper cites two others, and bibliographic coupling happens when two articles are cited by a third. We focused more on Bibliographic coupling due to its accuracy in quantitatively assessing relationships between documents.

Bibliographic coupling measures the strength of the relationship between documents based on shared references (Boyack & Klavans, 2010; Zupic & Čater, 2015). Unlike co-citation, which tends to highlight earlier works, Bibliographic coupling is effective for exploring recent contributions as it is not constrained by the citation frequency of older papers (Ganzaroli et al., 2013; Vogel & Güttel, 2013). Additionally, we utilized co-occurrence of keyword analysis, employing text-mining algorithms on article titles, abstracts, and keywords to identify common themes (van Eck et al., 2010; Baker et al., 2020; Donthu et al., 2021). This method determines the association between keywords based on their frequency of appearing together in articles.

2.3 Clustering strategy

In our study, we adopted a clustering strategy using keyword co-occurrence, co-citation, and bibliographic coupling analyses. This approach aims to capture insights from both historical and contemporary research. We anticipated that these methods would yield clusters of articles with similar or related study topics. In the bibliometric network, each manuscript is represented as a node, and the connections, signifying either co-citations or bibliographic couplings, depend on the type of link being examined (Belussi et al., 2019). A standard approach in bibliometric analysis involves selecting a set of publications, applying bibliographic coupling or co-citation analysis to find similarities between pairs of documents, and using similarity indices for clustering (Boyack & Klavans, 2010; Donthu et al., 2021; Ellegaard & Wallin, 2015).

We used VOSviewer for visualization and analysis of bibliometric networks. Developed by van Eck and Waltman in 2010, VOSviewer excels in combining network visualization and clustering, with VOS standing for ‘visualization of similarities’ (van Eck & Waltman, 2010). It generates co-citation maps, bibliographic coupling, and clusters, employing a distance-based mapping method to denote the association strength between objects. In this mapping, the proximity of two items indicates the strength of their relationship, with closer distances suggesting stronger links (van Eck et al., 2010).

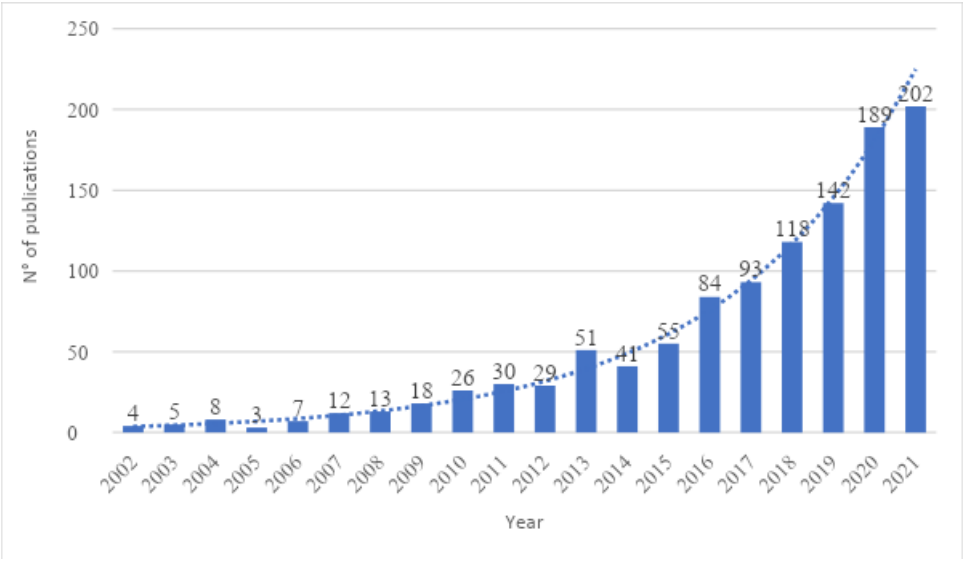
The benefits of this bibliometric technique are manifold. Firstly, it relies on quantitative statistical analysis and produces a credible dataset comprising a large number of peer-reviewed papers across various areas and specialties. Secondly, the visual network analysis facilitates a comprehensive understanding of the discipline's scope and structure. This is achieved by identifying prominent authors or articles and major clusters of ongoing studies. These insights are instrumental in outlining the main areas and trends within the subject field, providing valuable guidance for future research directions.

3 Results

3.1 Sample descriptive analysis

Sustainable business model research, initiated in 2002, has seen a significant increase in interest and publications over the past two decades. Figure 1 illustrates this growth, showing a modest start with fewer than 10 publications annually until a marked increase in 2013, when the number exceeded 50. This rising trend reflects the growing engagement of firms and scholars in this area.

Figure 1 – Yearly distribution and growth trend of publications (2002-2021) on sustainable business models



Source: Authors elaboration based on the Scopus Database, 2023

Globally, the research on sustainable business models is widespread, with key contributions from various countries, as detailed in Table 2. The United Kingdom, Italy, Germany, the USA, and the Netherlands are leading in this research area, alongside notable progress from developing nations like China and India.

Table 2 – Dispersion of the literature on sustainable business models over the world (2002-2021)

Country	Documents	% of documents
United Kingdom	96	12.8
Italy	77	10.3
Germany	72	9.6
United States	70	9.3
Netherlands	61	8.1
Sweden	53	7.1
Spain	41	5.5
China	35	4.7
India	32	4.3
France	26	3.5

Source: Authors elaboration based on the Scopus Database, 2023

For a focused analysis, a minimum of five papers per country, with at least 200 papers overall, was set as a criterion. This approach is reflected in the bibliometric mapping (Figure 2), where these countries are central to each cluster, showing strong links with other nations. In the United Kingdom, institutions like the University of Cambridge and the University of Manchester are prominent contributors, while the Delft University of Technology in the Netherlands and Lund University in Sweden each have a substantial number of publications. Italy also displays diverse contributions from universities like Università degli Studi di Torino and Università degli Studi di Napoli Parthenope.

Figure 2 – Bibliographic coupling of countries that publish in sustainable business models research

Source: Authors elaboration based on the VOSviewer software, 2022

Table 3 presents the top 10 journals in this field, with the *Journal of Cleaner Production* leading with 119 articles, followed by *Sustainability (Switzerland)* and *Business Strategy and the Environment*. These journals primarily focus on the business perspective, emphasizing long-term value generation and growth in sustainable business models. The British Food Journal also contributes by discussing sustainability in the food sector.

This increasing trend in publications is attributed to the growing recognition of sustainable business models in management circles, with researchers and journals exploring various aspects of this evolving concept. The *Journal of Cleaner Production*, known for its comprehensive coverage of sustainability,

exemplifies this trend, reflecting the broad interest in sustainable business models across different fields of study.

Table 3 – List of Top 10 Journals publishing articles on sustainable business models (2002-2021)

Journals	Number of documents
Journal of Cleaner Production	119
Sustainability (Switzerland)	105
Business Strategy and The Environment	19
Organization and Environment	11
Sustainable Production and Consumption	11
Energies	9
British Food Journal	8
Business and Society	7
Corporate Social Responsibility and Environmental Management	7
Management Decision	7

Source: Scopus Database, 2021

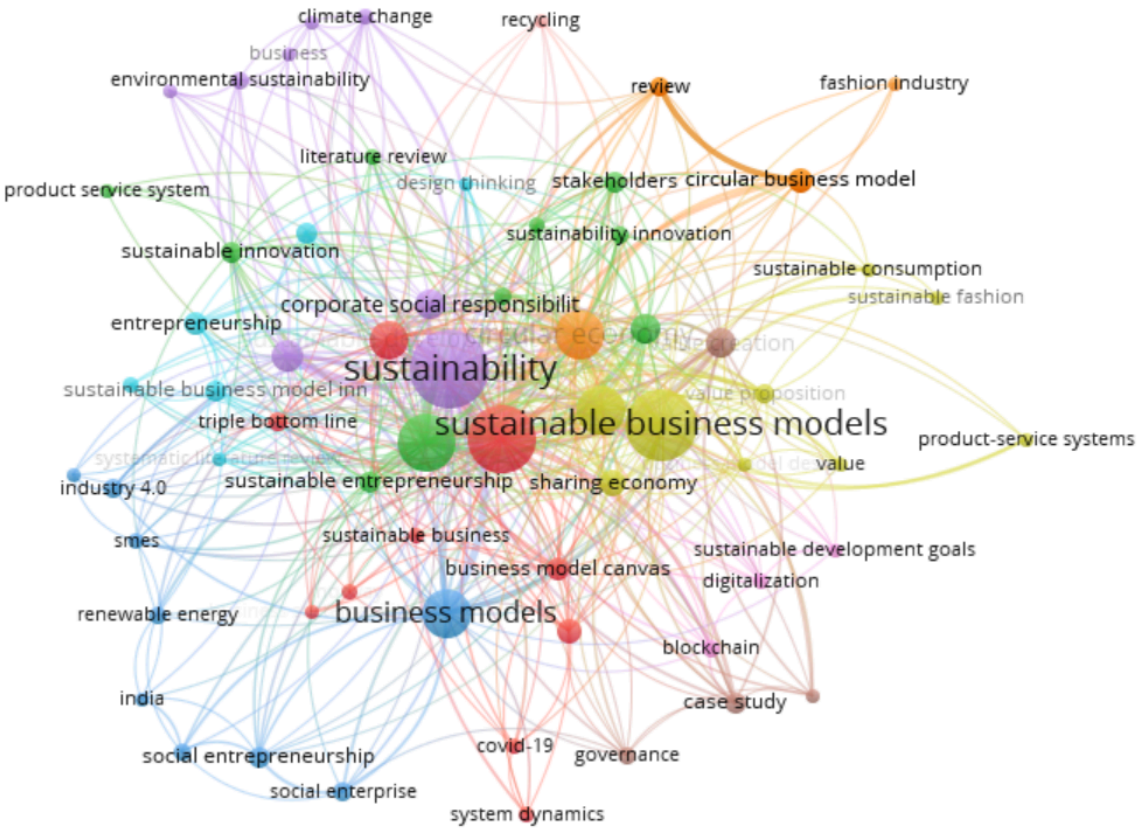
3.2 Co-occurrence analysis of authors keywords

Co-occurrence analysis of keywords is constructed for the study of sustainable business models (Figure 3). Based on an examination of 1844 keywords linked with all publications on sustainable business models, a keyword's minimum number of occurrences was set to 5 which yielded up to 64 major keywords. The term 'sustainability' is the most often used keyword in the research area with 135 occurrences. The terms 'sustainable business models' and 'sustainable business model' were repeated more than 200 times together. The keyword 'business model' was seen 77 times, whereas the keyword 'business model innovation' has 55 occurrences. The knowledge base related to the sustainable business models may be classified into 10 main clusters (Figure 3).

The top keywords indicate innovative approaches to sustainable business models used by firms that maximize long-term efficiency and enhance a massive advantage. The results display a variety of

technological terms like blockchain, digitalization, social media indicating that business models innovate along with the changing era for adapting a sustainable future.

Figure 3 – Co-occurrence of authors keywords of publications released in sustainable business models



Note: Clusters are divided into 10 colours: Red (sustainable development and sustainable business models); Green (sustainable entrepreneurship and business models); Blue (business models and industries transformation); Yellow (business model innovation and value creation); Purple (corporate social responsibility); Sky blue (strategy and design thinking); Orange (circular business models); Brown (value creation); Violet (blockchain and Web 3.0); Maroon (recycling).

Source: Authors elaboration based on the VOSviewer software, 2022

3.3 Citation network analysis

Citations are a key metric for assessing an author's credibility and the relevance of their work, serving as an indicator of quality. Table 4 highlights the most prominent sustainable business model publications based on their average annual citations. Notably, among the top five most-cited

publications, only one is a review paper, while the rest are articles, with no conference papers included. These influential publications predominantly date from 2013 to 2016.

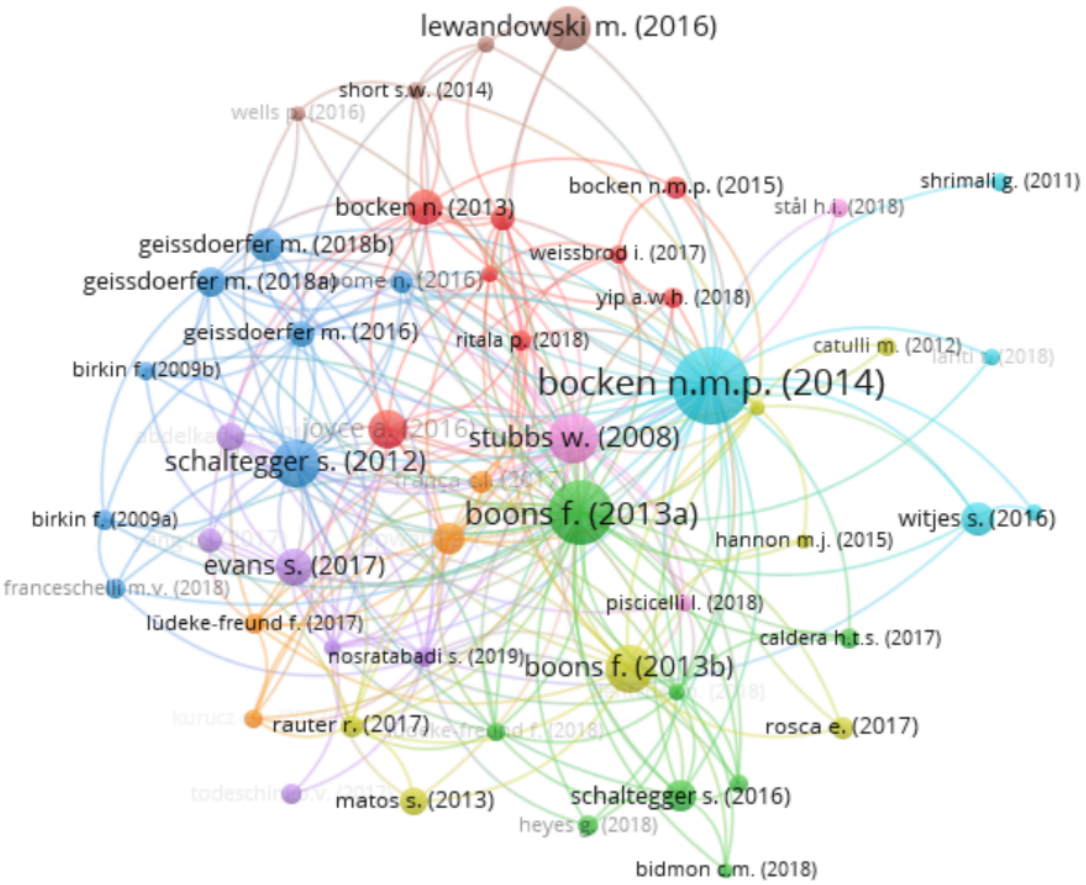
Leading the list is the study by Bocken et al. (2014), titled 'A literature and practice review to develop sustainable business model archetypes', which averages 157.12 citations per year (Table 4; Figure 4). This review underscores the significance of incorporating sustainability into business models and how innovations can transform business practices. The authors introduce a classification of sustainable business model archetypes, outlining structures and solutions that aid in developing sustainable business models. These archetypes are instrumental in driving innovation and delivering sustainability, yielding environmental, social, and economic benefits. Organizations can apply one or several of these archetypes to reorient their goals, thereby creating new avenues for developing sustainable value and enhancing the innovation process.

Table 4 – List of the Top 5 Articles by the number of citations

Rank	Authors	Source title	Contribution title	Year	Total citations	Average per year	Research direction
1	Bocken, Short, Rana, & Evans	*Journal of Cleaner Production*	A literature and practice review to develop sustainable business model archetypes	2014	1257	157.1200	Strategic research on sustainable business models
2	Boons, & Lüdeke-Freund	*Journal of Cleaner Production*	Business models for sustainable innovation: state-of-the-art and steps towards a research agenda	2013	901	100.11	Strategic research on sustainable business models and sustainable innovation
3	Lewandowski	*Sustainability (Switzerland)*	Designing the Business Models for Circular Economy – Towards the Conceptual Framework	2016	445	74.1	The design of circular economic models and sustainability
4	Evans, Vladimirova, Holgado, Van Fossen, Yang, Silva et al.	*Business Strategy and The Environment*	Business model innovation for sustainability: towards a unified perspective for creation of sustainable business models	2017	305	61	Strategic research on sustainable business models
5	Joyce, & Paquin	*Journal of Cleaner Production*	The triple-layered business model canvas: A tool to design more sustainable business models	2016	344	57.3	Processes and tools for business model innovation to design sustainable business models

Source: Authors elaboration based on the Scopus database, 2023

Figure 4 – Citation analysis of publications cited in sustainable business models research



Source: Authors elaboration based on the VOSviewer software, 2022

The second most cited paper in the field of sustainable business models is by Boons and Lüdeke-Freund (2013), titled 'Business models for sustainable innovation: state-of-the-art and steps towards a research agenda', receiving an average of 100.11 citations per year. This article explores the role of sustainable innovation within business models, viewing them as catalysts for innovation that integrate various aspects of production, consumption, and long-term investor expectations.

Lewandowski's (2016) paper, 'Designing the Business Models for Circular Economy-Towards the Conceptual Framework', with 74.1 citations per year, presents the circular economy as an innovative addition to business frameworks. It addresses the challenges of transitioning from linear to circular business models, offering a conceptual framework to guide this transformation.

Evans et al. (2017) contribute with 'Business Model Innovation for Sustainability: Towards a Unified Perspective for Creation of Sustainable Business Models', averaging 61 citations per year. This paper presents five propositions for establishing sustainable business models, identifying gaps and future research opportunities in the area of business model innovation for long-term sustainability.

Joyce and Paquin (2016) introduce the 'triple-layered business model canvas' in their article, receiving 57.3 citations per year. This tool aids in designing sustainable business models by outlining sustainability challenges and introducing new dimensions for analysis, such as horizontal and vertical coherence.

In addition to these prominent publications, other significant contributions in the field include works by Schaltegger et al. (2012); Witjes and Lozano (2016); Stubbs and Cocklin (2008); Boons et al. (2013); and Bocken et al. (2013), which have garnered substantial attention from both firms and researchers.

3.4 Co-citation analysis

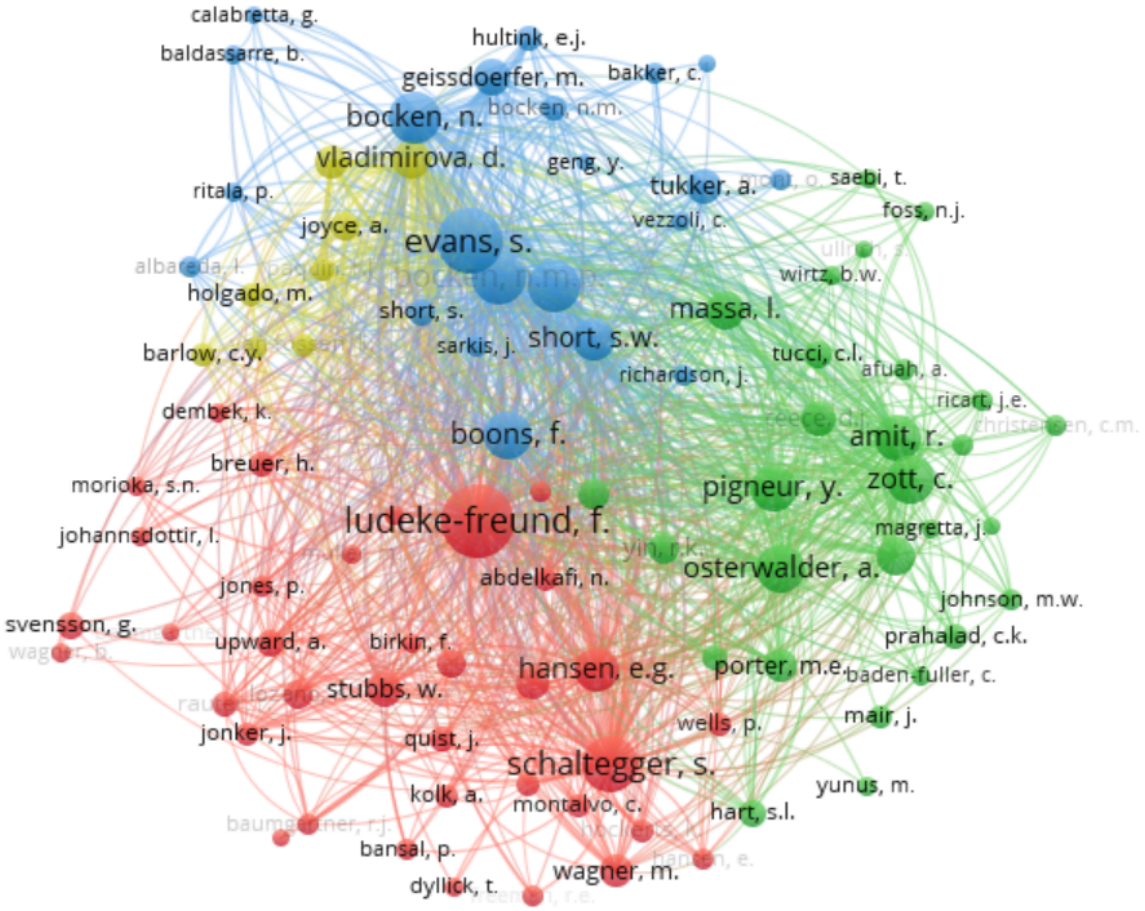
As discussed in the Section 2, co-citations are seen when two different publications are cited together by another publication, both publications appear to be in the cited references list of the publication. Co-citation analysis can identify and group articles that are not directly related to the sustainable business model theme because it finds matches in published citations of a sample of sustainable business model concepts. Co-citation analysis uses a retrospective approach and is extensively used to determine foundational work in specific fields of study. The degree of relevance of co-citation articles is calculated by applying the association strength of co-citations (Yaghtin et al., 2022).

Analysing the major studies and clusters, this study makes use of a co-citation analysis of 36,795 valid references, starting with a sample of 965 documents cited by the sustainable business model papers.

Because the number of references connected to the sustainable business model idea is very large, a final sample of 105 relevant references was selected to improve the quality of the publications, the authors set the threshold to make sure publications with at least 7 citations are included. In the literature, the choice of the threshold for references to be considered in co-citation analysis is discretionary and depends on several factors, such as the number of papers included in the analysis, the graphical visualization in VOSviewer, and the number of clusters obtained (see different thresholds: Belussi et al., 2019; Janssens et al., 2020; Tan, 2022). Therefore, given the extensive number of references associated with the SBM concept, we established a threshold of 7 citations to enhance the network's interpretability. This threshold reflects a judicious criterion for citation numbers, considering the topic's

maturity. It also strikes a balance between the diminished informational value resulting from an excessively high threshold and the rapid loss of potential relevance in cluster analysis observed with thresholds lower than 7.

Figure 5 – Co-citation of authors cited in sustainable business models research



Source: Authors elaboration based on the VOSviewer software, 2023

The potential of the authors can be known by the co-citation analysis. The study looked at the scholars who have got the most citations in the field of sustainable business models. In the co-citation analysis, there are 59 researchers with a minimum of 70 citations. A node in the mapping represents each author (Figure 5). The number of citations is proportional to the diameter of the node. Based on the output of Lüdeke-Freund (2020) this may be seen. The diameter of the node assigned to this author is

the biggest one, who is one of the most quoted authors in the field of sustainable business models research – together with Boons (2013). Both of the authors together published 'Business models for sustainable innovation: state-of-the-art and steps towards a research agenda' which is a major publication in the field of research with 940 citations. As a consequence of this, the papers of Lüdeke-Freund and Boons are among the most often mentioned works in the research field of sustainable business models (Figure 5). From the further analysis of the mapping, the most powerful participants in the sustainable business model study are: Lüdeke-Freund, Bocken, Schaltegger, Boons and Evans. They are designated as cluster leaders in the mapping analysis, which suggests that they draw other authors' attention to their study and, as a result, their articles are often referenced.

3.5 Bibliographic coupling analysis

Bibliographic coupling is a measure of the similarity between two documents, determined by the number of references they share (Ruggeri et al., 2018). Unlike co-citation, where two documents are linked through being cited by a third, bibliographic coupling links documents through their shared references to a third document. In bibliographic coupling, publications are associated because they cite the same documents. In addition, the bibliographic coupling uses a forward approach, since it looks at evolving trends in the literature and themes picked by authors who share the same bibliography (Belussi et al., 2019). Indeed, several authors suggest that bibliographic coupling is more appropriate for studying new fields and current research topics, improving the accuracy of results (Boyack & Klavans, 2010; Vogel & Güttel, 2013; Donthu et al., 2021). In summary, co-citation looks back at how documents are connected over time, while bibliographic coupling looks forward by linking documents through common citations. Moreover, using this method we do not examine the articles mentioned but investigate the growing sub-fields of the literature. This research employs a document bibliographic analysis of 692 documents that have been referenced by the sustainable business model publications included in this sample to analyse the major publications and the grouping of articles into distinct clusters.

Due to the large number of documents connected to the sustainable business models, the author established limits to include only articles with at least 20 citations to enhance the network's interpretability and concentrate on significant publications, resulting in a sample of 368 credible publications. As discussed in the co-citation analysis paragraph, in this case 20 citations reflect the optimal compromise between information loss owing to a too high threshold. The bibliographic coupling analysis of documents yielded 15 clusters. However, we only analyse the first 6 of them in size order based since the other 9 were relatively insignificant and remote (Table 5).

Table 5 – Bibliographic coupling analysis of documents classified in clusters

Documents in cluster and association strenght (in parentheses)	Label	Description	Cluster #	Size	Year
Geissdoerfer, M., 2020, (687); Ritala, P., 2018, (616); Hofmann, F., 2019, (485); Yang, M., 2017, (463); Bocken, N., 2019, (463); Stål, H.I., 2018, (451); França, C.L., 2017, (434); Bocken, N.M.P., 2018, (424); Yip, A.W.H., 2018, (398); Wells, P., 2016, (394); Mendoza, J.M.F., 2019, (348); Lewandowski, M., 2016, (340); Witjes, S., 2016, (335); Laukkanen, M., 2014, (289); Baldassarre, B., 2019, (253); Weissbrod, I., 2017, (250); Lahti, T., 2018, (247); Hannon, M.J., 2015, (220); Heyes, G., 2018, (198); Stål, H.I., 2017, (189); Sousa-Zomer, T.T., 2018, (177); Leipold, S., 2018, (141); Khan, M.A., 2018, (110); Ingemarsdotter, E., 2019, (88); Khmara, Y., 2018, (77); Zhang, W., 2018, (67); Scheepens, A.E., 2016, (61); Fonseca, L.M., 2018, (60); Chiappetta Jabbour, C.J., 2020, (56); Murray, A., 2017, (24); Catulli, M., 2012, (21); Bellos, I., 2017, (8); Mendoza, J.M.F., 2019, (2)	Circular Economy	Cluster 1 entails the circular economy and its potential in sustainable business models	1	33	2017
Morioka, S.N., 2017, (596); Pal, R., 2018, (547); Geissdoerfer, M., 2018, (537); Schaltegger, S., 2012, (491); Kozlowski, A., 2018, (323); Caldera, H.T.S., 2017, (207); Matos, S., (2013) 147; Boons, F., 2013, (144); Goyal, S., 2016, (114); Høgevold, N.M., 2014, (105); Svensson, G., 2015, (97); Schneider, A., 2015, (93); Stubbs, W., 2008, (90); Wasiluk, K.L., 2013, (84); Svensson, G., 2016, (70); Busse, C., 2017, (65); Goyal, S., 2017, (63); Barber, K.D., 2012, (52); Eriksson, D., 2015, (48); Birkin, F., 2009, (19); Høgevold, N.M., 2011, (14); Svensson, G., 2011, (13); Ho, H.P.Y., 2012, (8); Todeschini, B.V., 2017, (7); Jung, S., 2016, (6); Birkin, F., 2009, (6); Papies, D., 2008, (5); Steyn, M., 2014, (5); Tseng, M.L., 2013, (4); Atkins, J., 2015, (3); Dwivedi, Y.K., 2009, (1)	Sustainable supply chains	Cluster 2 entails that the concept of innovation evolved massively in this collection of papers proving a unique value proposition could pave way for successful business. Cluster 2 majorly deals with the value creation in business models and sustainable supply chains activity	2	31	2014
Geissdoerfer, M., 2018, (103); Geissdoerfer, M., 2016, (104); Biloslavo, R., 2018, (96); Lüdeke-Freund, F., 2020, (104); Lüdeke-Freund, F., 2018, (101); Boons, F., 2013, (96); Oskam, I., 2018, (102); Roome, N., 2016, (106); Bocken, N.M.P., 2014, (108); Evans, S., 2017, (105); Bidmon, C.M., 2018, (89); Yoyce, A., 2016, (98); Brehmer, M., 2018, (104); Rauter, R., 2017, (98); Barth, H., 2017, (95); Franceschelli, M.V., 2018, (101); Neumeyer, X., 2018, (98); Bocken, N., 2013, (92); Palomares-Aguirre, I., 2018, (97); Eppler, M.J., 2011, (73); Dentchev, N., 2016, (76); Yun, J.J., 2020, (74); Wells, P., 2013, (63); Peters, C., 2015, (65); Chandel, A.K., 2019, (50)	Innovations in the sustainable business models	Cluster 3 The articles in this cluster promote research on sustainable innovation via the use of a business model approach	3	25	2017
Schaltegger, S., 2016, (611); Täuscher, K., 2018, (552); Davies, I.A., 2019, (405); Upward, A., 2016, (401); Kurucz, E.C., 2017, (399); Jabłónski, A., 2016, (398); Davies, I.A., 2018, (383); Stubbs, W., 2017, (287); Esposito, M., 2012, (227); Alkire, L., 2020, (191); Bocken, N.M.P., 2015, (166); De Lange, D.E., 2017, (141); Stubbs, W., 2017 , (67); Becker, A., 2015, (25); Cantino, V., 2017, (12); Shrimali, G., 2011, (2); Budzianowski, W.M., 2017, (1)	Entrepreneurship and Corporate Social Responsibility	Cluster 4 Businesses are increasingly implementing sustainability measures in order to promote environmental and social responsibility while protecting and expanding profits	4	17	2016
Bocken, N.M.P., 2020, (610); Curtis, S.K., 2020, (457); Ciulli, F., 2019, (385); Short, S.W., 2014, (380); Piscicelli, L., 2018, (361); Gauthier, C., 2016, (345); Laukkanen, M., 2020, (220); Heiskala, M., 2016, (47); Wan, X., 2017, (13); Zamani, E.D., 2018, (3)	Sharing economy	Cluster 5 contributes the potential for long-term value generation of several forms of sharing economy company models	5	10	2018
Reinhardt, R., 2019, (693); Dembek, K., 2018, (544); Lüdeke-Freund, F., 2017, (541); Nosratabadi, S., 2019, (476); Matinaro, V., 2019, (469); Dentchev, N., 2018, (454); Di Vaio, A., 2020, (406); García-Muiña, F.E., 2020, (220); Ribeiro, I., 2018, (139); Di Vaio, A., 2020, (36)	Role of technologies and AI	Cluster 6 represents the connections between AI, fast advances in machine learning, and long-term development	6	10	2019

Note: We reported only the first author's name of each article, the year of documents and the association strengths in brackets due to spatial constraints. For the same reasons these authors have been not included in the references. For further information on this, you could get in touch with the corresponding author of this study.

Source: Authors elaboration, 2023

Coupling Cluster 1: The circular economy and its potential in the sustainable business models

In cluster 1 there are a total of 33 papers for which the average publication year is 2018 and consists of the most important papers on the research of sustainable business models. Publications having a shared bibliography (with the highest coupling link strength) are the ones written by Geissdoerfer et al. (2020); Ritala et al. (2018); Hofmann (2019); Yang et al. (2017); Bocken et al. (2019). The cluster majorly deals with 'the circular economy and its potential in the sustainable business models'. While the circular economy emphasizes process reform and material recycling, it may lead to more sustainable company models. According to Witjes and Lozano (2016) one of the most recent theories for tackling both environmental and socio-economic challenges is the circular economy. A circular economy strives to convert waste into resources while also bridging the gap between production and consumption. An interesting study by Fonseca (2018) looks at how the Internet of Things (IoT) might help with the transition to a circular economy (CE) by supporting circular business models and design methodologies. Some of the other versatile contributions in this cluster are: Weissbrod and Bocken (2017); França et al. (2017); Wells (2016); Scheepens et al. (2016); Lewandowski (2016).

Coupling Cluster 2: Value creation in business models and sustainable supply chains

Cluster 2 contains 30 articles and consists of evolutionary papers on the research of sustainable business models. Publications with the highest coupling link strength in the cluster are Morioka et al. (2017) and Geissdoerfer et al. (2018). The cluster majorly deals with the 'value creation in business models and sustainable supply chains'. An article by Stubbs and Cocklin (2008) aims to create a SBM, which is a model in which sustainability principles influence the firm's driving force and decision-making. Some of the papers also discusses the product-service system, especially in the fashion industry (Pal & Gander, 2018; Kozlowski et al., 2018; Todeschini et al., 2017). The apparel industry is a resource-intensive sector with several chances to decrease environmental consequences and develop new business models. Todeschini et al. (2017) looks at innovative business models in the fashion sector that include sustainability as a distinguishing feature, particularly in terms of the value proposition. The creation of sustainability-driven business models may be promoted in support of sustainable production and consumption by looking beyond the supply chain to include consumer behaviour. Some of the other versatile contributions in this cluster are: Schaltegger and Csutora (2012); Høgevold et al. (2014).

Coupling Cluster 3: Innovations in sustainable business models

Cluster 3 consists of 24 articles and consists of literature of some of the prominent authors who have contributed massively to the evolution of research related to sustainable business models. Publications with the highest coupling link strength in the cluster are: Geissdoerfer et al. (2018); Biloslavo et al.

(2018); Lüdeke‐Freund (2020); Boons and Lüdeke-Freund (2013). The cluster majorly deals with the 'innovations in sustainable business models'. The article of Lüdeke-Freund (2020) introduces the 'Business models for sustainability innovation (BMfSI) framework', which is used to explore how business models significantly affect sustainability innovations and commercial reasons for sustainability. The articles in this cluster promote research on sustainable innovation via the use of a business model approach. By integrating sustainability more deeply into the core of their operations, businesses may achieve a balance of social, environmental, and economic value. Research on sustainable innovation has tended to underestimate the importance of companies combining a value proposition, the structure of the upstream and downstream value chain, and a financial model in order to bring sustainable ideas to market. Sustainable innovation highlights existing gaps and future research alternatives to address the challenges of business model innovation in the long run. Some of the other versatile contributions in this cluster are Joyce and Paquin (2016); Evans et al. (2017).

Coupling Cluster 4: Entrepreneurship and corporate social responsibility

Cluster 4 consists of 16 articles dealing with the research of sustainable business models. Articles with the highest coupling strength in the cluster are Schaltegger et al. (2016); Täuscher and Laudien (2018); Davies and Doherty (2019); Upward and Jones (2016); Kurucz et al. (2017). The cluster majorly deals with 'entrepreneurship and corporate social responsibility'. Businesses are increasingly using sustainability measures in order to promote environmental and social responsibility while preserving and growing profitability. Some of the other versatile contributions in this cluster are: Stubbs (2017); Esposito et al. (2012); De Lange (2017).

Coupling Cluster 5: Sharing economy

This cluster contains 10 articles dealing with the research of sustainable business models. Articles with the highest coupling strength in the cluster are: Bocken and Geradts (2020); Curtis and Mont (2020); Ciulli and Kolk (2019). The cluster mainly deals with the 'sharing economy'. Piscicelli et al. (2018) investigates a new and creative kind of sustainable business model built on peer-to-peer (P2P) asset sharing made possible by digital platforms. Laukkanen and Tura (2020) research investigates the potential for long-term value generation of several forms of sharing economy company models. The study presents a conceptual framework to aid in the analysis of business models' potential for long-term value development. One of the current trending topics of blockchain and Web 3.0 were discussed in Zamani and Giaglis (2018), topic which advocates the significance of blockchain, or distributed ledger technology, in the development of novel business models such as machine money, autonomous economic agents, and decentralized organizations.

Coupling Cluster 6: The role of technologies and artificial intelligence (AI)

Cluster 6 contains 10 publications dealing with the research of sustainable business models. Publications with the highest coupling strength in the cluster are Reinhardt et al. (2019) and Dembek et al. (2018). The cluster mainly deals with 'The role of technologies and artificial intelligence' in sustainable business models. Di Vaio et al. (2021) research examines the connections between AI, fast advances in machine learning, and long-term development. Recently AI has had potential growth in the business sectors proving it as a valuable asset for the future.

4 Discussion: managerial and theoretical implications

The growing body of research on SBMs provides insightful managerial implications and guides policy formulation focused on sustainability. The marked increase in scholarly publications, particularly in recent years, underscores the rising significance of SBMs in both academic and business fields. The predominant contributions from regions like Europe, the USA, and emerging economies such as China and India highlight the global relevance of SBMs.

Influential journals such as the *Journal of Cleaner Production* and *Sustainability (Switzerland)* have been at the forefront of SBM research, disseminating key findings and fostering academic debates in this area. Several publications have explored different aspects of sustainable business practices, from creating sustainable business model archetypes to advancing sustainable innovation.

The research trends identified in SBMs encompass several crucial areas: the integration of circular economy principles into business models, innovative approaches in sustainable supply chains, the intersection of entrepreneurship with corporate social responsibility, and the role of new technologies and artificial intelligence in enhancing environmental management. These trends not only inform current business practices but also offer a roadmap for future research and development in sustainable business strategies.

From a managerial perspective, these insights suggest a strategic shift towards incorporating SBMs as a core part of business operations. This transition involves a focus on value generation through sustainable practices, a thorough assessment of SBM designs across different industries, and the exploration of innovative products and processes that emerge from eco-friendly products. Additionally, the effective implementation of SBMs can significantly enhance the efficiency of the circular economy, contributing to overall sustainability goals.

Achieving the United Nations' Agenda 2030 requires a collective effort, not only from policymakers but also from businesses at the firm level. Instead of merely adding social and environmental goals to a

financially successful business model as a form of corporate social responsibility, it is more effective to design business models that are economically sustainable and aligned with the Sustainable Development Goals (SDGs) for creating shared value. This approach can lead to revenue benefits through product differentiation, enhanced brand image, effective customer communication, and increased value and productivity. Indeed, for policymakers, these findings provide a framework for developing regulation and policies that support and encourage the adoption of sustainable business practices based on the three pillars of sustainability: environmental, social, and economic. This could involve incentivizing businesses to adopt circular economy principles, where resource use is minimized, and waste is repurposed effectively. Additionally, policies could support the integration of renewable energy sources and energy-efficient practices into business operations, aligning with climate change mitigation and adaptation efforts.

The rapid growth of SBMs encountered a significant challenge with the onset of the COVID-19 crisis in early 2020, dramatically altering the landscape (Li et al., 2022). Certain SBMs, especially those emphasizing frugality or rooted in the amateur economy during lockdown periods, gained momentum and possibly positive environmental and social outcomes in the immediate term (Csutora et al., 2022). Conversely, others, such as those associated with the sharing economy in mobility (Faiyetole, 2022), faced substantial setbacks. The long-term effects of the COVID-19 crisis on sustainability practices and the viability of SBMs remain uncertain. An additional area of inquiry is the durability of any sustainability gains achieved during the crisis; specifically, the extent to which these benefits will persist or diminish once restrictions fully lift and whether SBMs will retain their appeal. One outcome of this shock was the enhancement of firms' digital capabilities and their ability to adapt by implementing resilience strategies during the COVID-19 pandemic (Khlystova et al., 2022). Furthermore, shifts in business models towards 'digitalization' and 'diversification' were observed in response to the pandemic (Kilu et al., 2023), providing alternative ways to offer products and services (see case studies proposed by Silva et al., 2023 and Xue et al., 2022). Therefore, COVID-19 pandemic has fundamentally altered how businesses operate, offering a unique window for policymakers to embed sustainability into the core of business recovery strategies. This could involve providing financial and regulatory support for businesses transitioning to more sustainable models in the post-pandemic landscape. Policies may also focus on bolstering supply chain resilience, encouraging local sourcing and sustainable procurement practices to mitigate future disruptions. The National Recovery and Resilience Plan (PNRR) is not merely a multilevel governance system for financing investments and reforms but a catalyst for fostering cohesion and innovation between the public and private sectors. Among its objectives is the regeneration of the production system through the adoption of advanced organizational models, technology, and work practices (e.g. *nearworking*) (Butera, 2022). This also includes the reconfiguration of cities and the reform and reorganization of the public sector: education, healthcare,

justice, and public administrations at large. By emphasizing comprehensive modernization and efficiency, the PNRR aims to not only support Italy's economic landscape but also to ensure that the country is better equipped to face future challenges, thereby promoting sustainable growth and societal well-being.

Although the paper primarily focuses on the production side, in general, it is important to note the increasing role that 'green brand' plays in consumer recognition and decision-making (Lopes et al., 2024). Green marketing, also known as sustainable, organic, or environmental marketing, focuses on promoting products, services, or lifestyles that are environmentally friendly. It targets consumers' readiness to spend more on products that are safe for the environment, emphasizing the sale of products that are either environmentally safe or perceived to be so. This approach to marketing concentrates on the explicit or implicit willingness of consumers to pay a premium for eco-friendly products.

Adopting environmentally friendly practices, or 'being green', helps businesses stand out and gain a competitive advantage (Arseculeratne & Yazdanifard, 2014). Consumers frequently purchase products not necessarily for their utility or actual need, but because they are associated with companies that implement circular and sustainable business models. The willingness of consumers to pay more for green products reflects the perceived additional value in these products.

Furthermore, there is an opportunity to leverage digital transformation, accelerated by the pandemic, in advancing sustainability goals. Policies that encourage digital innovation in sustainability – such as using AI for energy management or blockchain for transparent supply chains – can be crucial (Dal Mas et al., 2023). Consequently, the advanced technologies implementation has given rise to disruptions in all sectors, business models and management practices (Bagnoli et al., 2018; Bagnoli et al., 2019; Toniolo et al., 2019; Urbinati et al., 2019). In addition, AI has transformed business operations (Schneider & Leyer, 2019), reshaping trade and management across various industries. This shift has led to the development of products and services that are both more competitive and sustainable (Wirtz & Müller, 2019; Govindan et al., 2020; Sipola et al., 2023).

These initiatives must be adaptive and responsive, recognizing the diverse needs of different industries and regions. Collaborative efforts between governments, businesses, and other stakeholders are fundamental for developing and implementing effective policies. This includes engaging in dialogues to understand industry-specific challenges and opportunities in transitioning to sustainable practices, as well as monitoring and evaluating the impact of these policies to ensure they are effectively driving the desired change towards sustainability.

Considering the evolving landscape of sustainable and circular business models, this paper highlights also several theoretical implications. These might include the development of frameworks that guide firms in leveraging green technologies for innovation, models for assessing the impact of

green innovation on sustainability metrics, and strategies for overcoming barriers to the adoption of green technologies.

A significant theoretical implication emerges from the analysis of the interplay between technological advancements and SBM efficacy. The new fields of artificial intelligence and digital technologies offer a fertile ground for research into their potential to enhance the scalability and impact of SBMs, particularly in fostering circular economy practices. This intersection presents a rich domain for academic inquiry, challenging scholars to shed a light on the mechanisms through which technology can serve as a lever for sustainable transformation within business operations.

Moreover, this paper emphasises the need for empirical research that probes into the dynamics of stakeholder engagement and value creation within SBMs. It suggests a scholarly pursuit to unravel how stakeholder inclusivity and collaborative partnerships influence the design and implementation of SBMs, aiming to bridge the theoretical gap in understanding the relational complexities that underpin sustainable value co-creation.

5 Conclusions

The study on SBMs has successfully addressed the purpose of the work through descriptive and bibliometric analysis, uncovering key insights in the field. The surge in scholarly publications, particularly in the past 8 to 10 years, highlights a growing global interest in SBMs, predominantly in Europe, the USA, and developing countries like China and India.

Prominent journals like the *Journal of Cleaner Production*, *Sustainability* (Switzerland), *Business Strategy and the Environment*, and *Organization and Environment* have played a significant role in this field. Influential authors including Bocken, Boons, and Lüdeke-Freund, and most cited articles like those by Bocken et al. (2014) and Boons and Lüdeke-Freund (2013) have shaped the discourse around sustainable business models. The research identified major trends in SBMs, such as the integration of the circular economy, value creation in business models and sustainable supply chains, innovations, entrepreneurship, corporate social responsibility, the sharing economy, and the role of technology and AI in environmental management (see Dal Mas et al., 2023; Wamba-Taguimdje et al., 2020). These trends align with strategic clusters like sustainable development, sustainable entrepreneurship, and innovation.

While the study provides comprehensive insights, it acknowledges limitations such as its focus on English language publications in specific database categories. These findings offer a substantive

contribution to the understanding of SBMs, setting a foundation for future research and practical application in the business and academic communities.

As future directions, one of the forthcoming steps for the authors will be to update their analysis in a future work to collect and evaluate various publications on the topic. This will help to understand whether there has been a bibliometric difference or a sense of continuity in trends before and after the pandemic, taking into account all related consequences such as lockdowns. Additionally, a meta-regression analysis could serve as a significant endpoint to statistically quantify the information from these papers. This approach will not only deepen the understanding of SBMs in the context of global challenges but also offer a robust methodological framework for assessing their evolution and impact in the post-pandemic era.

In conclusion, the study of SBMs offers a comprehensive overview of the current state of sustainable practices in business, highlighting key areas for development and offering strategic directions for both business leaders and policymakers. The integration of these models into mainstream business practices not only addresses immediate sustainability concerns but also sets the stage for long-term economic and environmental resilience.

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Strategies to fight poverty in Italy: Professional social work and Third Sector

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Abstract

The aim of this work is to represent, from a series of plural and scientifically integrated perspectives, the multidimensional phenomenon of poverty, understood in its different meanings and nuances as well as in its dynamics of evolutionary complexity. For this reason, the paper will be introduced by an in depth statistical analysis, capable of explaining its dimensions in terms of breadth, intensity, diffusion and definition (in terms of absolute and relative poverty) in the national framework, and then open the topic to its further theoretical, epistemological and operational expressions, in specific relation to the values, actions and interventions implemented by the professional social service system, with its welfarist response strategies to the challenges produced by social change and its ramifications of the different forms of poverty that are part of the dynamics of enforceability of rights and the recognition of the new social risks of complex society. Finally, the work articulates and deepens the increasingly close and consistent relationship between professional social services and the Third Sector, also in light of recent regulatory and legislative adjustments which have promoted a new protagonism of the social private sector in the sphere of planning, planning and provision of interventions and services to the person, under the aegis of the welfare partnership.

Keywords – Poverty; Social Service; Social Work; Third Sector; Social Epistemology; Multidimensional Analysis; Social Statistics.

Paper type – Academic Research Paper

Sommario

Strategie per combattere la povertà in Italia: servizio sociale professionale e Terzo Settore. – L'obiettivo del presente lavoro è quello di rappresentare, da una serie di prospettive plurali e scientificamente integrate, il fenomeno multidimensionale della povertà, intesa nelle sue diverse accezioni e sfumature nonché nelle sue dinamiche di complessità evolutiva. Per tale ragione, l'articolo verrà introdotto da una approfondita analisi di tipo statistico, capace di esplicitarne le dimensioni in termini di ampiezza, intensità, diffusione e definizione (in termini di povertà assoluta e relativa) nel quadro nazionale, per poi aprire il tema alle sue ulteriori estrinsecazioni teoriche, epistemologiche ed operative, in relazione specifica ai valori, azioni e interventi attuati dal sistema del servizio sociale professionale, con le sue strategie di risposta alle sfide prodotte dal mutamento sociale e dalle ramificazioni delle diverse forme di povertà che si inscrivono nella dinamica di esigibilità dei diritti e di riconoscimento dei nuovi rischi sociali della società complessa. Infine, il lavoro articola ed approfondisce il rapporto sempre più stretto e consistente tra servizio sociale professionale e Terzo Settore, anche alla luce di recenti adeguamenti normativi e legislativi che hanno promosso un nuovo protagonismo del privato sociale nell'ambito della programmazione, progettazione ed erogazione di interventi e servizi alla persona, sotto l'egida del *welfare partnership*.

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1 The dimensions of poverty

Poverty in Italy is growing. The inadequate availability of an income sufficient for the needs of daily life is only one aspect, albeit an important one of poverty; the concept must be expressed in terms of access to opportunities for people's social, cultural and educational development. The economic dimension defines an area of poverty, but does not circumscribe its boundaries, the situations of need and social hardship it gives rise to, the forms of inequalities it produces (Negri & Saraceno, 1996; Esping-Andersen, 2005; Sen, 1992; Gregori & Gui, 2012).

Among the causes of poverty, we find the absence or inadequate amount of income, commensurate with the life needs of individuals and families; to this aspect are added the regulation of the distribution of resources and opportunities offered by welfare systems and the labor market (Saraceno, 2014). Tax collection, monetary transfers, the redistribution of national income and welfare services contribute to defining the spread and incidence of poverty in society: the phenomenon is multidimensional. The precariousness of work, the fragmentation of welfare systems, the heterogeneity of the offer of services and social interventions, the territorial differences in the production and distribution of income, are just some aspects that characterize the presence and diffusion, quantitative and qualitative, of poverty in Italy (Saraceno, Morlicchio, & Benassi, 2022). The different incidence among the population is historically and socially defined; the variables underlying the phenomenon are multiple and are specified in their concrete dynamic correlation.

The development and necessary revision of the methodologies and analysis techniques contribute to making the study of the phenomenon complex (Istat, 2009). These techniques follow two logics of method and temporal interpretation: a dynamic and procedural one and a static one of marginality and social exclusion.

The dynamic and procedural perspective reveals that in life one is not poor forever, but one can be poor at different times as the condition of poverty can change several times during one's life. From this perspective, poverty emerges because of one or more episodes that can determine insufficiency of income and inadequacy of economic and social resources to meet the needs of everyday life (Siza, 2009, p.19): poverty takes on a temporary character, it can last even a short time and can concern people and families involved in processes of temporary precariousness of life.

Poverty in the static analysis describes a permanent condition relating to specific social groups, identifiable based on structural variables that affect the well-being of families and individuals. In terms of method, poverty is examined in its structural aspects; this allows us to identify specific social categories at risk.

On the other side, poverty as a dynamic, procedural, and temporary condition is increasingly apt to describe the current situation of economic difficulty of families and people in contemporary society.

Economic poverty – identified as a social condition marked by destitution due to a level of income that is too low to satisfy the fundamental needs of life – is expressed by the lack of material resources, by the deprivation of goods and services necessary for a functional adaptation to the lifestyle and consumption of society; from this perspective, the condition of poverty is contextualised within the society to which one belongs, the historical-cultural period of reference and social expectations: the category of poverty and the identification of the relevant social groups affected by the phenomenon vary based on living conditions expressed by society at a given historical moment.

In the sociological study we identify concepts and measures capable of formalizing the changes and incidence of the phenomenon (Maroncelli, 2017). The introduction of the concepts of absolute poverty and relative poverty is of extreme interest for the purposes of planning and designing of social intervention. The first defines people and families who have a lack of minimal resources for the material requirements of daily life such as food, money, housing; the second refers to situations in which the insufficiency of goods and services is given in relation to the average standard of living of the population of a given society in each historical period (Ranci & Pavolini, 2015, p.113).

Unlike absolute poverty, relative poverty is a less serious condition even if the people and families involved lack goods for economic-social and cultural requirements, to an extent that could compromise the full realization of their personality and individual aspirations.

2 Absolute and relative poverty in Italy

The variables that affect the spread of poverty in Italy are different and range from the structure and demographic dynamics to the composition of the family unit, from the labor market to its regulation; the welfare structure and services contribute to defining the nature, dimension, and diffusion of the phenomenon. The forms of income support and economic transfers to individuals and families, the presence of an effective territorial welfare system that is attentive to the poverty conditions of the population, the forms, and methods of access to social welfare and health services contribute to the potential strategies and actions to protect families and socially and economically vulnerable people.

Italy, faced with this phenomenon, finds itself more exposed than other European countries. This is a result of a segmented labor market (Barbieri & Fullin, 2014; Carrieri, 2012) with strong territorial differences in employment, unemployment and activity indicators (Reyneri, 2017), a welfare system that often resorts to forms of compensation identified in assistance, in family solidarity, a significant

presence of NEETs (Not in Education, Employment or Training) with consequences on the social destiny of the new generations (Rosina, 2015; Agnoli, 2015; Lazzarini, Bollani, Rota, & Santagati, 2020), a considerable demographic aging of the population with effects in the context of the increase in social-welfare needs.

In calculating poverty and estimating its spread in Italy, Istat takes into account the combination of family types, geographical distribution and municipalities of residence; distinguishes between absolute and relative poverty, defines method and forms of empirical survey. Istat writes:

> If absolute poverty classifies families based on the ability to acquire certain goods and services, the measure of relative poverty, defined with respect to the average standard of the population, is linked to the inequality in the distribution of consumption expenditure and identifies poor families among those who are at a disadvantage compared to others. In fact, a family of two with a consumption expenditure lower than or equal to the average per capita consumption expenditure is defined as poor. For families of different sizes, an equivalence scale is used, which takes into account the different needs and the economies/diseconomies of scale that can be achieved in families of greater or lesser size. The equivalence scale used in estimating relative poverty, known as the Carbonaro equivalence scale, is based on a double logarithmic function between consumption expenditure and family size (Istat, 2022, p. 11).

The poverty thresholds defined by Istat (2022) allow us to identify on the one hand the proportion of families who, although not relatively poor, are more exposed to the risk of becoming so, on the other the proportion, among poor families, of those with levels of consumption expenditure well below the poverty line.

To understand the extent of the spread of poverty in a given society, the development of the calculation method and the availability of data are fundamental moments for understanding how many people and families live in such conditions, for monitoring the change in the situation over time and for planning intervention plans and services.

Based on Istat estimates, for the year 2023, families in absolute poverty in Italy are 2.235 million, with an incidence of 8.5%. There were 5.752 million people in this condition, with an incidence of 9.8% of the total population. The values are high although stable compared to 2022, the year in which families in absolute poverty were 8.3% and the people involved were 9.7%. Compared with 2021, the situation worsened: there were 2.021 million families in absolute poverty, with an incidence of 7.7%, and the people involved were 5.317 million, with an incidence of 9.0%. The data, although distributed

differently in the areas of the country, describes a situation of increasing absolute poverty; families in the municipalities of Southern Italy are most affected (Istat, 2024).

Relative poverty, defined as the condition of absence of the primary goods necessary to ensure the social reproduction of individuals, measured in relation to the average standard of living of the reference population, presents a problematic situation for Italy. While absolute poverty is determined by a lack of essential goods and services, relative poverty has an average value as a reference and is connected to the identification of an average standard of consumption expenditure: it expresses the impossibility of a family to reach a specific spending threshold that is conventionally considered adequate to social expectations.

In measuring relative poverty, the introduction of corrective measures is envisaged based on the size of the family unit and the different needs of the members. Families with the same number of members can express different needs in relation to the age of the people who are part of it, and the specificity of the economic, social, educational and health needs of its members. Among the variables that affect the condition of poverty, those relating to the regional area of reference, the demographic size and geographical location of the municipalities, the presence of foreigners, elderly people, minors, the level of education of the family members must be identified.

Istat, on the basis of the monthly expenditure in euros of Italian families, has identified different relative poverty thresholds in relation to the members of the family and has defined four typologies:

- definitely not poor families with spending 120% higher than the poverty line;
- almost poor families with spending between the poverty line and 120% of it;
- barely poor families with a monthly expenditure between 80% of the poverty line and the poverty line;
- definitely poor families with spending up to 80% of the poverty line.

In 2022 in Italy, there will be approximately 2.6 million families in conditions of relative poverty for a total of approximately 8.2 million people (Istat, 2023). The families in greatest suffering are above all those with three or more minor children. The set of these situations confirms the dimensions and development of poverty in Italy on which sociological analysis insists and on which it is necessary to intervene with structural programs and relational processes as part of preventive and reparative actions carried out by the welfare system as a whole and of the social service in its operational specificity.

3 Poverty as a multidimensional phenomenon and issue

Identifying difficult situations; analyzing the conditions of opportunity and criticality; planning and evaluating targeted interventions and actions, in the perspective and offer of integrated personal services: all this undoubtedly represents the operational task of an "intersystemic translation" (Abbott, 1995) carried out by the Social Service in the implementation of various socio-health policies (Ferrario, 2014; Ranci & Pavolini, 2015), for the protection of citizens and users with respect to emerging needs and risks adequately contextualized in the territories (Bertotti, Fazzi, & Rosignoli, 2021; Campanini, 2020) thanks to the now complete approach to local welfare (or community welfare), with respect to which a further recent trend of partnership integration is clearly evident, due to the convergence between public and private social institutions in the integrated co-planning of services and interventions (De Ambrogio & Guidetti, 2016), overcoming the previous forms of asymmetric relationship represented by the logic of contracting and outsourcing and therefore inaugurating the entry of social services into the new era of partnership welfare. Thanks to these characteristics and developments, today it appears capable of proposing to the community (Scardigno, 2020), different collaborative, experimental and institutional strategies (Tarsia, 2019), intended as effective solutions to combat the phenomenon of poverty (Cervia, 2015; Gregori & Gui, 2012; Salmieri, 2021 and 2022; Curti & Fornari, 2022, Giancola & Salmieri, 2023).

The latter involves, in its main sociological and social welfare developments and correlates, a continuous change in the qualitative and quantitative dynamics of social phenomena, with a direct impact on the effectiveness and incisiveness of the interventions designed and implemented by aid professionals (Gori, 2020; Mantovani, 2021; Salmieri, 2021; Siza, 2009). It is no coincidence that the United Nations Development Program (UNDP) has used, as an essential reference for its articulation, the multidimensional poverty index (MPI), created with the aim of representing the overlap and contemporaneity of the deprivations experienced by individuals, both as the co-presence of different causal factors, both as a degree of intensity of the phenomenon (United Nations Development Programme & Oxford Poverty and Human Development Initiative, 2019).

Due to its complex nature, defined as "multidimensional", poverty involves not only economic or material deprivation – essentially linked to the lack or insufficiency of income – but also causes various forms of marginalization and social exclusion, especially in relation to the impossibility for people and families to access services and housing and protect their health adequately, or provide for their own education (as in the case of educational poverty), both in the form of opportunities and in self-awareness at a personal level (relational poverty) (Pasotti, 2020; Duflo, 2021). For such reason, measures to combat poverty represent one of the most important and important actions for the effectiveness of social and socio-welfare policies, in their preventive and ameliorative purposes with respect to situations of

difficulty and socio-economic hardship of people and families (Bramanti & Carrà, 2021; Saraceno, Morlicchio, & Benassi, 2022), thanks to the identification and provision of community and territorial resources, as well as the tendency towards optimization of services with a view to the structurality of interventions with respect to the plurality and non-homogeneity of resources and social spending (Ferraresi, 2018; Ranci Ortigosa, 2018), as appropriately recalled in the National Plan for Interventions and Social Services 2021-2023 (see paragraph 5 in this paper).

At the same time, these measures involve specific aspects and competence profiles of planning and intervention by social workers, called to respond to the challenges of multidimensional poverty in formal and informal terms of coping and direct relationship with the users, made up of people in different age groups and life cycles: they manifest themselves appropriately in the microsocial dynamics of the planning conducted by the professional, as well as in the macrosocial dynamics of the planning of services for areas of user and social and socio-health intervention legitimized and verified in the institutional documentation of the planned services and offered at a local level.

4 Epistemological issues of poverty and operational aspects of its fight

It is appropriate, in such a defined context, to highlight and explore, wherever possible, the issue of the complexity and multidimensionality of poverty, analyzed in terms of specific methods of recognition and identification of its causal characteristics suitable for measuring the phenomenon, such as for example: the type of information collected: objective or subjective etc.; the positionality of the phenomenon, made possible by the poverty threshold: absolute or relative; the duration and/or temporal consistency of the investigation: longitudinal or transversal etc.; the analysis of the dimensions of poverty: material/immaterial etc.

At an international level, one of the recently developed theoretical and professional approaches in the field of social work with people in poverty is the one based on the PA-P (Poverty-Aware Paradigm) model, proposed by Michal Krumer-Nevo, professional, academic and social service expert, who proposed this paradigm based on four fundamental dimensions: a) transformation, b) recognition, c) rights, d) solidarity, in turn capable of restoring, in their interweaving and composition, an integrated vision of poverty, seen as a situation of material deprivation and also as a relational and emotional experience (Krumer-Nevo, 2021).

This innovative approach makes possible to identify the dynamics of poverty as originating from a situation – indirect or collateral – of violation of human rights, given the inequity and distributional imbalance of socio-political and economic structures as causes of the asymmetries and lack of

opportunities of which poor people are victims, who however possess an essential capacity for resilience towards their condition of poverty, resilience on which the PA-P paradigm leverages to set up a professional practice in working with poor people, based on six reference principles. They are identified in the following characteristics:

- recognition of the social and cultural perception of people in poverty;
- understanding the feeling of difficulty and pain of people in poverty;
- interconnection of the material component with the relational/emotional one;
- role of poverty in reducing opportunities and choice alternatives;
- creation of a professional practice capable of overcoming the acceptance of poverty;
- recognition of people's resilience to poverty.

Returning comparatively to the Italian situation on the issue of poverty, we can take into consideration the analysis described in the INAPP (Istituto Nazionale per l'Analisi delle Politiche Pubbliche) 2021 Report, in chapter 7, about inclusion policies, where it tells us about a story of poor effectiveness of the Italian protection system in the fight against poverty, at least until the introduction of national measures, namely the SIA Support for Active Inclusion (financed through the 2018-2020 National Poverty Fund established with the 2016 Stability Law), subsequently falling within the REI (Reddito di Inclusione/Inclusion Income) and then again, through the Legislative Decree 4/2018, in the RdC (Reddito di Cittadinanza/Citizenship Income), understood as a double innovation strategy: an active policy provision and, at the same time, an institutionally guaranteed measure to combat poverty.

In relation to the latter, the Report specifies how the beneficiaries are selected and sent directly either to the Employment Centers or to municipal social services. Then they evaluate the complex needs through a multidimensional analysis (definition of a personalized project and creation of a multidisciplinary team).

As noted in the Report, a strong integration is taking place between public and private social services, understood as a challenge for social policies at a national level. Compared to the REI, the RdC has allowed, also thanks to the progressive integration of the Poverty Fund (established in 2016), with European Union resources for the 2014-2020 programming of the PON Inclusion, to enhance and expand the audience of beneficiaries with greater amounts of the subsidy paid, even doubling the number in the year of Covid-19, reaching more than 2.8 million people and over 1.2 million families in December 2020, with a significantly higher inclusion rate than the REI, equal to 47 people per 1000 inhabitants (Istituto Nazionale per l'Analisi delle Politiche Pubbliche, 2021, p. 233). According to the researchers,

> the resources allocated have led to a growth in the number of beneficiaries, the work carried out by the services (Employment Centers and Social Services) has increased and has also changed in the organizational methods. The infrastructure put in place needs not only to be strengthened but above all to work in a network, if it wants to guarantee real paths of work and social inclusion. Even more so in a scenario in which situations of poverty, exclusion, even 'social invisibility', risk worsening due to the crisis (p. 235).

From the perspective of Law 328/2000 – still very relevant today, especially in relation to the strategy of implementation and realization of local welfare through area planning – it can be observed how it is in some way reiterated or even strengthened (despite the evident asymmetry and imbalance between the levels of integration that have occurred in the different regions and in the local territorial contexts), thanks precisely to the renewed attention of policies towards poverty, giving greater visibility to the integrated system of services and interventions, but in particular to the territorial social sphere, where the participatory strategy of planning, management, provision and organization of social welfare services is implemented.

In fact, the implementation and provision of the RdC measure involves the challenge of a high participation and integration of many different institutional actors, starting from the Ministry of Labor and Social Policies, to INPS, to the Regions, to the areas and services municipal social networks; from Employment Centers to social enterprises and the Third Sector, also including the Italian Post Office and the charitable organizations and CAFs in this participatory procedure. For these reasons, always following the INAPP Report,

> the effective governance of a measure like the RdC represents a challenge in itself, especially if we consider a series of factors: the levels of government involved (from local to national), the number of actors (institutional and non-institutional), the (tight) preparation and implementation times, the starting human and instrumental resources, the financial resources of different origins (institutional resources and community resources). Each actor involved is responsible for a series of more or less complex activities. In this context, the social services system therefore takes on an increasingly important role (Istituto Nazionale per l'Analisi delle Politiche Pubbliche, 2021, p. 237).

In the Italian panorama of professional social service, the network methodology and that of multidisciplinary team work, precisely because of their importance as strategic elements of action and integrated intervention with respect to the multidimensional dynamics of the phenomenon of poverty,

have gradually obtained an increasingly broad recognition and affirmation as adequate operational tools to combat this phenomenon: in fact, the network of services and interventions represents, on a theoretical-conceptual as well as on a methodological-pragmatic level, the original and productive dimension of every complex vision of participatory and partnership procedures planning of interventions and services at an individual, territorial and institutional level (Franzoni & Anconelli, 2021); similarly, we can affirm that social work in multidisciplinary teams is the most suitable model (and practice) to respond to the same multidimensional characteristic of poverty, in relation to which the plural aspect of services and interventions made possible by networks and teams finds at least hopefully its full potential of effectiveness and expression: as Salmieri states, the integration at an institutional, organizational and professional level of the various processes referred to by measures to combat poverty is a central aspect for the implementation of social policies (Salmieri, 2021, p. 14).

These considerations show, definitively, the centrality and protagonism – not always adequately expressed at the level of public perception – of the social workers involved in the demanding work of social planning, which manifests itself in the active dimensions of the professional, such as: the relationship between help, the professional interview, the methodological procedure, the taking charge of individuals, groups and communities, albeit in the unavoidable individuality of the interventions, legitimized to start and in line with the institutional, legal and ethical procedures, or the ethical-professional principles, as also reiterated in the recently (2020) updated Code of Ethics. In fact, the training and profession of the social worker appears, more than ever today, implicit in the processes of development of knowledge and skills of coping and resilience, in order to address, in a planned and synergistic mode with the actors and territorial and community networks, the issue of poverty with respect to its socio-economic and socio-political phenomenologies, in the overall framework of the centrality of social planning and intervention.

5 Strategies of integration of social services with the Third Sector in the fight against poverty

The 2021 Budget Law has provided for the allocation of resources from the Fund for the Fight against Poverty and Social Exclusion, for the permanent hiring of social workers by public areas and territorial bodies, to be employed both in the context of measures to combat poverty, and in that of strategies, actions and professional interventions for the translation of the social policies adopted. Finally, the National Plan for Interventions and Social Services 2021-2023 is adopted with the

Interministerial Decree of 22 October 2021, a general regulatory framework for programming which includes the National Social Plan, the Poverty Fund and for Long-Term Care.

In the last 10 years, according to research by CNEL with the Astrid Foundation and the Foundation for Subsidiarity, it has grown by 25%, even during the course of the Covid-19 pandemic, with 375,000 entities including associations, social cooperatives, foundations and an involvement of 10.5 million people who participate in the various association activities; in detail, there are 900,000 people directly involved as employees, operators and various managers, while volunteers reach 4 million people. In detail, the research reveals a very vital subsidiary fabric, with the presence of bodies active in different areas (culture, sport and recreation; social assistance and civil protection; trade union and business relations; religion; education and research; healthcare). According to Vittadini, President of the Foundation for Subsidiarity, the pandemic has even highlighted even better the central role of the Third Sector in Italy, since it has supported public intervention with participatory and partnership strategies and actions, especially in particularly sensitive areas, such as social assistance and healthcare, despite the inevitable penalization of other areas such as day centers for disabled people, kindergartens, sports and recreational activities (Bassanini, Treu, & Vittadini, 2021).

Following these perspectives and levels of discussion, it is definitely plausible to define the role of the professional social worker in the context of the institutional structures of public-private welfare and territorial social service, due to the expectation towards the creation of resolutive forms of intervention to be implemented in comparisons of the different and multiple manifestations of socio-health problems – essentially assessable in terms of local services between public institutional actors and the Third Sector – aimed at enhancing the figure of the social worker in his work of integrated construction of networks and actions effective in responding to the challenges of individual and collective poverty.

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Investiment in art and gold between sustainability and portfolio diversification

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Abstract

In this work, attention was paid to investments in contemporary art, gold and other areas, taking into account two essential factors, namely sustainability and portfolio diversification. Having these two elements as guides, we proceeded with the analysis of investments in the various sectors taken in consideration. Especially with regards to gold, those aspects have been identified that allow sustainable investments. Concrete examples of portfolio diversification were also provided by referring to the Portfolio Selection Theory developed by Harry Markowitz.

Keywords – ESG; Sustainable Investiment; Art; Gold; Portfolio Selection: Diversification; Optimal Portfolio.

Paper type – Academic Research Paper

Sommario

Investire in arte e oro tra sostenibilità e diversificazione di portafoglio. – Nel presente lavoro l'attenzione è stata rivolta agli investimenti in arte contemporanea, in oro e in altri ambiti, tenendo conto di due fattori imprescindibili, ossia la sostenibilità e la diversificazione del portafoglio. Avendo questi due elementi come guide si è proceduto all'analisi degli investimenti nei vari settori presi in considerazione. Soprattutto per quanto concerne l'oro sono stati individuati quegli aspetti che permettono investimenti sostenibili. Sono stati, inoltre, forniti esempi concreti di diversificazione del portafoglio facendo riferimento alla Teoria della Portfolio Selection elaborata da Harry Markowitz.

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1 Introduction

An old adage goes: “Learn the art, and put it aside”. If knowing how to invest, in different areas and sectors, is also an art, it is possible to try to understand its characteristics and peculiarities, to the point of assimilating it and making it your own. This ability cannot be lacking in knowledge, and the awareness that only through the diversification of the so-called investment portfolio can one guarantee a certain solidity to one’s financial actions can never be absent.

It is also possible to invest your savings, in various sectors, in an ethically conscious manner, i.e. taking into account the dictates of the so-called “sustainable finance”. The latter is nothing other than that finance that takes in consideration environmental factors (Environmental), social factors (Social), and corporate governance or structure (Governance). These are ESG factors now considered fundamental in investment decision-making processes, since many people feel the need to direct capital towards longer-term sustainable activities and projects.

ESG factors include issues of absolute importance, such as climate change mitigation, the energy transition, the zero-emission economy, issues relating to biodiversity and social issues (inequalities, labor relations, respect for human rights).

Making a financial investment that takes ESG factors into account means investing in companies that make sustainable business choices, consistent with the principles of the United Nations Global Compact.

If art is generally sustainable in itself, and sensitive to the themes indicated, in the case of investing in gold or other areas it is necessary to move with caution and make appropriate choices.

2 Investing in contemporary art

We talk more and more frequently about sustainable economics, or finance. Sustainable finance places environmental, social and corporate governance factors at the center of its actions, i.e. the so-called ESG factors, using an English acronym (Environmental, Social, Governance). This type of finance, therefore, directs capital and investments towards activities that do not damage the environment (i.e., that do not act negatively on global warming and climate change), that respect individuals and human rights, that have a corporate structure clear. Sustainable finance is, therefore, the application of the concept of sustainable development to financial activity.

Given the greater sensitivity towards environmental and social issues, a growing number of individuals are moving towards financial investments that take ESG factors into account. Many seek to

invest in companies that make sustainable business choices, consistent with the principles of the United Nations Global Compact, relating to human rights, labor standards and environmental protection. The underlying idea is that a sustainable economy can help create a better, more livable world.

Savers can choose to invest in certain companies, rather than others, by making very specific choices. They may decide, for example, not to invest their savings in companies that do not respect international conventions on workers' rights or that operate in sectors and areas that do not comply with international treaties.

An investment can be said to be "sustainable" by referring to indicators, the ESG ratings, which express a synthetic judgment on the level of environmental, social and corporate governance sustainability of issuers (companies, states, etc.) of securities and collective investment instruments (UCITS and ETFs). The ratings are assigned by specialized agencies that develop them on the basis of analyzes conducted starting from non-financial information published by companies and obtained from other sources. It must be said, however, that there is a lack of internationally shared standards for assessing sustainability.

Nonetheless, ESG scores are widely used in finance for the selection of financial instruments, for the creation of investment portfolios and for the creation of market indices defined as sustainable.

The Bank of Italy, sensitive to environmental issues, has developed an important Charter of Sustainable Investments, through which the institution wants to define its vision of sustainable finance.

Therefore, in the most disparate fields the need for sustainable finance and development is felt. But how does art deal with these questions? Investment in works of art, in general terms, can be considered sustainable, since the art itself has no implication with those elements that can be considered harmful to the environment and to human rights. Art, indeed, brings spiritual (as well as economic) enrichment which must be considered as an absolutely positive factor for individual growth. Not only. Art has always combined its aesthetic value with a function of stimulation and awareness on certain issues, becoming, in some cases, also a clear denunciation of discrimination and injustices.

Today art can (and often does) take into account issues related to environmental and social sustainability. Many artists, in recent years, have committed themselves to defending the environment, raising awareness of sustainability issues and ecosystem protection.

Street art has shown itself to be particularly sensitive to all issues related to the environment. There are also sustainable works of art, made with natural elements and recycled, non-toxic materials. Some artists even manage to implement ecological approaches in the marketing of their works.

Furthermore, the anti-smog murals are particularly interesting, made with special paints capable of absorbing the harmful particles of smog. The largest mural of this type, as far as Europe is concerned, is Hunting Pollution by Iena Cruz, it is located in Rome and covers an area of 1,000 square meters. This

work of art on the wall has the ability to absorb a quantity of pollutants equivalent to that which 30 trees could purify. Naples, Milan and Padua also each have a mural made with special anti-smog paints. After all, environmental art is not a recent invention or discovery of recent years. It has existed for more than half a century. It is that art in which the artist actively engages with the environment, interacting with the latter in various ways. The art critic Germano Celant stated that there is a continuous exchange between the work and the context. In fact, starting from the end of the 1960s, the attention of many artists shifted from the particular to the general and from the single object to the space in which the object is immersed. Land Art considers the territory as a gigantic canvas. It takes into consideration vast spaces, within which man leaves his artistic mark. It is the art of Smithson and Christo. Environmental art in some cases negatively impacts the environment, and is therefore not always eco-sustainable.

In any case, with very few exceptions, art always takes the side of the environment and its protection.

The art market has seen a constant increase in recent decades, attracting an ever-increasing number of collectors and investors. Many works of art by internationally renowned artists are considered, like gold, as a true refuge asset. In particular, there has been growing attention towards contemporary art. A Numisma report underlined how modern and contemporary art was the investment that had recorded the highest returns by far between 1995 and 2009.

In recent years there has been a real transformation of the art market, especially following the competition generated by the over 154 fairs held every year all over the world, and also due to the importance of investors and funds investment in this sector.

Investment in art is something delicate and complex at the same time. It is not enough to appreciate a work, to esteem its author. If you want to invest consciously you need to know the market and understand the economic and financial mechanisms on which it is based.

Therefore, to invest in contemporary art it is necessary to take into account many factors and have skills in both the artistic and economic fields. Not only. Even a certain intuition can be valuable. Among the protagonists of Arte Povera, Alighiero Boetti is the artist who is enjoying the greatest success. For a tapestry of 5 letters, which until a few years ago could be purchased for around 30,000 euros, today you have to spend 50,000. Yet, in the 1990s tapestries could be purchased for less than a million lire each. Those who invested in Boetti in those years now own a real capital.

A work of art can be defined as a unique object, made manually with decorative intent, under the direct control of the artist, or directly by the artist himself. The work of art is a luxury good whose possession is a source of social prestige and communicates the refinement of taste of those who purchased it.

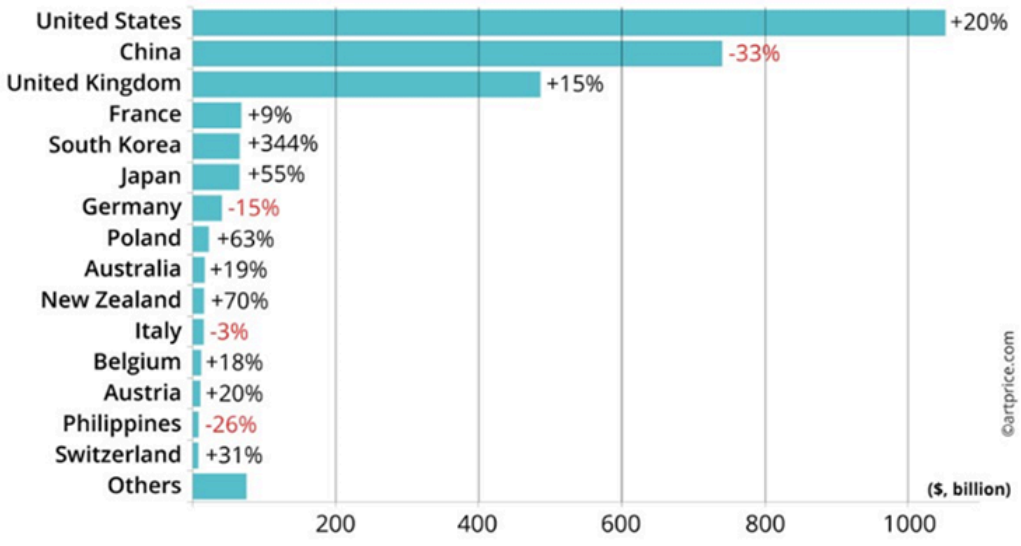
The art market is large and varied; in fact, it offers both works that satisfy more aesthetic needs and works more oriented towards satisfying a cultural and symbolic dimension.

Like the stock market, the art market is also divided into primary and secondary. The primary market is the one in which trade takes place directly between the producer and the first buyer; the secondary is the one which has as its object sales subsequent to the first. The market is then, physically, made up of galleries, auction houses and fairs, although an entire underground market should not be ignored. Furthermore, a private individual can sell a work of art to another private individual, without going through intermediaries. However, it must be said that, especially for modern and contemporary works, the documents relating to them are of absolute importance, i.e. certificates of authenticity, archiving, advertising, etc. Purchasing a work from a private individual, let's say, by Schifano, De Chirico or Morandi, just to give some examples, without the relevant documentation is very risky.

As regards sales, the sector that has seen a growing increase is above all that of auctions. The United States continues to be the hub of the art market.

Figure 1 shows us the geographical distribution of the turnover of contemporary art auctions.

Figure 1 – Geographical distribution of the turnover of contemporary art auctions



Source: artprice.com

The art market has proven to be strong and dynamic even in the midst of the pandemic. In fact, in 2020/2021, 119,400 contemporary works changed hands, with an increase of 12% compared to the previous year. The number of works sold for over one million euros is also increasing. In 2022, works

were sold for exorbitant prices. The work sold for the highest price that year was a "sage blue Marilyn Monroe" by Andy Warhol, at Christie's in New York, sold for the record price of 195 million dollars.

In addition to private collecting, there is corporate collecting. An ever-increasing number of companies and banking foundations are investing large sums in the purchase of works of art.

Furthermore, many banks, believing in investing in art, have organized themselves to offer their customers the possibility of investing a portion of their savings in works of art. A fundamental figure is that of the art advisor. This is an expert art consultant, usually active within an art banking structure. Aside from specific skills in art history and criticism, the art advisor must have a good knowledge of the rules of the international market and the prices of artistic goods. He must be able to advise his clients in the best way, both in the case of valuations of art assets and in the case of buying and selling works of art. As with all investments, naturally, even in this sector there are risk factors that need to be evaluated. Contemporary art is subject to unpredictable ups and downs. For this reason it is necessary to know, study and rely, if necessary, on competent and scrupulous professionals. Never follow trends. Every now and then we rediscover forgotten, marginal artists who are artfully inflated (so to speak), and who then just as willingly deflate, with a sudden significant decrease in the prestige and value of their works. We need to focus on historicized artists, recognized by critics and art history. It is also good practice not to focus on just one name, but to acquire works by multiple artists, even very different ones.

The choice of artists to invest in is dictated by more traditional criteria, such as artistic value and potential appreciation. Certainly, one can also follow the criterion of sustainability and sensitivity to certain themes with regards to artists still active.

Finally, it is necessary to refer to art investment funds. There are different ways of investing in art. The traditional system, which is still the most practiced (and, ultimately, the most correct) consists in the direct purchase of a work of art. The investor, however, can also decide not to participate directly in the sale of a work of art, but to intervene indirectly, through participation in art investment funds. *Art funds* are financial products specialized in the buying and selling of works of art, with a mechanism similar to that of mutual investment funds. They contain a set of works, often by different artists, so as to offer some diversification.

The limit of "art funds", however, lies in the fact that the investor-collector does not own the works, does not have them in his home, cannot observe them, appreciate them. In this way the work of art is treated like any financial product and its purchase is a mere economic speculation.

3 How to invest in gold sustainably

Gold, as is known, is a rare and precious metal. It has always been associated with complex symbols that refer either to the divine realm, or to the supernatural, or to perpetuity. In different cultures and eras gold symbolizes divinity, power, royalty, the sun, light. For the pharaohs of ancient Egypt, gold was the substance of which the immortal gods were made. The Bible says that the pillars of Solomon's temple were covered with gold.

Symbol of beauty, uniqueness, splendor, gold is not only a rare metal, but also resistant to both air and most chemical agents, and, despite its high specific weight, it is extremely ductile and malleable. For all these characteristics it has always lent itself to the creation of refined and precious objects.

Gold was such a valuable and desired commodity that from the Middle Ages to the dawn of modernity, alchemists tried to transform base metals into pure gold.

For gold, the ancient Arabic measurement of carats, equivalent to carob seeds, is still used to indicate its purity, while the troy ounce, an ancient English medieval measurement, is used to determine its weight. Thanks to its low melting point, gold allows for easy reuse, so it is possible to transform jewelry into coins and coins into jewelry. Therefore, gold, with its scarcity or abundance, has always influenced the history of men.

Furthermore, gold has historically represented a means of measuring the value of goods and was used as a payment instrument in almost all ancient civilizations. Numismatists know the value of ancient Roman gold coins well.

Since ancient times, gold has always represented a fundamental commodity of exchange. It continues to represent an effective hedging tool in times of crisis and against adverse events. The price of the yellow metal, in fact, tends to rise when financial operators perceive a high level of risk. It is no coincidence that the price of gold increased in 2020, that is, in the middle of the pandemic, and in March 2022, immediately after Russia's invasion of Ukraine, when it exceeded 2,050 dollars an ounce.

Furthermore, gold has always guaranteed protection against excessive increases in inflation, precisely because of its ability to preserve its value over time. In currency crisis situations, a central bank can dispose of gold, as well as foreign currency reserves, to preserve confidence in its currency. The United States is the world's largest holder of gold reserves with more than 8,000 tons, followed by Germany, which has 3,377.9 tons, Italy, which has 2,451.8 tons and France, which is quota 2,435 tons. The Bank of Italy is the fourth largest holder of gold in the world, if we also take into account the International Monetary Fund, the third in the ranking of central banks.

The reserves of the Bank of Italy, equal, as mentioned, to 2,451.8 tonnes, have a value of approximately 90 billion euros. Referring to 2016, this is just over 5% of Italian GDP, which that year

was equal to 1,672 billion euros. It must also be said that, for various reasons, approximately 55% of Italian gold is kept outside national borders.

Gold is found on Earth in primary and secondary deposits. The former consist of rocks or gold-bearing veins, while the latter consist mainly of alluvial deposits, deriving from the erosion of gold-bearing rocks and the sedimentation of gold. Although it usually occurs in the form of dust, flakes or grains, alluvial gold is also sometimes found in the form of larger agglomerates called nuggets.

Gold is still being extracted today, especially from mines. This is an aspect to keep in mind if you want to make an eco-sustainable investment. In fact, gold mining is quite harmful to the environment. It is estimated to be the cause of 38% of all mercury emissions in ecosystems. Mercury, a highly toxic substance, easily enters the human food chain from ecosystems due to its chemical characteristics. Not only. If we refer to atmospheric emissions dangerous for the environment, on an annual basis gold mining emits more greenhouse gases than all the passenger flights of all European states combined, and this data only concerns the extraction, not the processing of gold. The yellow metal is extracted causing serious damage to nature. Large quantities of water are needed, which are contaminated by chemicals. Furthermore, the opening of mines corresponds to large deforestations. In certain cases (think of Brazil and Peru) gold mines cause irreparable damage to complex and fragile ecosystems, such as that of the Amazon forest. Therefore, the path of this coveted raw material, from the mines to the transformation into a luxury good, is anything but golden.

Gold used for medical, industrial and technological purposes is only 7% of that mined each year. The remaining 93% is used to create jewelry and for banking activities, i.e. the production of coins and ingots. Can we stop mining gold? According to many, yes. The solution would be the recycling, or reuse, of gold already in circulation. In fact, gold is already one of the most recycled materials in the world today. In fact, a quarter of the global supply comes from reuse, while the remaining three quarters come from extractive activities. The amount of gold coming from recycling could increase further, so much so that 45% of all the gold used by jewelry companies could come from the metal already in circulation. With the reuse of this precious metal, the emissions associated with it would be reduced by 99%. And gold, however, would continue to play its role in the world economy, considering that, with less gold mined, its value would increase. Therefore, even in the case of a total cessation of mining, the stability of the banks and nations that have their own gold reserves would be preserved.

Recycled gold, that is reused, can also be defined as “ethical gold”. This recently coined expression refers to a type of gold extracted and processed in harmony with the surrounding ecosystem and in collaboration with the communities involved. In the case of ethical gold, chemical components that are incompatible with the environment cannot be used during the extraction phase. Furthermore, working conditions must comply with minimum safety standards.

Those who invest their savings in gold have various choices: many collect ancient precious gold objects (think of gold boxes, often enriched with micromosaics or miniatures); in this case, since it is ancient gold, the question of sustainability does not arise at all (as happens with ancient gold or silver coins). There is, therefore, the possibility of investing in gold and, at the same time, in antiques, which can never lose their value.

Anyone who buys physical gold in ingots or bars must verify the quality of the purchased good. The gold must be certified, with the LBMA (London Bullion Market Association) good delivery certificate.

In recent decades the market has changed profoundly, with the birth of the so-called financial or paper gold. The so-called metal accounts, partly similar to traditional current accounts, but denominated in gold, are divided into "allocated", a type of investment in physical gold for which the account holder is the owner of some ingots, identifiable by the number, and "unallocated", in which the account holder is the owner of a certain quantity of financial gold, not directly associated with specific ingots.

Exchange Traded Funds, commonly referred to by the acronym ETFs, are investment instruments traded on regulatory markets. They have the objective of replicating the underlying, i.e. gold, to which they refer. ETFs do nothing but replicate the price trend of gold. This replication can be physical or through "futures" contracts. In the case of physical replication, the invested amount is allocated by the issuer of the ETCs (Exchange Traded Commodities) in ingots, kept in armored vaults. Various investment options are available in "futures" replication. It is possible, for example, to take bullish (long) or bearish (short) positions.

Like ETFs, also ETCs are traded on exchanges but are specifically designed to provide exposure to commodities. While ETFs can cover a variety of assets (they track the performance of market indices, sectors, bonds, currencies or commodities), ETCs focus exclusively on individual commodities or baskets of commodities (such as gold, oil, natural gas, and so on), offering a simple and transparent way to invest in these markets. ETCs may be physically backed by commodity reserves or by derivative contracts that track the price of commodities.

From a practical point of view, physically replicating ETCs are more suitable for a traditional investor, who perhaps aims to build financial positions gradually, with multiple subsequent purchases. "Futures" tracking ETCs are more suitable for a dynamic investor, who does not want to wait too long for feedback, but who takes advantage of upward and downward fluctuations. Such an approach, however, entails quite a few risks.

Gold, whether in the form of precious objects, coins, ingots, or in the form of ETCs, certainly cannot be missing from an investment portfolio, for the various reasons mentioned above.

It is also suggested to combine the investment in gold with that in contemporary art. These are different areas (although there are points of contact), but for this very reason they can be perfect for portfolio diversification.

Moreover, gold has little correlation with the main market assets, with the exception of precious metals, the currencies of gold-producing countries and stock prices.

It, therefore, always represents a valid tool for risk diversification, having a trend largely unrelated to both the stock and bond markets.

At this point it is necessary to delve deeper into a very important aspect, namely portfolio diversification, which has been mentioned several times.

4 Portfolio diversification

A portfolio is a collection of different financial assets. The portfolio may contain shares, bonds, raw materials, liquidity, funds, policies and may also consist of non-negotiable securities, such as works of art or private investments. Each asset that makes up the portfolio will have its own return and risk, and the return and risk of each asset will influence the overall return and riskiness of the portfolio.

In investment choices, it is very common to find that individuals tend not to concentrate their investments in a single security but in portfolios made up of multiple securities. The choice to diversify your investments derives from the fact that this allows you to reduce the overall risk of the portfolio.

One of the main finance theories is Harry Markowitz's portfolio selection model, published in the *Journal of Finance* in 1952. Markowitz, through the publication of "Modern Portfolio Theory", introduced a new perspective on portfolio analysis. His goal was to develop a scientific approach to optimal portfolio construction, considering how different assets could be combined together to obtain the maximum expected return for a given level of risk or the minimum risk for a given level of expected return. Markowitz, in fact, has demonstrated that through diversification, investors can reduce the overall risk of the portfolio without compromising, and in some cases, improving the expected return.

4.1 The Markowitz model

In Modern Portfolio Theory, Markowitz states that investors generally prefer portfolios that offer higher returns with as little uncertainty or risk as possible. This preference reflects the rational nature of investors, who seek to maximize expected return for a given level of risk or minimize risk for a given level of expected return.

In this theory Markowitz defined the concept of expected value (or average) of the rate of return as a key measure to quantify the expected profit that investors expect to obtain from their investment portfolio, and the variance or standard deviation of expected returns as measure of the risk associated with an investment portfolio.

Investors use the Markowitz model to identify all possible combinations of portfolios that maximize the expected return for a given level of risk or that minimize the risk for a given level of expected return and which are on the so-called "efficient frontier". Investors are considered rational when they try to allocate their capital along the efficient frontier, choosing portfolios that best satisfy their personal preferences in terms of risk and return. The objective of Portfolio Selection is, in fact, precisely to provide investors with a rational and mathematical way of making investment decisions, taking into account both fundamental aspects: return and risk. The process of building the efficient frontier involves optimization that aims to find the optimal combination of financial assets in order to maximize the expected return for a given level of risk or minimize the risk for a given level of expected return. It is therefore a question of solving an optimization problem which consists in finding weights which minimize the variance or which maximize the expected return. To solve this optimization problem, two constraints are imposed on the variance minimization or expected return maximization equation: the first establishes that the investor wishes to reach a specific level (target) of expected return or risk in the portfolio; and the second is that the sum of the asset weights within the portfolio must equal 1. The solution to this optimization problem returns optimal weights assigned to each asset within the portfolio. These weights represent the proportion of total capital invested in each asset. Once the optimal weights have been obtained, it is possible to build the optimal portfolio. This optimal portfolio will be on the efficient frontier that represents the optimal trade-off between risk and return. The choice of the optimal portfolio among those present in the efficient frontier (which represents a series of optimal portfolios that offer the best possible combination of expected return and risk), as has already been said, is up to the investor and depends on his risk tolerance and personal preferences.

Investor preferences can vary greatly. Some investors may be willing to take higher risks to seek higher returns, while others may prefer a portfolio with a lower level of risk, even at the cost of a slightly lower expected return.

Furthermore, another key concept in Markowitz's approach to portfolio management is so-called "diversification". Through diversification it is possible to spread investments across a variety of financial assets or assets to reduce the overall risk of the portfolio. The reasoning behind portfolio diversification is that financial assets may behave differently in response to market events or economic conditions. By allocating capital across a variety of assets with lower or even negative correlations, you can reduce exposure to specific risks tied to a particular stock or sector. In this way, if one asset suffers a

decline, the others could compensate for the losses, helping to maintain greater stability of the overall portfolio. Portfolios made up of a few securities, in fact, may be subject to high levels of risk because they may not be diversified. Therefore, the variance within a portfolio can be reduced by adding a greater number of assets to the portfolio and avoiding investing in securities with high covariances or correlations between them. Markowitz demonstrates, in fact, that the risk of an investment portfolio, a set of shares, for example, depends more on the relationship between the shares that compose it than on the risk of the individual shares. He was the first to rigorously quantify the benefits of diversification, i.e. the advantages of not putting all your eggs in one basket, demonstrating how it is possible to reduce the overall risk of the portfolio without penalizing the return until reaching the optimal portfolio, i.e. the one with the highest return for the same risk or with the lowest risk for the same return.

4.2 Critical issues and limits of Modern Portfolio Theory

Although Markowitz's Modern Portfolio Theory represented a milestone in financial theory and investment management, it is essential to recognize that this model is not immune to limitations and criticisms.

Over the years, Markowitz's approach has contributed significantly to the understanding of risk diversification and the construction of optimal portfolios, introducing key concepts such as frontier efficiency and variance of returns.

Founded on diversification and the balance between risk and return, Modern Portfolio Theory has provided investors with a solid conceptual framework for optimizing the composition of their portfolios to maximize expected returns and minimize overall risk. Despite its indisputable contributions to financial theory, it is important to carefully examine the critical issues and limitations of the Markowitz model, as these can influence its practical applicability and its ability to provide reliable results in a dynamic financial market context.

We will explore these critical issues in detail below, highlighting the challenges that can influence the practical application and effectiveness of Modern Portfolio Theory within modern financial markets:

- *Simplified hiring*. Modern Portfolio Theory is based on some unrealistic simplifications, such as the normal distribution of returns and the absence of transaction costs. These assumptions do not take into account the real-world complexity of financial markets which can result in non-normally distributed returns and significant transaction costs.
- *Lack of consideration of macroeconomic factors*. Modern Portfolio Theory treats assets as isolated entities, without adequately considering the macroeconomic and geopolitical factors

that can influence the entire market. For example, events such as changes in monetary policy or political instability can have a significant impact on all financial assets.

- *It ignores the behavior of markets during crises*. During periods of financial crises or high volatility, markets may experience sudden and substantial changes in investor behavior. In such circumstances, diversification based on Modern Portfolio Theory may not be effective in reducing overall portfolio risk.
- *Sensitivity to historical data*. Modern Portfolio Theory uses historical data to estimate expected returns and covariance between assets. However, past performance may not be predictive of future performance, especially in times of economic change or evolving markets.
- *Liquidity problems*. Modern Portfolio Theory may suggest the inclusion of illiquid assets in optimal portfolios, which may not be practical for investors who need immediate liquidity. Illiquid assets can be difficult to sell quickly without incurring large losses.
- *It does not take into account investor behavior*. Modern Portfolio Theory is based on the hypothesis that investors are rational and make decisions based on expected utility and risk. However, investors can be influenced by emotions, irrational behavior and imperfect information, which can lead to suboptimal decisions and deviations from the principles of Modern Portfolio Theory.
- *Difficulty in practical application*. Implementing Modern Portfolio Theory in practice can be complex due to the need for accurate parameter estimates and portfolio allocation. Furthermore, it requires ongoing monitoring and adjustments of portfolios which can be costly and require considerable time and resources.
- *Systematic risk not considered*. Modern Portfolio Theory focuses on asset-specific risk, neglecting systemic risk or market risk that can affect all investments simultaneously. Macroeconomic or geopolitical events that affect the entire market can make diversification based only on Modern Portfolio Theory ineffective in mitigating risk.
- *Efficient markets assumption*. Modern Portfolio Theory assumes that markets are efficient and that all participants have access to the same information. However, this assumption does not take into account market inefficiencies that can arise from asymmetric information, price manipulations or herding behavior, affecting the validity of Modern Portfolio Theory models.
- *Asset valuation models*. Modern Portfolio Theory relies on asset pricing models, such as the Capital Asset Pricing Model (CAPM), to estimate expected returns. However, these models may be limited in their ability to capture market complexity, and estimates of expected returns may be subject to significant errors.

- *Overestimation of predictive ability*. Modern Portfolio Theory may overestimate investors' ability to predict future returns and mitigate risk through diversification. In reality, the predictability of returns and the ability to manage risk can be limited by the complexity and uncertainty of financial markets.

While Modern Portfolio Theory provides a useful framework for building diversified portfolios, it is important to recognize its limitations and consider other factors and approaches when managing investments to achieve more robust results tailored to market conditions. It becomes clear that Modern Portfolio Theory is a simplified model that provides useful guidance for building diversified portfolios, but it is important to integrate it with other approaches and considerations for more comprehensive and resilient investment management.

In conclusion, while recognizing the value of Modern Portfolio Theory as a guide for portfolio construction, it is important to integrate this theory with other approaches and considerations for more comprehensive and resilient investment management. It is essential to understand its limitations and adopt a flexible and informed approach to investment decisions. Integrating Modern Portfolio Theory with other perspectives and methodologies can contribute to investment management that is more comprehensive and adaptable to changing market conditions.

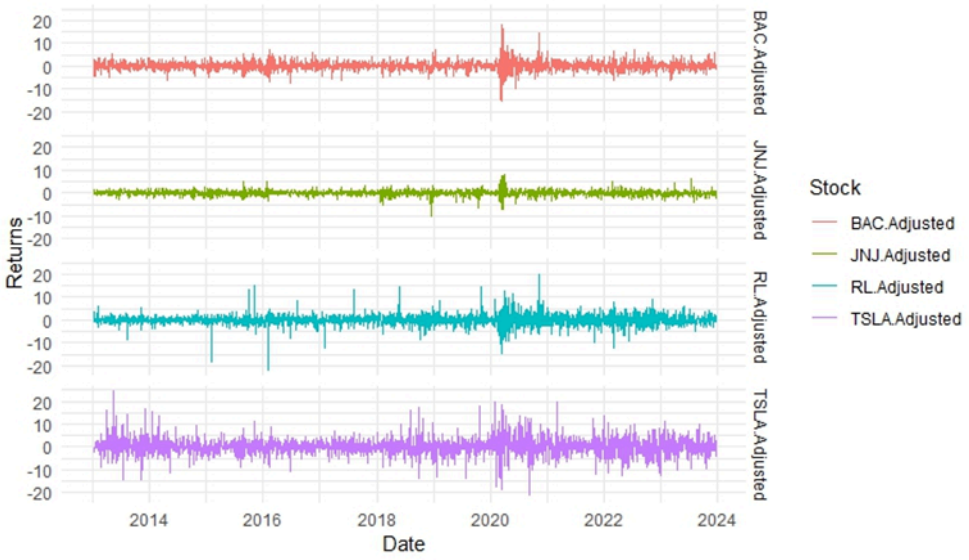
4.3 Construction of the optimal portfolio

In this last part of the thesis we have dealt, through the use of the RStudio programming language, with simulating the construction of an optimal portfolio, setting the objective of minimizing risk for a given level of expected return and taking into consideration the investor preferences. The choice of the optimal portfolio among the optimal ones present on the efficient frontier was made by taking into consideration a multi-asset portfolio made up of four stocks.

The stocks examined and which make up the multi-asset portfolio are: the stock of the multinational bank of America, the stock of the US pharmaceutical company Johnson & Johnson (which produces drugs, medical equipment and personal care products such as shampoo and creams), the action of the US company Ralph Lauren Corporation (active in the clothing, marketing and distribution of products in four categories: clothing, home, accessories and perfumes), and the action of the US company Tesla (specializing in the production of electric cars, photovoltaic panels and energy storage systems). These are equity securities belonging to different areas and sectors and which finance activities that contribute to environmental protection, to ensure portfolio diversification and therefore reduce the overall risk of the portfolio.

The first step, in RStudio, was to import the daily prices of the four shares from Yahoo Finance in the period from 2 January 2013 to 22 December 2023. Subsequently we proceeded to create the returns of the four shares in order to plot them of returns in order to evaluate the performance of the shares.

Figure 2 – Adjusted returns of the four stocks



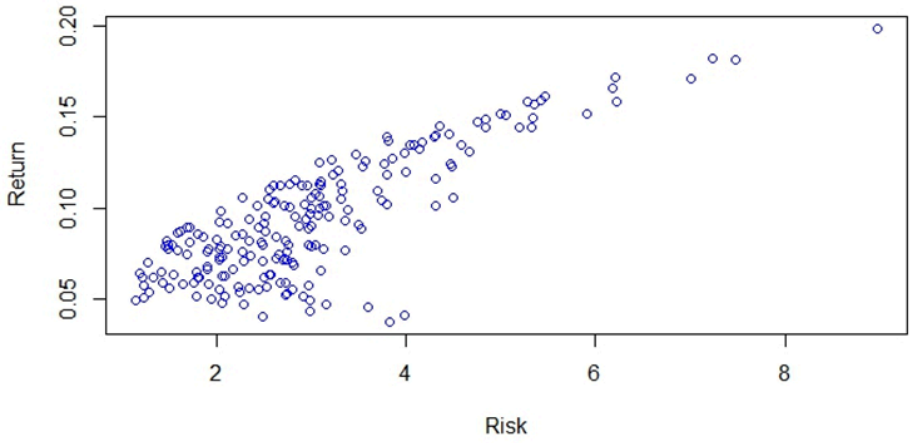
Source: our elaboration

Looking at Figure 2, what we can notice is that there are evident fluctuations in the returns of the four stocks both in 2020, i.e. during the Covid crisis period, and in 2022 following the invasion of Ukraine by Russia.

The next step was to create random portfolios and calculate their weights. The expected returns of these portfolios were then calculated (using the weights assigned to the assets) and the variance-covariance matrix which in the context of Modern Portfolio Theory is used to quantify the risk produced by a portfolio made up of multiple securities.

Figure 3 is a scatterplot of random portfolios and is a common practice in Modern Portfolio Theory and in the construction of the efficient frontier. This chart is used to visualize the variety of portfolios that can be formed by combining different financial assets randomly. Each point in the graph represents a different portfolio. Portfolios that are at the bottom and left have lower risk and return, while portfolios that are at the right and top have higher risk and return. The disposition of the portfolios seems to follow the trend of the efficient frontier.

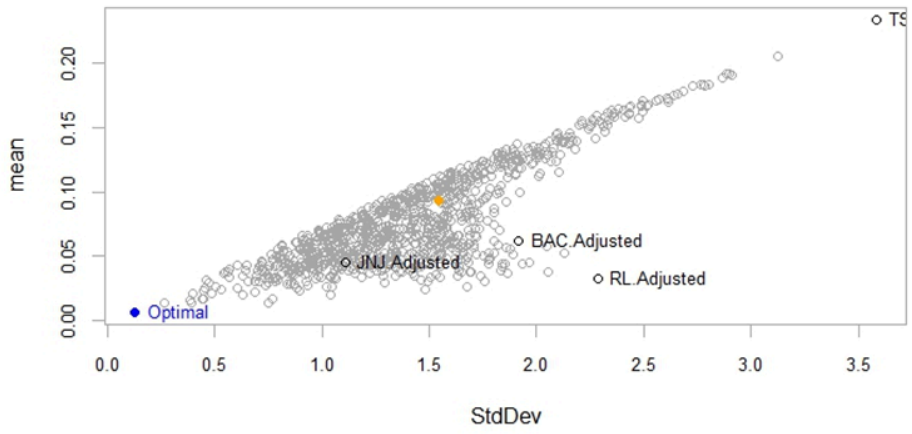
Figure 3 – Frontier portfolios



Source: our elaboration

In order to proceed with the identification of the optimal portfolio among the efficient portfolios present on the efficient frontier, the optimization of the weights of these random portfolios was carried out by imposing as a first constraint the minimization of risk for a given level of return and as a second constraint that the sum of asset weights must equal 1 (this ensures that the investor is fully allocating his capital and leaving no resources unused).

Figure 4 – Mean-variance portfolios



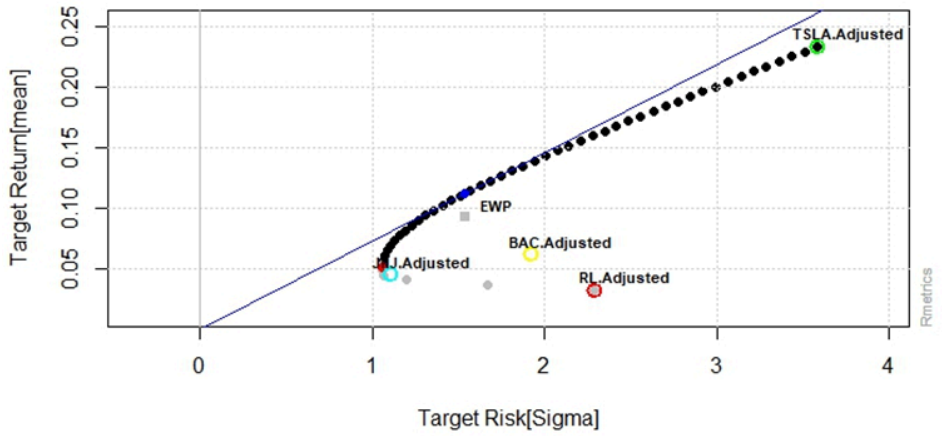
Source: our elaboration

In Figure 4 we can see that each point represents a portfolio and that the positioning of each point is determined by the risk-return trade-off. The blue dot called "Optimal" positioned at the bottom and left of all the others represents the optimal portfolio and is characterized by minimal variance.

Finally, the graphical representation of the efficient frontier was carried out.

Investors can select the optimal portfolio on the efficient frontier based on their risk-return preferences. Portfolios that are on the efficient frontier represent the best combinations of risk and return. The efficient frontier, as has already been said several times, represents all the possible portfolio combinations that minimize the risk for a given level of expected return or that maximize the expected return for a given level of risk. What is interesting to note in the graph of the efficient frontier is the presence of a red dot which represents the optimal portfolio, that is, the one which among all the optimal portfolios that are on the efficient frontier is the best of all because it is characterized by a minimum variance for a given expected level of return.

Figure 5 – Efficient frontier



Source: our elaboration

5 Conclusions

Investing well and carefully, whatever the chosen area, is not easy and requires knowledge, application and intuition. The indications provided in this article are not conclusive and absolute, since everyone, based on their own experience and tastes, will be able to make choices in certain directions and areas.

However, two elements are clear and must be reiterated and underlined. It is right, for the protection of the environment and fundamental human rights, to move towards a sustainable economy that embraces the principles attributable to the so-called ESG factors. In deciding how to invest capital, savers and the financial intermediaries who manage their savings can play a fundamental role in better allocating capital towards financing positive investments for society. You can choose to invest in businesses that generate a positive environmental and social impact.

Art, as has been said several times, is very often a means of reflecting on contemporaneity and its many contradictions. Collecting works of art is a unique experience, capable of enriching individuals both from a spiritual and aesthetic point of view, and from a material point of view.

You can choose to invest in a specific area (Poor art, Conceptual, Informal, ...) or in multiple areas at the same time.

Investing in gold can also be very profitable. In this case the investor can purchase antique gold objects, or choose so-called recycled gold or ethical gold.

The other element that cannot be ignored is that relating to the diversification of the investment portfolio. In their investment choices, individuals tend not to concentrate on a single security but build portfolios made up of multiple securities. Diversifying your investments means: reducing risk, improving the risk-return trade-off and mitigating the impact of specific events linked to a company or sector on a single security. From this point of view, the reference to Harry Markowitz's Portfolio Selection Theory is essential. In fact, it shows that it is necessary to identify the so-called "optimal portfolio" on the efficient frontier, characterized by the minimum risk for a given level of return or the maximum return for a given level of risk. This optimal portfolio represents the best possible trade-off between risk and return, given the set of investment opportunities available.

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