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RESEARCH ARTICLE

REVIEW

COMMENTARY

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REVIEW

Dovetailing the human resource management with the cloud computing in the era of industry 4.0: A review

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Abstract: The Current review evaluates the human side of Industrial Revolution which is blending the physical, biological, and digital worlds, erasing the borders between technology and human. The Current article examines the potential benefits of Cloud Computing (CC) in the area of HR, and their significant advantages in various HRM processes and highlights the development and trends in the industrial revolution. The 44 articles were retrieved from free search engines like Google scholar, Proquest, Research Gate and Google from (2010-2022). The articles selected through this process were carefully analyzed to synthesize existing knowledge. The findings emphasized that cloud based HRMS offers distinctive advantages to enhance efficiency and cost-effectiveness. The review surfaces that innovative programs have disrupted traditional HR management practices by transitioning the company's segregated in-house HRMS to the cloud. The organizations; implementing and practicing such technologies have gained competitive edge over their rivals. Additionally, cloud computing facilitates efficient resource utilization, seamless scalability, elimination of hardware and software maintenance requirements, and reliable data recovery capabilities. The study suggests strategies on how HR must create a digital workplace that can innovate, collaborate, and tackle business issues.

Keywords: human resource, HRM, industry 4.0, cloud computing

1 Introduction

In the realm of HRM, information technology (IT) preserves an essential and growing role [1]. Human Resources (HR) have transformed into an official and internal structure of organizations, serving as the governing body for all facets of HRM. Starting from Compensation, Recruitment, and incentives, work relationships, relations among employees, training of staff, and organizational development are all HR responsibilities [2]. The advent of the information system in HR and electronic HRM resulted from the expansion of human resources' role and the advancement of technology [3]. According to [4], e-HRM refers to the utilization of web-based technology for the implementation of HRM policies, strategies, and practices within a company [4]. The information systems of HR are the technical tools that are there for gathering, storing, maintaining, and retrieving the data of an organization's employees are known as human resource information systems [5]. It can assist firms in managing people and fostering a culture of creativity [6]. Cloud computing technology enables HR managers to focus on more strategic thinking tasks such as supporting innovation, by streamlining functional and service-delivery responsibilities [7].

The shift of physical labor to machines and the growing significance of mental abilities have also reshaped the workforce in terms of its skill requirements and composition. Human Resource Management (HRM) has begun to incorporate these new technologies and we are witnessing a digital boom, which is radically transforming our work environment and reshaping our perception of HR. This surge in digital advancements brings forth the potential for innovative HR technology solutions [8].

Traditional Human Resource rules are being influenced by the current generation of technology. With new creative technologies, the HR industry is rapidly evolving. These types of departments of an organization are progressively abandoning traditional techniques in favor of emerging Cutting-edge technologies like Cloud Computing and Artificial Intelligence (AI) 2

(Cloud Computing, 2013). From hiring through onboarding, training, and other advantages, these technological solutions have changed the recruitment process by automating and streamlining the process. Technology now plays a very important role in increasing the functions of an administrative HR department globally.

According to Ghosh (2020) of Elets News Network (ENN), cloud computing plays a crucial role in driving the Industrial Revolution 4.0. It supports advancements in internet of things (IoT), automation, and robotics, enabling more efficient processes in the banking and financial industry to stay competitive. Cloud computing is a scalable platform that allows non-technical people to easily manage and access hardware and software through a web application via the internet [9]. Industries or organizations of all sizes get the advantages of IoT and more importantly, it had a significant and favorable impact on big to small-sized organizations [10]. The new software's capacity to maintain talent management effectively and high-quality, enhance performance and achieve all of this while remaining cost-effective was the driving force behind the current technological solutions.

It is evident from Figure 1 that due to technological improvements, from the 1970s to the 1990s cloud computing evolved at breakneck speed. International Business Machines (IBM) company then released the Virtual Machine operating system in 1972 [11]. Telecommunications firms began selling Virtual Private Networks as rented services in the 1990s. In 1997, Professor Ramnath Chellapa introduced Cloud computing and sooner the cloud gained so much popularity in business and in 1999, Sales force Company emerged as a shining example of cloud computing success adoption.

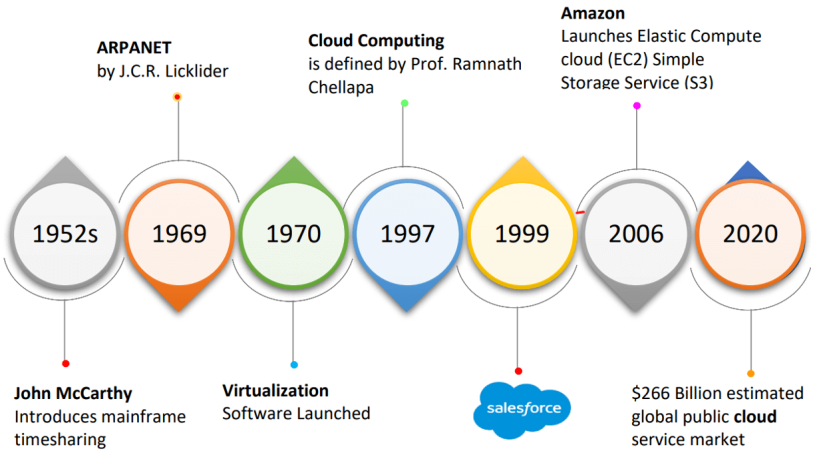

Figure 1 Cloud computing road map (Source: Developed by the authors in line with the literature review)

With the advancements in HR automation, HR professionals now view themselves less as administrators and more as strategic elements in important organizational choices and human resources departments are seen more as online resources than actual people. Moreover, HRM may undergo a radical and an unimaginable transformation, owing to the widespread availability of human resource services provided by most companies via technical and web-based applications [12]. These shifts are typically brought about by the necessity to cut expenses while simultaneously increasing service quality. In the extant literature, some studies have identified the factors that cause firms to embrace Cloud Computing [13, 14]. However, there is a dearth of in-depth research regarding factors that impact the uptake of Cloud Computing by organizations. Thus, the current study reviews and synthesis the possible benefits of Cloud Computing (CC) in the field of human resources, as well as their substantial advantages in different HRM activities, and highlights developments and trends in the industrial revolution.

Going ahead, a review of literature is conducted on prior studies to understand the impact, challenges, and countermeasures. There are primarily five sections to this article. The first part is an introduction where a brief overview of the topic and the justifications for the study are laid out followed by an introduction to Human Resource Management in the second section. Industry revolution and why Cloud Computing matters in Human resources are discussed in section three, followed by a concise summary of CC Architecture in the subsequent section. The fifth part presents some of the prior research studies in the field and the findings and discussion of the research on the adoption of CC by organizations is discussed and final part is conclusion. (see Figure 2)

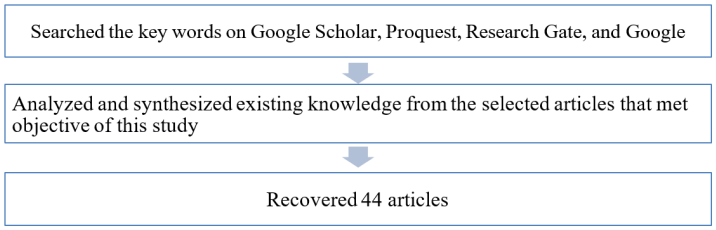

Figure 2 The methodology adopted for the study

2 Human Resource Management (HRM)

According to Flippo and Munsinger (1982), HRM is "the process of planning, directing, organizing and controlling the acquisition, compensation, integration, maintenance, development, and separation of human resources to the end that individual, organizational and social objectives are achieved." Human Resources (Human Capital) are essential for the success of any company. Human resources allow an organization to foster the growth and development of its employees through the sharing of valuable personnel knowledge, skills, and experience. The use of Cloud Computing (CC) holds considerable importance and benefits in terms of business performance. Organizations can improve their cloud computing adoption through agility and culture. Expert cloud has a substantial influence on and direct relationship with HRs because it eases communication among HRs while also lowering service costs [15]. The shift of HRM to the "cloud" represents a novel and advanced approach that can enable enterprises to attain notable cost savings. In the realm of cloud computing, HRM systems provide a competitive edge [16].

Small and mid-size factories face challenges in upgrading their IT infrastructure efficiently due to limited resources, such as financial and human capital, which are comparatively lesser than those available to large-size factories. Consequently, this lack of adequate resources may hinder their competitiveness when competing in a business environment against more powerful competitors [17]. While cloud computing applications offer benefits to companies to survive in a competitive environment. To attain business agility, the majority of organizations employ various Information and Communication Technology (ICT) tools, including Management Information Systems (MIS), Decision Support Systems (DSS), Business Intelligence (BI), Knowledge Management (KM), and web collaboration. Furthermore, this could lead to a significant rise in energy consumption, thus, raising significant environmental concerns. Cloud computing presents an ideal and cost-effective solution to address these issues and offering a platform for sustainable business practices that contribute to increase profits, a healthier environment, and improve HRM [18].

The management of human resources involves the application of contemporary science, technology, and HRM theories to accomplish the strategic objectives of an organization.

This process entails acquiring human capital from society and subsequently adapting, integrating, and developing the existing human resources. The Human Resource Management System (HRMS) encompasses a diverse array of elements, including the management of personnel information, employee recruitment, performance appraisal, attendance management, salary management, and more [19]. (see Figure 3)

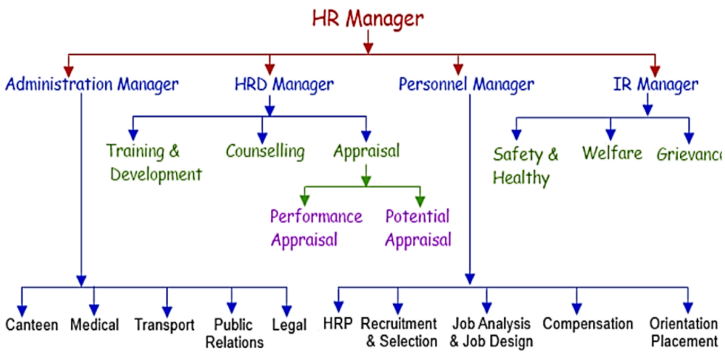

Figure 3 Human Resource Management Activities and Processes

3 Industry revolution and why cloud computing matters in HR

The First Industrial Revolution saw the adoption of water and steam power for the mechanization of production and then electricity became instrumental in the Second Industrial Revolution, enabling mass production of goods [20]. The Third Revolution witnessed the introduction of electronics and computer technologies, which played a pivotal role in automating production processes [20]. The fourth Industrial Revolution, commonly referred to as the digital revolution, is currently unfolding [20]. It is characterized by the convergence of various technologies that blur the lines between the physical, digital, and biological domains. These phases are known as the term 1.0, 2.0, 3.0, and 4.0 respectively and Figure 4 describe a brief idea of industrial revolutions over time.

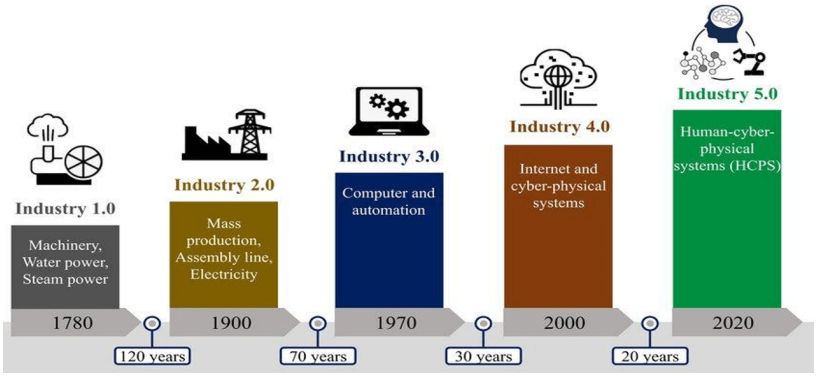

Figure 4 The roadmap of Industrial Revolution [20]

The industrial landscape has undergone a series of transformations since the first industrial revolution, with each stage marked by significant technological advancements. Figure 4 provides a visual representation of the industrial evolution from the first revolution to the current fourth industrial revolution. It illustrates the different eras of industrial development and the key innovations that have shaped each phase.

3.1 Industry revolution

The fourth revolution is progressing at an exponential rate as compared to the earlier industrial revolution and today's changes are notable for three factors: scope, system impact, and velocity. Furthermore, it is now touching nearly every industry's entire system from management start to production and governance across the globe. HR professionals nowadays are responsible for a variety of tasks such as recruiting new employees, payroll, employee relations management, strategy development, and many more [8]. The HR Department lacks the capacity to handle all the manual, paper-based processes alongside its existing responsibilities. Auspiciously, the advent of the digital revolution has brought about a transformation in the way we live and work. HR professionals' duties also have been transformed, allowing them to focus on organizational reform and growth rather than the day-to-day administrative weight of paper works.

3.2 Major reasons why cloud computing matters in HR

This transition began in the recent years 2020 and 2021, as firms increased their digital transformation initiatives in response to the epidemic. Throughout COVID-19 pandemic, companies learned how critical it was to have access to their applications, data, and computing resources, not just within the office but from anywhere their employees worked. (see Table 1)

The Current Industrial Revolution is blending the physical, biological, and digital worlds, erasing the borders between technology and humans. The effects of these technological shifts on how people work, and organizations create value will span all sorts of business. Organizations of all sizes and the department of Human Resources, in particular, will need to adjust to these developments while also assisting with workforce transformation. Exploring the three tiers of cloud service delivery models will reveal the capabilities and benefits these technologies may provide to your business. Use them to respond more quickly to changing client demands.

The integration of Human Resource management and Cloud Computing have a profound impact on employees, organizations and societies in terms of living styles, job patterns, company's

Table 1 Old HRM vs new HRM in the current technology era [21]

SN	Old HR Goals and Objectives	New HR Goals and Objectives
1	To establish standardized HR practices, he HR department directs its attention towards process design and harmonization	Employers' teamwork, productivity, engagement, and career progression are all priorities for HR departments.
2	To attain scalability, HR chooses a cloud-based, the HR department selects a cloud-based vendor and applies out-of-the-box procedures.	HR creates unique, company-specific programs and scales them using the platform.
3	The HR center of excellence places emphasis on process design and striving for process excellence.	At the HR center, there is a strong focus on prioritizing excellence through the utilization of innovative technologies such as Artificial Intelligence (AI), chatbots, apps, and other cutting-edge advancements.
4	HR highlights self-service as a strategy for scaling services effectively.	HR places its focus on enabling to assist employees in completing tasks more efficiently.
5	HR programs are built for global scalability and consistency.	HR programs are tailored to certain segments, personae, and groups of employees.

organizational structures, and how they are carried out. Cloud computing allows organizations, especially Small and Medium Business (SMBs), to innovate and enhance their electronic HR procedures. Cloud computing in a private, dedicated, or solo environment will boost productivity and security [10]. Digital Technology has an impact on all parts of Human Resource Management [17].

According to a report by Market Research Future (IDC, 2022), the forecast for cloud deployment in enterprise infrastructure spending is set to rise significantly between 2020-2025. The report indicates that buyers of enterprise infrastructure are increasingly investing in cloud deployment. To be more precise, the report predicts Compound annual growth rate (CAGR) of the global cloud infrastructure market 11.4% from 2016's value of $19.10 billion to reach $50.73 billion by 2025 as shown in Figure 5.

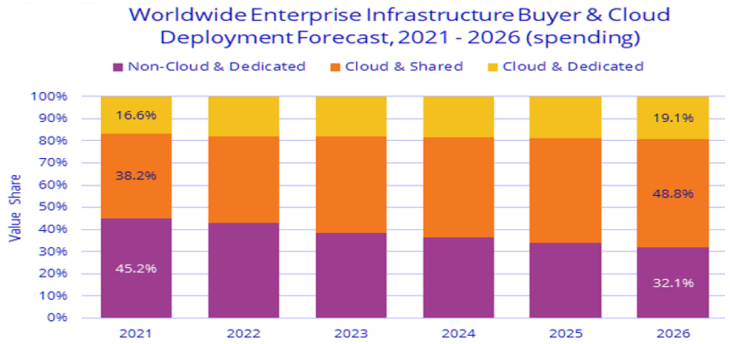

Figure 5 Buyers of Enterprise Infrastructure and Forecast of Cloud Deployment in the World, within 2020-25 Spending (Worldwide Quarterly Enterprise Infrastructure (IDC, 2022)

This represents a substantial shift towards cloud adoption, as businesses realize the benefits of flexibility, scalability, and cost-effectiveness offered by cloud-based infrastructure. Therefore, it is clear that there is a growing trend among enterprise infrastructure buyers towards cloud deployment, with significant growth expected in this area over the coming years.

4 A comprehensive look at cloud computing: Unveiling the key aspects

Cloud computing encompasses a range of internet-based services, such as servers, databases, storage, networking, software, intelligence, and analytics, that are provided to users. The infrastructure and its maintenance are the responsibility of a cloud vendor. Cloud computing, from the standpoint of technological advancement, serves as an integrated solution that enables users to effectively manage extensive network resources, leveraging various technological advancements. Within the purview of cloud computing, the three primary service categories include Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) [22]. From a targeted marketing standpoint, Cloud computing may be categorized based on the users. Public cloud, private cloud, and community cloud are examples of cloud types [23].

Figure 6 shows the different service models of cloud computing with their examples. CC is an emerging field and has been identified with its major characteristics [22]:

(1) PAY-AS-YOU-GO: Cloud computing operates on a pay-as-you-go model where users only pay for the platform or services they utilize, ensuring efficient resource allocation without any wastage. Manufacturing or service resources are distributed based on the specific demands of the users [24].

(2) SHARING: Cloud computing solutions enable anyone, anytime from anywhere to access, interchange, and sharing of data. Cloud computing, in contrast to traditional information technologies, encourages collaboration and the sharing of computing resources between businesses. Cloud computing solutions enable anyone, anytime from anywhere to access, interchange, and sharing of data. Cloud computing, in contrast to traditional information technologies, encourages collaboration and the sharing of computing resources between businesses [22].

(3) FLEXIBILITY: Employing a type of personal assistant devices or computing terminals, consumers can request services and acquire computing resources from anywhere they are located and at any time [22].

(4) LOW COST: Larger corporations be able to create the systems they rely on, which are based on cloud and make extensive use of them to reduce the cost of their information systems [22]. For enterprises, systems produced by foremost IT providers such as IBM, Amazon, Google, and Microsoft are available.

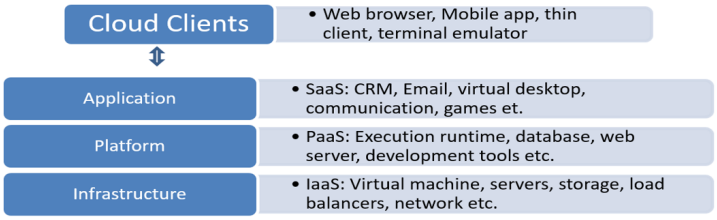

Figure 6 Cloud service delivery models

The different cloud service delivery models are depicted in Figure 1. The figure shows the three primary cloud service delivery models along with their respective characteristics and examples such as:

(1) Software-as-a-Service (SaaS);
(2) Platform-as-a-Service (PaaS);
(3) And Infrastructure-as-a-Service (IaaS)

5 Prior research studies of cloud towards HRM

Because of the popularity of this revolutionary technology, the market for cloud technology is experiencing a rapid growth and is considered one of the fastest-growing sectors in this century. Market demands push enterprises of all sizes to use cloud computing solutions to benefit from cloud services and their advantages such as flexibility, user-friendly, scalability, and availability [25]. The conventional approaches emphasized that HR has placed on talent management, procedure, and transactional work is giving way to a broader mandate. Human resources are increasingly taking on the role of innovative consultants with expanded responsibilities, including the design, simplification, and enhancement of the whole employee and applicant experience.

This section focuses on some cloud-based HRM adoption by the organization, as well as the benefits and obstacles of implementing such emerging technologies. Enterprise Human Resource Management System (HRMS) model is presented by using Cloud Technology to handle HR difficulties in this sector [25]. The proposed model is made up of sixteen basic modules that are commonly found in well-known HRM systems. The system was created utilizing a variety of technologies, including the Code Igniter software framework, and was launched and deployed in the Elastic Compute (EC2) of Amazon Web Services (AWS). With the increased need and complexity of producing online services and based on an examination of HRM and information System (IS) needs for multiple organizations, to make web services more user-friendly, stretchy, inexpensive, and adaptable.

To make the organization more flexible and expandable, a distinct approach for HRM was proposed utilizing cloud technology. The proposed approach provides four key services -HRM, HRM-Web, Management Configuration, and agent service in the cloud-based portal. When an

agent uses HRM Web Service to request services, the data is submitted, and HRM Web Service responds to the request. The data is then sent to the database via Web-Port, where the required data is saved. Then via Web-Port data is collected from the database, which is in the cloud, while HRM-Web executes the implementation to build a report that is conveyed by the user, as shown in Figure 7. The configuration manager is used for monitoring many of the services of cloud storage.

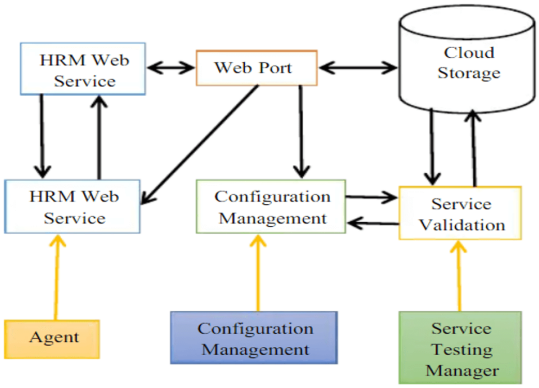

Figure 7 Cloud-based HRM model

HRM framework is based on the cloud to deliver effective HRM solutions for businesses; it also allows users to do various HR tasks in a simple and user-friendly manner [8]. Salary and Personal Information Management, Leave, Benefits, Employee Self Services, and other modules are included in the proposed framework. Which also allows the users to perform various HR actions by providing a user-friendly interface. If the user chooses the Salary section, for example, all payroll issues will be addressed.

In their study, Wang et al. (2016) [22] focused on the utilization of cloud-based solutions in small and medium businesses (SMEs). By leveraging these solutions, organizations can efficiently share computing resources and incorporate advanced functionalities, such as on-demand payments, into the HRM sub-system. The proposed model not only enhances the performance of traditional HRM activities but also increases system flexibility to handle uncertainties and changes while standardizing HRM procedures. Figure 7 shows the proposed model diagram of the paper.

Using Cloud Computing (CC) for HR management is an ambitious attempt to apply cross-disciplinary technologies to the field [26]. This article presents the architecture for a rural HRM platform built on the IoT and cloud computing. Organizational structure and planning, employee compensation and benefits, hiring and onboarding, evaluation of job performance, induction and training, employee self-service, rules and regulations, administration of employment agreements, and system administration are all key components of this system's design. The system function well, by facilitating extensive collaboration and using CC Integration, collaborative management, and distributed computing. These elements enable seamless integration and processing of data from multiple sources, meeting the demands of HRIM (Human Resource Information Management) managers. The authors further stated the application sectors for CC and big data analysis and processing are rising. The future studies should focus on improving existing approaches to managing big data in HR.

Making use of cloud computing's enormous size, versatility, scalability, and high reliability, HR archive-DSS is constructed in this research for use in a variety of management and decision-making tasks [7]. The system's design is grounded in an examination of the benefits of CC in areas such as resource sharing and integration, and it is built upon a multi-layer architecture consisting of data acquisition, cloud computing support, network service support, system application, data standardization conversion system layer, decision support, and others. The solution addresses the limitations of traditional archive management, which include insufficient data resources, the inability to attain Isomorphy, and the challenge of processing data uniformly from various data bases. (see Figure 8)

Avram (2014) [27] studies the benefits and the challenges of cloud-based solution adoption from the standpoint of the enterprises; the analysis was based on aspects that an enterprise must consider when deciding to use the cloud. Cost, performance, security, and most important the integration of existing IT infrastructure with the cloud are all aspects to consider. According to the study, the business should be the first to adopt the cloud because their procedures are much

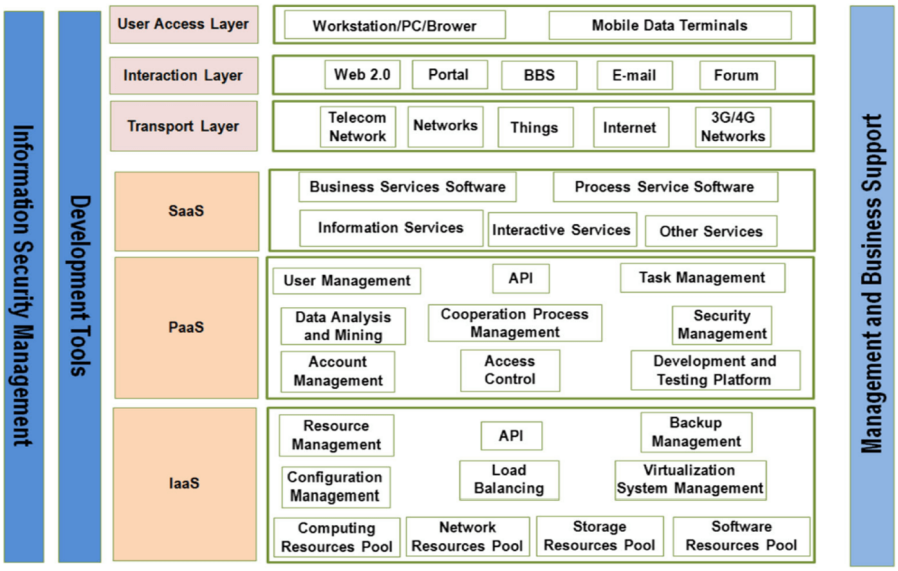

Figure 8 Human Resource information system for Small and medium-sized enterprises

easier than those of large corporations. It is also pertinent to mention that some companies would refrain from using the cloud because of putting their sensitive data off-premises.

6 Discussion

An outstanding blend of on-premises and cloud infrastructures is the true essence of cloud computing. A hybrid platform may be built on top of it, making it easier for companies to grow and diversify their revenue streams. In terms of functionality and adaptability, today's cloud-based solutions are unmatched. For organizations of any size or industry, it helps them satisfy their infrastructure, software, and hardware needs. The cloud based HRM solutions can help with the transition from office administration to different procedure management. But with limited IT capabilities, human resources managers face a hurdle [28]. Human resource managers should have a greater understanding of management tools and IT skills. In this cloud era, human resources managers should be able to do the following:

Firstly, cloud strategy's capability. Managers, who serve as implementers of strategies, are required not only to offer strategic support to businesses but also to acquire the skills to effectively position businesses and actively contribute to the formulation of their strategies.

Secondly, the ability to coordinate cloud resources. Because HRM will eventually be divided as firms grow in size, managers should keep a coordinative role such as managing the connection between superiors and lower-level employees, as well as all departments and newly hired staff even though if they do not possess formal authority or permission to do so.

Thirdly, the capability of cloud learning. The utilization of cloud technologies in HRM represents a crucial learning point that managers should acknowledge, as it enhances the ability of cloud-based learning, making it the third important aspect to consider. They must develop expertise in cloud administration [29]. Fourthly, the key aspect is proficiency in cloud consulting. Managers need to cultivate their consulting skills in order to deliver tutoring and consulting services related to cloud management, which are sought after by businesses, whenever required. They should support businesses in acquiring expertise in cloud management theory, methodologies, and capabilities. This enables them to become effective communicators who can facilitate the widespread adoption of cloud technology within organizations. (see Table 2)

Given the crucial role of HR in the organization's dedication to working well and efficiently, with tools and data to make the accurate decisions and show value, the study's findings indicated an intention to embrace cloud human resources management. The most dynamic persons in the senior workforce today are HR professionals. They may significantly contribute to setting up and sustaining a productive workplace by learning more about the cloud and digital technologies by employing HR management tools in the cloud. To line up with the company, HR needs to modernize and adapt. Meanwhile, this is also important to manage all HR activities and expand their usage of cloud-based services, HR must select the best HR system in the cloud. Therefore,

Table 2 Numerous studies have explored HRM in relation to the integration of cloud computing technology

Reference	Title	Aims
(Abdullah et al., 2020)	An HRM system for small and Medium enterprises Based on cloud computing technology	The usage of Cloud Technology has been proposed and applied to tackle the HR issues in this area using an EHRMS paradigm.
(Nandan et al., 2014)	Advancement of human Resource Management with Cloud Computing	This research proposed cloud based HRM. The suggested system employs Cloud-based HRM to allow users to access resources based on established criteria. The suggested architecture dynamically picks a computing resource by a service request to make HR more efficient using the Cloud. This helps us manage complex and strategic corporate operations.
(Datta et al., 2012)	Cloud Computing: A Solution to Human Resource Management System	This study aims to design a cloud based HRM application that enables a company the make use of cloud HR Management web service to provide cost-effective HR solutions and gain economic benefits.
(Wang et al., 2016b)	Cloud computing in HRM systems for small and medium enterprises	The author suggests employing cloud computing in the sharing of computing resources and facilitating advanced features, such as on-demand payments, within the human resource management subsystem. The focus of this proposal centers on applications tailored for small and medium enterprises.
(Chai, 2022a)	Design of Rural Human Resource Management Platform Integrating IoT and Cloud Computing	A design scheme for a rural HRM platform built on the IoT and cloud computing. Organizational structure and planning, employee compensation and benefits, hiring and onboarding, evaluation of job performance, induction and training, employee self-service, rules and regulations, administration of employment agreements, and system administration.
(Cai & Chen, 2021a)	Optimization of HR File Information Decision Support System Based on CC	An HR archive-DSS is constructed in this research for use in a variety of management and decision-making tasks. The solution addresses the limitations of conventional archive management, including insufficient data resources, the inability to achieve isomorphism, and the challenge of processing data uniformly from various data sources.
(Avram, 2014)	Advantages and challenges of adopting CC from an enterprise perspective	This article examines the factors that businesses should consider when making a decision about adopting cloud computing, focusing on the business perspective. It evaluates the advantages and disadvantages of various aspects, including integration with existing IT infrastructure and software, costs, return on investment, performance, and security. Furthermore, it explores how these factors are influenced by the company's size and industry, aiming to determine the most suitable type of cloud computing solution for each specific business.

when cloud computing is integrated with the company's HRM system, the cost of managing HR is reduced, the effectiveness of managing resources is increased [7], and the company's size and capital constraints are removed.

7 Conclusion

Cloud computing has progressed dramatically in recent years. Digital technologies link the globe today. This changed cloud computing's scope. Cloud computing's future breadth requires more employment, technology, and research funding. So many cloud computing trends are astounding. This article makes a substantial contribution to the field in understanding of Cloud computing (CC) and HRM integration, along with increasing the efficiency and effectiveness of HRM functions, industry revolution 4.0, and the adoption of CC in HRM. Human resource departments may already benefit from cloud computing, which is already fulfilling its promise of making them more dynamic and effective. HR management is no longer administrative. Disruptive forces have transformed how firms are operated, and HR must adapt. HR must create a digital workplace that can innovate, collaborate, and tackle business issues. We are already seeing the effects of cloud computing on HR. Hence, cloud based Human Resource Management System (HRMS) offers distinct advantages such as enhanced efficiency and cost-effectiveness. This innovative program disrupts traditional HR management practices by transitioning the company's segregated in-house HRMS to the cloud. Organizations that adopt this technology gain a competitive edge over their rivals. Additionally, cloud computing provides further benefits, including efficient resource utilization, seamless scalability, elimination of hardware and software maintenance requirements, and reliable data recovery capabilities.

8 Future research agenda

Impact of cloud-based HRMS on employee productivity and performance: Further research can investigate the direct impact of cloud-based HRMS on employee productivity, performance,

and job satisfaction. This can help organizations understand the specific mechanisms through which cloud technology influences employee outcomes.

Adoption and change management in transitioning to cloud-based HRMS: Future studies can focus on the challenges and strategies involved in the adoption and successful implementation of cloud-based HRMS. This can include examining change management practices, employee training and support, and overcoming resistance to technological changes.

Security and privacy considerations in cloud-based HRMS: Given the sensitive nature of HR data, it is important to explore the security and privacy implications of using cloud-based HRMS. Research can delve into issues such as data protection, encryption, access control, and compliance with relevant regulations.

Organizational culture and readiness for cloud-based HRMS: Investigating the organizational culture and readiness for adopting cloud-based HRMS can provide insights into the factors that influence the successful integration of technology. This can involve examining factors such as leadership support, organizational climate, and employee attitudes towards technological change.

Long-term impact and sustainability of cloud-based HRMS: Future research can explore the long-term effects and sustainability of adopting cloud-based HRMS. This can include assessing the scalability, flexibility, and long-term cost-effectiveness of cloud technology in HR management.

International collaborations and migration: Researches can be advanced in the field of cloud which can be studied as a facilitator for cross-border cooperation and remote work. Skilled professionals may collaborate on projects, exchange resources, and contribute to teams in other locations without physically migrating. This has ramifications for both the phenomena of brain drain/gain and the worldwide spread of expertise and creativity [30].

Overall, these research areas can contribute to a deeper understanding of the integration of cloud computing and human resource management and guide organizations in maximizing the benefits of cloud-based HRMS while addressing potential challenges.

9 Practical implications

The current article prioritize the value of cloud computing in HRM integration and embraces the transformative potential of cloud computing in the context of industry revolution 4.0. It also surfaces the shift from administrative to strategic HR management, leveraging the cloud-based technologies and foster a digital workplace that promotes innovation, collaboration, and agility. The study unveils the competitive advantage by adoption of cloud-based HRMS and Leverages additional benefits of cloud computing, such as resource utilization and data recovery. It is highly recommended for the organizations to embrace cloud computing, adapt to the digital era, and optimize HR practices to drive innovation and gain a competitive edge.

10 Limitations

This paper reviews relevant literature in line with our study's objective. The purpose of a literature review is to provide contextual information on a specific topic. As such, the methodology is not exhaustive but aims to offer an overview and introduction to the subject. This is achieved by evaluating existing research, theories, and evidence, and critically discussing and evaluating the content. It is important to note that this study may have limitations, such as potentially missing papers from different paid databases, as we conducted our search on Google and Google Scholar and others, selecting the latest and most relevant articles for this article.

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RESEARCH ARTICLE

Comparative effects of self-evaluated and test-based financial literacy on choosing life insurance policies in a multi-racial context

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Abstract: Background: This study investigates the relationship between financial literacy and the choice of life insurance policies in the multi-racial context of the United States. Both subjective and objective measures of financial literacy are considered important factors in shaping consumer behavior in the life insurance market. Methods: Logistic regression analyses were conducted using data from the 2022 Survey of Consumer Finance to explore how financial literacy is related to the ownership of different types of life insurance, including term insurance, cash value insurance, and a combination of both. The analysis controlled for demographic variables such as age, race, and marital status. Results: The results show that subjective financial literacy significantly influences the ownership of all types of life insurance, while objective financial literacy only affects ownership of term insurance. Demographic factors, such as belonging to Generation X, or being married, also have a positive impact on life insurance ownership. Higher levels of education and income are associated with a higher likelihood of owning life insurance, while unemployment has a negative impact. Conclusion: The findings highlight the central role of subjective financial literacy in motivating individuals to purchase life insurance. Confidence in one's financial knowledge appears to be more influential than actual knowledge when making insurance decisions. Therefore, financial education programs should aim to improve both financial knowledge and confidence to encourage wider adoption of life insurance, ensuring greater financial security for diverse populations.

Keywords: life insurance, term policy, racial disparities, financial literacy, consumer behavior

1 Introduction

The life insurance market in the United States is crucial for economic stability and personal financial planning because it provides a financial safety net against the economic risks of premature death. In 1998, more than 52 million policies with a face value of nearly $2.2 trillion were purchased, highlighting the industry's significance [1]. The market offers various products, such as term life insurance and cash value life insurance, to meet different consumer needs [2,3]. As of 2022, the market had total gross written premiums of $631.7 billion, with significant contributions from general annuity and life insurance products. This underscores the ongoing importance and growth of the sector, which achieved a compound annual growth rate (CAGR) of 2.5% from 2017 to 2022 [4,5].

Consumer preferences have evolved due to demographic shifts, improved financial knowledge, and the availability of alternative investment options. There is now a growing demand for term insurance instead of cash value insurance, driven by the benefits of tax-advantaged savings plans [6,7]. Regulatory frameworks ensure market solvency and fair practices, impacting the development and pricing of insurance products [7]. Technological advancements, particularly the Internet, have revolutionized the process of comparing prices and purchasing financial products, making them more accessible [8,9].

Research suggests that socio-demographic factors and financial literacy significantly influence the demand for life insurance [10–14]. Financial literacy can be measured objectively through tests and subjectively through self-assessment, with subjective literacy often being a stronger predictor of insurance purchases [12,14].

This study utilizes data from the 2022 Survey of Consumer Finance to investigate whether subjective financial literacy has a greater impact on life insurance demand compared to objective measures. This pilot research aims to gain insights that could enhance financial education and marketing strategies within the U.S. life insurance market.

Addressing the disparity between subjective and objective financial literacy and its influence on life insurance purchasing behavior, the main question is whether subjective financial literacy, as measured by confidence, has a more substantial effect on purchasing decisions than objective knowledge. This investigation could significantly contribute to our understanding of financial decision-making and have implications for financial education and marketing efforts. By understanding these dynamics, we can better design educational programs that improve both financial knowledge and consumer confidence, ultimately leading to better financial outcomes and increased life insurance adoption.

2 Background

2.1 Context and Historical Overview

The concept of life insurance has existed since ancient times but was not formalized until the 17th century in England. The first life insurance policies were underwritten in the early 1700s, mainly by marine insurance companies. These early policies were basic and relied on a limited understanding of risk and mortality rates. The development of life insurance mathematics in the latter half of the 17th century marked a significant advance, introducing more systematic approaches to risk assessment and premium calculation [15]. By the 19th century, life insurance had become more common, especially in the United States and Europe, driven by industrialization and the growing middle class. The American life insurance industry experienced significant growth during this period, with companies like New York Life and MetLife gaining prominence. The industry's expansion was supported by better actuarial data and more sophisticated risk assessment models, enabling a wider range of life insurance products [16–20].

The historical context of life insurance is complex and rich, shaped by changing cultural definitions of risk, gambling, and the value of life. In the early 19th century, life insurance was viewed skeptically and often associated with gambling, making it a speculative venture. However, as the century progressed, shifts in religious and economic morality facilitated the acceptance and legitimization of life insurance [21]. The industry's marketing techniques evolved to address the dual goals of business and altruism, with agents navigating the tension between being salespeople and seeing themselves as missionaries [22]. The transformation of life insurance from a controversial concept to an accepted financial instrument reflects broader sociological dynamics. The industry's growth was influenced by ideological resistance in various cultures. Additionally, the development of life insurance in the United States differed from other types of insurance, such as fire and marine insurance, which were more readily accepted due to their clear economic rationale [22]. The resistance to life insurance stemmed from a value system that opposed the financial valuation of human life, challenging the idea of establishing monetary equivalents for sacred aspects of the social order [22].

2.2 Literature review

The literature on life insurance extensively explores various aspects of consumer behavior, market dynamics, and the impact of financial literacy on insurance purchasing decisions. Significant studies have provided insights into how demographic factors, economic conditions, and consumer knowledge influence the uptake of life insurance.

Research has shown that demographic variables such as age, income, and family structure significantly affect the demand for life insurance. For example, younger adults often perceive less need for life insurance, while older adults with dependents see it as essential for financial planning [23, 24]. Studies conducted by the Insurance Studies Institute have also highlighted how improvements in life expectancy influence consumer perceptions and the market demand for life insurance products [25].

The demand for life insurance in the United States has historically varied significantly among different racial groups due to a range of economic, cultural, and systemic factors. In the past, life insurance was predominantly marketed towards white Americans, who generally had greater access to it through their employment. This pattern reflects the broader context of employment and economic opportunities that historically favored white individuals over other racial groups [26].

The 2022 Survey of Consumer Finance presents a compelling visualization (Figure 1) of life insurance coverage among diverse racial groups in the United States. The data is divided into four main categories: no life insurance, concurrent enrollment in term and cash value life

insurance, reliance on term insurance only, and exclusive commitment to cash value insurance. The bar graphs derived from the survey data reveal significant racial disparities in life insurance uptake, highlighting uneven coverage distribution among different racial demographics. All figure sources are from my analysis.

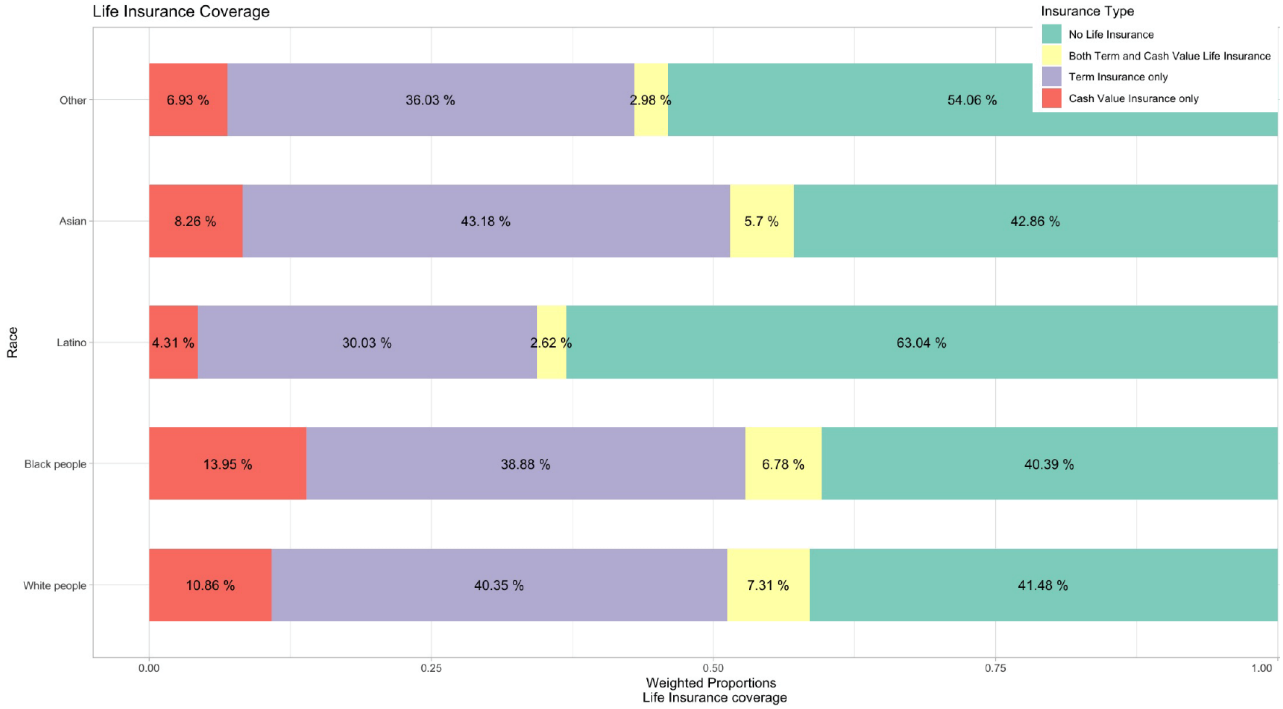

Figure 1 Relative proportion: life insurance type by race. (Source: Author's analysis)

The data shows that among Latinos, a significant 63.04% do not have any form of life insurance coverage, which is the highest percentage among the groups studied. Asians follow closely with 42.86% lacking life insurance, while the proportion of uninsured White individuals is slightly lower at 41.48%. Black individuals have a slightly higher insurance coverage rate, with 40.39% lacking life insurance.

When examining preferences for term life insurance, Asians show a particularly high preference for this type of coverage, at 43.18%, closely followed by White individuals at 40.35%. These percentages indicate significant engagement with term life insurance policies within these communities, reflecting a specific value placed on the straightforward, time-bound nature of this insurance form.

Conversely, cash value life insurance, which focuses on investment, sees its highest relative uptake within the Black community, with 13.95% choosing this insurance type. This indicates a preference for policies that provide a death benefit and a savings accumulation feature. White individuals also show a notable affinity for cash value insurance at 10.86%, suggesting that a significant segment within these racial categories values the growth potential inherent in these policies.

Additionally, the survey highlights that White individuals lead in securing a combination of both term and cash value life insurance policies, with a rate of 7.31%. This indicates a comprehensive approach to financial planning regarding life insurance. Black individuals are not far behind, with 6.78% also choosing to diversify their life insurance strategies with both types of policies.

The survey's findings clearly indicate the presence of racial disparities in the life insurance market, with varying levels of coverage adoption across different groups. This suggests the need for a nuanced understanding of the socio-economic factors that contribute to these disparities, as well as a potential reevaluation of how life insurance products are marketed and made accessible to each racial demographic.

Income and the demand for life insurance are closely linked, as demonstrated by research [27–29]. The life insurance industry is of great importance, with millions of policies being bought every year, and it serves as a financial safety net for households [30]. The rise in premium income from life insurance companies, which experienced a substantial increase from

2001 to 2010, indicates an increasing demand for life insurance products that correlates with income levels [30]. This growth is also evident in the number of new policies sold, suggesting that as incomes increase, there is a greater tendency to seek life insurance.

A more detailed analysis of the 2022 Survey of Consumer Finance, using a scatter plot (Figure 2), provides valuable visual insight into how income affects the demand for life insurance. The plot shows that the White demographic has a wider range of income levels, indicating greater income variability. Asian individuals exhibit the next highest level of income variation. These patterns suggest that income levels have different effects on the demand for life insurance among these groups. Contrary to the previous figure (Figure 1), which suggested that cash value life insurance is particularly important to Black individuals, Figure 2 reveals that this preference does not seem to be directly linked to income. Black individuals, regardless of the life insurance product they choose, have a narrower range of income levels. This suggests that income has less variability in its influence on the demand for life insurance among Black individuals compared to White, Asian, and Latino groups.

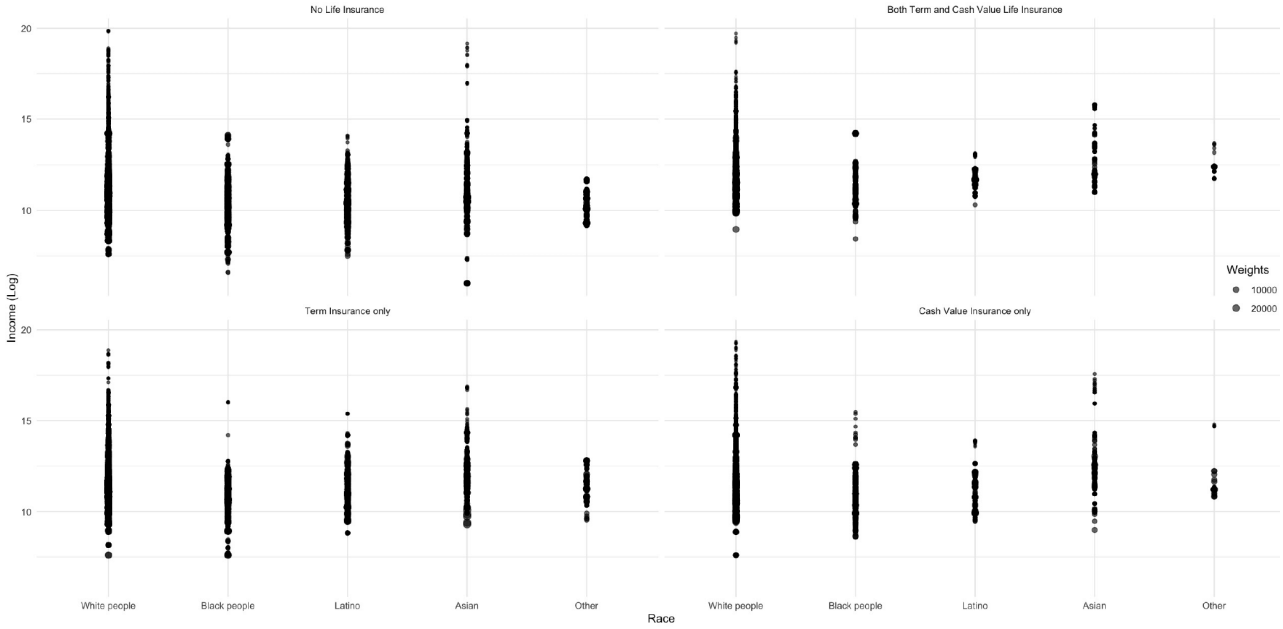

Figure 2 Weighted scatter plot: Race and life insurance types. (Source: Author's analysis)

These findings have significant implications, indicating that factors other than income may contribute to the demand for different types of life insurance. Cultural preferences, perceptions of risk, access to financial information, and the perceived value of life insurance offerings are all potential factors influencing this demand. Societal norms, historic trust in financial institutions, targeted marketing efforts, and differential access to financial advisors and resources may also shape decisions regarding life insurance.

The observed variations among racial groups suggest that complex socio-economic dynamics influence the types and levels of life insurance coverage chosen by individuals. To fully understand these patterns of consumer behavior, further research is necessary that goes beyond income as a predictive factor. Such research should explore the cultural, educational, and social factors that shape the demand for life insurance within diverse communities. This expanded analysis will be crucial for insurers looking to effectively tailor their products to meet the specific needs of their customers.

Figure 3 examines the relationship between income levels and life insurance status among different racial groups in detail. Using a logarithmic scale for weighted mean income allows for a clear comparison of income disparities within each category of life insurance coverage: no life insurance, both term and cash value life insurance, term insurance only, and cash value insurance only. Among White individuals, the graph shows a wide range of income levels, indicating a broad variation among those with and without life insurance. The peak for this group suggests that individuals with both term and cash value life insurance tend to have higher incomes. Asian individuals exhibit a broader variability in income with a higher peak, indicating a direct correlation between income levels and the possession of life insurance.

The plot for Black individuals shows a narrower income range across the different types of

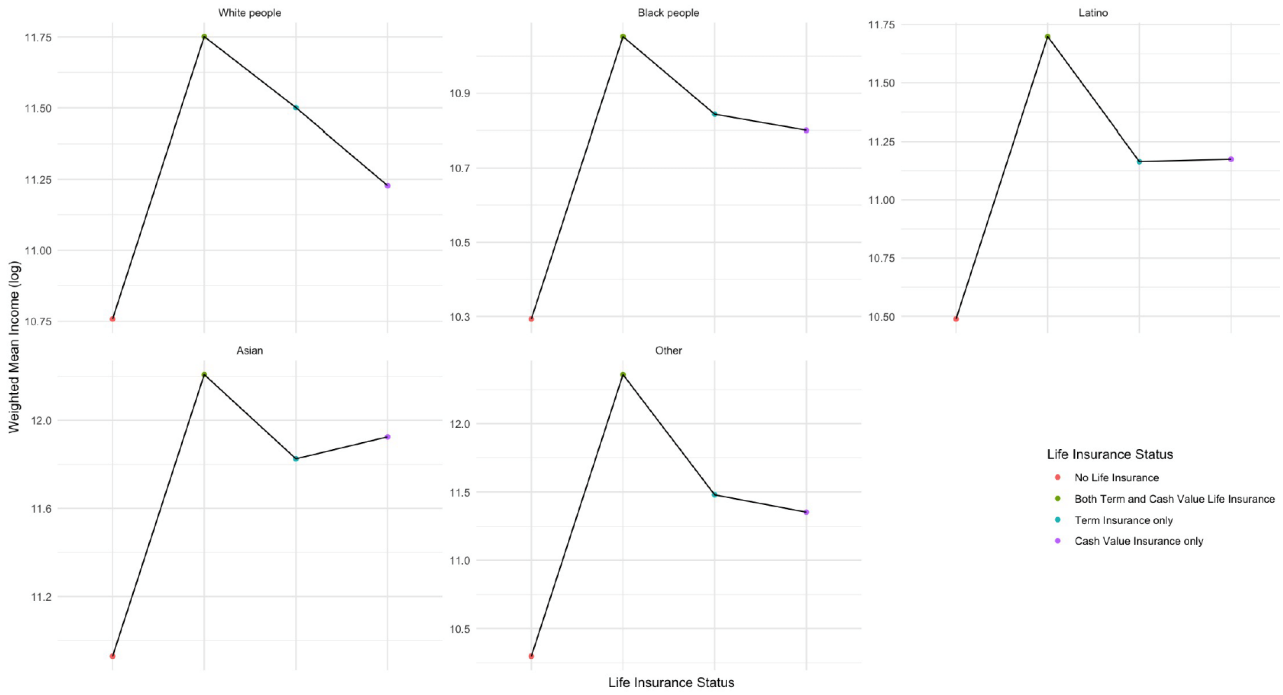

Figure 3 Interaction plot: Race by life insurance types. (Source: Author's analysis)

life insurance, suggesting that income might not be the sole or most significant factor driving life insurance coverage within this group. For Latino individuals, there is a sharp increase to the peak for those with both term and cash value life insurance, followed by a decrease, and then a slight rise for those with cash value insurance only. This pattern suggests that while income does play a role in life insurance coverage for Latinos, particularly for those investing in both types of policies, other factors may also be influential.

The overall analysis suggests that while there is an income effect on life insurance demand among racial groups, the degree to which income influences life insurance choices varies. Income appears to be a more significant factor for White and Latino individuals when opting for both term and cash value life insurance, while for Black and Asian individuals, the influence of income is less pronounced. This variation points to the possibility that cultural, social, or systemic factors may also play a role in determining life insurance coverage choices in addition to income.

The life insurance market has undergone significant changes, with shifts in product offerings reflecting broader economic and regulatory trends. The emergence of flexible products like universal life insurance and the growing use of digital platforms for distribution demonstrate how the market adapts to evolving consumer needs and technological advancements [31, 32]. Comparative studies of different markets, such as those in Ukraine and Romania, have revealed how regional economic conditions and consumer preferences drive market development [33].

Despite extensive research, there are still gaps, particularly in understanding the nuanced impacts of subjective versus objective financial literacy on life insurance purchasing behavior. Most studies have not adequately distinguished between these types of literacy or delved deeply into their interaction with socio-economic factors. Additionally, while the impact of demographic shifts on life insurance demand is well-documented [23, 34], less is known about how these shifts intersect with changes in financial education and consumer confidence over time.

One of the challenges in the existing literature, which this research also encounters, is the use of cross-sectional data. While this approach provides a valuable snapshot of financial literacy and life insurance purchasing behavior at a specific moment, it does not allow for the analysis of long-term trends or the establishment of causality. Despite this limitation, cross-sectional studies are helpful in identifying correlations and can inform hypotheses for future research. Cross-sectional studies are excellent for descriptive analysis, providing a detailed overview of a population, including the distribution of variables such as behaviors, attitudes, and conditions at a specific point in time [35, 36]. Furthermore, these studies are useful for generating hypotheses that can later be tested with more rigorous experimental or longitudinal methods. By identifying

associations between variables, researchers can develop hypotheses about causal relationships that might be explored in future studies.

2.3 Key definitions and terminology

Life insurance is a crucial financial tool that provides financial support to dependent when the policyholder passes away. By entering into a contract with an insurer, the policyholder ensures that a predetermined sum will be paid to their beneficiaries upon their death, in exchange for regular premium payments. Life insurance is important for estate planning and offers a sense of security while maintaining the financial stability of the survivors [37, 38].

Term insurance, a type of life insurance, is characterized by its specified coverage period and the provision of a death benefit if the insured passes away within that time frame. Known for its simplicity and affordability, term insurance is a popular choice for those who need temporary coverage without an investment component [23, 39, 40].

On the other hand, cash value life insurance is a permanent insurance option that includes an investment component. A portion of the premiums paid contributes to a cash reserve, which has the potential to grow and can be accessed through loans or withdrawals. This type of insurance offers long-lasting coverage and the opportunity for financial growth, although it is more complex and expensive. Cash value life insurance includes various products such as whole life, universal life, and variable life insurance, each with unique features [24, 41, 42]. Cash value life insurance, in particular, stands out for its flexibility. Policyholders can adjust premiums and death benefits according to their changing circumstances. It also earns interest tied to market trends but guarantees a minimum rate. This flexibility makes cash value life insurance an essential component of long-term financial planning [39].

2.4 Significance and impact of the research

The study suggests that personal evaluations of financial knowledge may sometimes provide a more accurate reflection of consumer behavior than objective assessments from standardized tests. The hypothesis is based on the observation that subjective literacy often reflects immediate financial concerns and is directly linked to everyday financial decision-making [43–45]. The study considers variables such as race and socioeconomic status to understand how these factors interact with financial literacy to impact consumer choices in the life insurance market.

This research has practical implications in the financial services industry. It can inform the development of products and educational programs tailored to the needs of diverse consumer populations. By addressing a critical gap in existing literature and incorporating controls for demographic variables, the study improves theoretical models of consumer behavior in financial markets. It also provides actionable insights for policymakers and industry professionals who aim to promote financial well-being and increase engagement with life insurance products. The findings could lead to more effective financial education strategies and marketing tactics that are responsive to the diverse financial perceptions and realities of consumers across different demographic groups.

2.5 Scope of the study

The scope of this study is limited to the United States. It examines how subjective and objective financial literacy affect life insurance purchasing behaviors across the racially diverse population of the country. The research utilizes data from the 2022 Survey of Consumer Finance and incorporates a weighting mechanism to account for the racial demographics of the U.S. population. This methodological choice is important to ensure accurate representation of the national landscape and understand the interplay between financial literacy and consumer behavior in a diverse societal context.

The study specifically focuses on U.S. life insurance and excludes international markets and other insurance products. By setting these boundaries, the research avoids complexities associated with varying international regulations, economic conditions, and cultural factors that could obscure the relationships under investigation. This focused approach allows for a deeper exploration of the variables within the context of the U.S., providing valuable insights directly applicable to the American life insurance industry and its consumers.

2.6 Theoretical framework

The theoretical framework of this study is grounded in the concept of bounded rationality, which posits that individuals make decisions based on limited information and cognitive constraints [46, 47]. Bounded rationality is critical for understanding consumer behavior in

complex financial markets, particularly in the context of life insurance. This theory suggests that subjective financial literacy significantly influences purchasing decisions, as individuals often rely on their perceived financial knowledge rather than objective understanding [48,49].

Recent studies have expanded on this concept, emphasizing the role of cognitive biases and information overload in financial decision-making. In today's information-rich environment, consumers are often overwhelmed by the volume of available data, which impacts their ability to process information effectively and make optimal decisions [50,51]. This reality underscores the importance of examining how subjective financial literacy affects life insurance choices, given the increasing complexity and availability of financial products.

Bounded rationality helps explain why individuals with higher subjective financial literacy may feel more confident in their financial decisions, leading to an "emboldening effect". This effect occurs when decisions are driven by confidence rather than accurate knowledge, which can result in suboptimal financial choices [52–55]. This study focuses on whether perceived financial literacy outweighs objective financial knowledge in influencing life insurance purchasing behavior. To address the gap between subjective and objective financial literacy, this research investigates whether self-assessed financial knowledge has a more substantial impact on life insurance decisions than standardized measures of financial literacy. Objective financial literacy involves quantifiable knowledge of financial principles, assessed through tests, while subjective financial literacy refers to individuals' self-assessment of their financial understanding and confidence [56,57].

This study's hypotheses aim to empirically test these theoretical propositions, providing evidence on the relative influence of subjective versus objective financial literacy on life insurance purchases. By integrating these theories, the research contributes to academic discourse on financial literacy and consumer behavior, offering practical insights for developing more effective financial education programs and marketing strategies tailored to consumer perceptions and needs [58,59].

2.7 Hypotheses development

The conceptual model of this research aims to clarify the relationships between financial literacy, both objective and subjective, and the uptake of life insurance products. The model takes into account various socio-economic and human capital variables. According to the model, both forms of financial literacy have an impact on an individual's likelihood of purchasing life insurance products. The dependent variables in the model include the uptake of life insurance products in general, term insurance uptake, cash value life insurance uptake, and the uptake of both term and cash value life insurance.

Objective financial literacy is measured through standardized tests that evaluate an individual's knowledge of financial concepts and products. Based on previous research, it is expected that higher levels of objective financial literacy will correlate with a greater likelihood of life insurance uptake. This is because individuals with a better understanding of the products and their benefits are more likely to purchase life insurance. Subjective financial literacy, measured through self-assessment, is also expected to have a significant influence on life insurance uptake. In fact, it may have an even greater influence than objective financial literacy. This is because subjective financial literacy reflects an individual's confidence in their own financial decision-making, which can drive them to take action, such as purchasing insurance.

The model also includes controls for socio-economic status, such as age generation, marital status, and race, as well as measures of human capital, such as education level, income, and employment status. These controls are necessary to isolate the effects of financial literacy on life insurance uptake from other factors that may influence the decision. For example, age generation may affect life insurance uptake due to different life stages and financial needs, while marital status could influence the perceived necessity of life insurance to protect one's spouse. Race is included as a control to account for potential disparities in access to financial education and resources, which could impact insurance purchasing behavior. Human capital measures, such as education level, income, and employment status, are expected to be positively associated with life insurance uptake, as they often indicate greater financial resources and stability, making it easier to purchase insurance.

The rationale for these relationships is based on existing theories that suggest financial literacy plays a crucial role in helping individuals navigate complex financial markets and make informed decisions. Therefore, the conceptual model provides a framework for testing the research hypotheses and understanding the complex dynamics between financial literacy, socio-economic factors, and life insurance purchasing behaviors.

In this study, objective financial literacy is defined as an individual's level of knowledge about financial concepts, products, and services. This can be measured through standardized testing. The measurement of objective financial literacy is conducted using a set of questions that assess understanding of basic financial principles [60]. These questions are derived from validated financial literacy surveys used in previous research. Participants are asked to answer these questions, and their scores is calculated based on the number of correct responses, providing a direct measure of their financial knowledge. On the other hand, subjective financial literacy is defined as an individual's self-perceived ability and confidence in managing financial resources effectively. This is measured through self-assessment questions that ask participants to rate their own financial knowledge and confidence in making financial decisions. These questions will explore areas such as personal financial management, investment decision-making, and understanding of insurance products. The scale used for these assessments will be adapted from a financial literacy scale developed by researchers such as Hung et al. (2009) [61]. Responses are collected using a ten-point Likert scale.

Both measures are essential for this study as they provide a comprehensive view of financial literacy from both an objective and subjective perspective. This approach allows for a detailed analysis of how each type of financial literacy influences life insurance purchasing decisions, while also controlling for other socio-economic variables. This methodology aligns with previous research that emphasizes the importance of measuring both objective and subjective financial literacy to fully understand their impacts on financial behavior [62, 63]. Additionally, previous studies support the use of these operational definitions, demonstrating their validity and reliability in capturing the constructs of financial literacy as they relate to consumer financial decision-making [64, 65]. This approach ensures that the study can effectively test the proposed hypotheses regarding the differential impacts of subjective and objective financial literacy on life insurance uptake.

This research contributes to the theoretical landscape by critically examining the dual roles of objective and subjective financial literacy in the context of life insurance purchasing decisions. While existing theories and studies have established a clear link between objective financial literacy and prudent financial behaviors [23, 34], the role of subjective financial literacy remains contested. Some scholars argue that higher self-perceived financial literacy can lead to overconfidence, resulting in less optimal financial decisions, such as underinsurance or inappropriate product choices [66]. This study aims to extend this discussion by exploring the "emboldening effect" of subjective financial literacy. It hypothesizes that this self-assessment can sometimes be a more accurate predictor of consumer behavior than objective measures.

The theoretical contribution of this research lies in its nuanced approach to understanding how subjective perceptions of financial knowledge influence actual financial behaviors, particularly in the complex decision-making process involved in purchasing life insurance. By empirically testing the impact of subjective financial literacy, this study addresses a significant gap in the literature. It challenges the prevailing assumption that objective financial literacy is always the more reliable indicator of sound financial decision-making [24]. Instead, this research proposes that subjective financial literacy, through its emboldening effect, may lead individuals to engage more actively with financial products, including life insurance, potentially increasing uptake rates.

Furthermore, this study contributes to the broader discourse on financial education and consumer behavior by suggesting that enhancing subjective financial literacy could be as crucial as improving objective financial literacy. If the emboldening effect of subjective literacy proves to be significant, it could inform the development of targeted financial education programs. These programs would aim not only to improve objective understanding of financial concepts but also to boost confidence and perceived competence among consumers. This dual approach could lead to more engaged and informed decision-making, ultimately fostering better financial outcomes for individuals. Thus, the findings of this research could have important implications for policymakers, educators, and financial service providers, urging them to consider both dimensions of financial literacy in their efforts to enhance consumer financial well-being. The main purpose of this research is to test the hypothesis that subjective financial knowledge has a greater impact on the demand for life insurance products than objective financial knowledge. This hypothesis is based on the assumption that subjective financial literacy, which refers to an individual's self-assessment of their financial knowledge and confidence, is more strongly correlated with the decision to purchase life insurance, including term insurance, cash value life insurance, and combinations thereof.

To ensure the validity of the findings, the study controls for various socio-economic factors

such as age, generational cohort, race, education level, marital status, employment status, and income. These controls are necessary to isolate the effect of subjective versus objective financial literacy on life insurance purchasing behavior.

The hypotheses to be tested are as follows:

Hypothesis I: Subjective financial knowledge is positively related to the demand for life insurance products.

Hypothesis II: The influence of subjective financial knowledge on life insurance demand is greater than that of objective financial knowledge, even after considering socio-economic variables.

3 Methodology

3.1 Data source and sample design

The 2022 Survey of Consumer Finances (SCF) was conducted from March to December 2022 by the Board of Governors and executed by the National Opinion Research Center (NORC) at the University of Chicago. This comprehensive survey included 4,602 observations, covering various financial aspects such as net worth, income, and financial behaviors. To address missing data, the SCF uses a multiple imputation procedure, generating five values for each missing entry, resulting in a full dataset of 23,010 observations. This method enhances the robustness of the data by mitigating biases associated with nonresponse. Weights are applied to account for unequal probabilities of selection and nonresponse, ensuring that the results are representative and reliable despite the skewed nature of many financial variables. However, the 2022 SCF lacks detailed information on insurance selection factors, which could limit certain analyses. The survey aimed to capture a wide range of market segments, including various income levels, wealth brackets, and demographic groups, to provide a comprehensive picture of the financial conditions and behaviors of U.S. households.

The SCF uses a unique weighting approach to ensure that data collection accurately reflects the entire population. This method ensures that each participant's responses contribute equitably to the overall analysis, regardless of their probability of selection. By adjusting these weights meticulously, the SCF successfully captures the diverse demographics and intricacies of the population, accounting for variations in selection probabilities and potential non-responses. The SCF employs a complex weighting framework to further enhance the representativeness of survey results. This framework incorporates initial selection probabilities, supplemented with additional data and aggregate figures from the Current Population Survey. While this methodology is comprehensive, it is important to acknowledge the presence of diverse variables within the SCF data. Due to their infrequency or susceptibility to outlier values, some variables may impact the results. To mitigate this, logarithmic transformations are used during the analysis phase to address these disparities, especially for variables like income that are heavily skewed.

To address the issue of missing data, the SCF employs a strategy called multiple imputation. This involves generating five separate datasets for every missing value to closely mimic the original data distribution [67, 68]. This procedure expands the dataset to include 23,010 entries from the initial pool of 4,602 respondents, significantly improving the robustness and accuracy of the statistical analysis. In this context, the R "survey" package is crucial in managing the complexities of the augmented dataset resulting from multiple imputations. It ensures that the data remains appropriately weighted throughout the analysis process, even when adjusted by a factor of five for certain evaluations. This tool is essential for reducing bias and generating estimates that more accurately reflect the true characteristics of the population. Working in conjunction with the "mitools" package, the "survey" package is proficient in handling data with multiple imputations, facilitating accurate and minimally biased analyses [69].

3.2 Main variables

3.2.1 Dependent variables

The paper analyzes four main dependent variables that are associated with the uptake of life insurance. These variables are as follows:

(1) Overall life insurance ownership: This variable is measured by asking the survey question, "Do you (or anyone in your family living here) have any life insurance? Please include individual and group policies, but not accident insurance." It is a binary variable, with 1 indicating that the respondent has life insurance and 0 indicating that they do not.

(2) Term life insurance uptake: This variable is determined by the question, "Are any of your

(family's) policies term insurance?" It is also a binary variable, with 1 representing the presence of term life insurance and 0 indicating its absence.

(3) Cash value life insurance uptake: This variable is measured by asking, "Do you have any policies that accumulate a cash value or that you can borrow against? These policies are sometimes referred to as 'whole life', 'straight life', or 'universal life' policies." Once again, this is a binary variable, with 1 indicating the presence of cash value life insurance and 0 indicating its absence.

(4) Uptake of both term and cash value life insurance: The researchers created a new binary variable to identify individuals who have both term and cash value life insurance policies. It is coded as 1 if the respondent has both types of coverage, and 0 if they have only one type or no life insurance at all.

By examining these four distinct dependent variables, the study aims to provide a comprehensive understanding of how different dimensions of life insurance ownership are influenced by the key explanatory variables, particularly subjective and objective financial literacy. This approach allows the researchers to uncover potential differences in the factors driving the uptake of term versus cash value life insurance, as well as the factors associated with holding a combination of both policy types.

3.2.2 Independent variables

The key independent variables employed to explain life insurance uptake in this study encompass both objective and subjective measures of financial literacy. The objective measure is constructed from an index based on answers to three financial test questions: one on interest rates, one on inflation, and another on stock market risk. Each component is described below along with its integration into the index:

(1) Interest Rate Knowledge is assessed via the question: "If \$100 is deposited in a savings account with a 2% annual interest rate, what will the balance be after 5 years?" The possible answers are: "More than \$102," "Exactly \$102," and "Less than \$102."

(2) Inflation Knowledge is evaluated through the question: "With a 1% annual return from a savings account and a 2% inflation rate, what will the purchasing power be after one year?" Respondents can choose from: "More than today," "The same as today," and "Less than today."

(3) Stock Risk Knowledge is measured by the question: "Is buying a single company's stock usually safer than a stock mutual fund?" with the response options "True" or "False."

The three binary variables based on respondents' answers to these financial knowledge questions are defined as follows:

(1) For Interest Rate Knowledge (X_1):

$$X_1 = \begin{cases} 1 & \text{if answer is "more than \$102"} \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

(2) For Inflation Knowledge (X_2):

$$X_2 = \begin{cases} 1 & \text{if answer is "less than today"} \\ 0 & \text{otherwise} \end{cases} \tag{2}$$

(3) For Stock Risk Knowledge (X_3):

$$X_3 = \begin{cases} 1 & \text{if answer is "False"} \\ 0 & \text{otherwise} \end{cases} \tag{3}$$

The Financial Literacy Index is then computed as:

$$\text{Financial Literacy Index} = X_1 + X_2 + X_3 \tag{4}$$

Potential values and their interpretations include:
0 – No Financial Knowledge
1 – Low Financial Knowledge
2 – Medium Financial Knowledge
3 – High Financial Knowledge

The subjective measurement of financial knowledge in this study is based on a self-assessment. Respondents rate their understanding of personal finance on a scale from 0 (no knowledge) to 10 (highly knowledgeable). This method of measuring subjective financial literacy is well-supported in the literature [70–72]. It provides valuable insights into individuals' perceptions of their financial abilities.

3.2.3 Control variables

A comprehensive set of variables is used to enhance the analysis of how objective and subjective financial literacy impact life insurance uptake. This methodological approach aims to include additional factors and demographic characteristics that may influence insurance purchasing decisions. Respondents' ages are categorized into six generational cohorts as of December 2022: Generation Z (born 1997 or later), Millennials (born 1981-1996), Generation X (born 1965-1980), Baby Boomers (born 1946-1964), the Silent Generation (born 1928-1945), and those aged 95 years and older. Marital status is divided into three categories: never married, married or cohabiting, and separated or widowed. The study also acknowledges racial diversity by classifying respondents into several racial groups: Asian, Black, Latino, White, and an aggregated category labeled "Other" for underrepresented races in the sample. This categorization helps examine the effects of race on financial decisions regarding life insurance. Additionally, the research incorporates various measures of human capital, such as education level, employment status, and income, to assess how these socioeconomic factors may influence the likelihood of purchasing life insurance. By incorporating this extensive array of variables, the research provides a detailed analysis of the interplay between financial literacy (both self-evaluated and test-based) and life insurance purchasing behaviors. This approach allows for a better understanding of how demographic and socioeconomic factors potentially shape these behaviors, offering valuable insights into the dynamics of financial decision-making across different population segments.

3.3 Data analysis

This study investigates the impact of objective and subjective measures of financial literacy on the demand for various life insurance products, including term insurance and cash value life insurance. Participants were surveyed about their current life insurance status, and logistic regression was employed for data analysis. Logistic regression is well-suited for this type of analysis as it enables the prediction of categorical outcomes, such as ownership of different types of life insurance, based on a set of predictor variables. These variables encompass both objective and subjective financial literacy.

To ensure the study's findings are representative, weights were applied in the logistic regression analysis. These weights were used to account for demographic differences within the sample. This methodological step is crucial to ensure that the sample accurately reflects the demographics of the broader population. It helps mitigate potential biases and enhances the validity of the findings.

The utilization of the "survey" package in R software was vital in this context. It provided the necessary tools to effectively incorporate these weights, thereby improving the accuracy and reliability of the study's outcomes. This approach allows for a more precise assessment of how different levels of financial literacy influence decisions regarding life insurance, providing a more comprehensive understanding of the population's behavior.

The logistic regression model can be expressed as:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n \tag{5}$$

Where:

(1) p is the probability of the dependent variable equalling a case (e.g., 1);
(2) $\beta_0, \beta_1, ..., \beta_n$ are the coefficients;
(3) $x_0, x_1, ..., x_n$ are the independent variables.

And the probability p can be expressed as:

$$p = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n)}} \tag{6}$$

In the realm of multiple logistic regression analyses, it is important to address the issue of multicollinearity. Multicollinearity occurs when predictor variables have high intercorrelations.

To ensure the validity and interpretability of the model, one must carefully monitor the Pearson correlation coefficient. A commonly accepted guideline suggests that correlation coefficients exceeding 0.7 indicate a strong connection between variables [73]. Following this threshold is crucial in identifying significant correlations that may distort the impact on the dependent variable, while also ensuring that informative variables are not unnecessarily excluded from the analysis. Striking this balance is essential to prevent multicollinearity from introducing instability in the regression coefficients. This preserves the robustness of the model and enhances its predictive accuracy and depth of insight. This approach aligns with best practices in statistical analysis, maintaining the model's integrity while retaining valuable data that enriches the model's analytical capabilities [74, 75]. Figure 4 presents the 2 by 2 correlation matrix of all the independent variables used in the models. The figure suggests that there is no significant intercorrelation in the model.

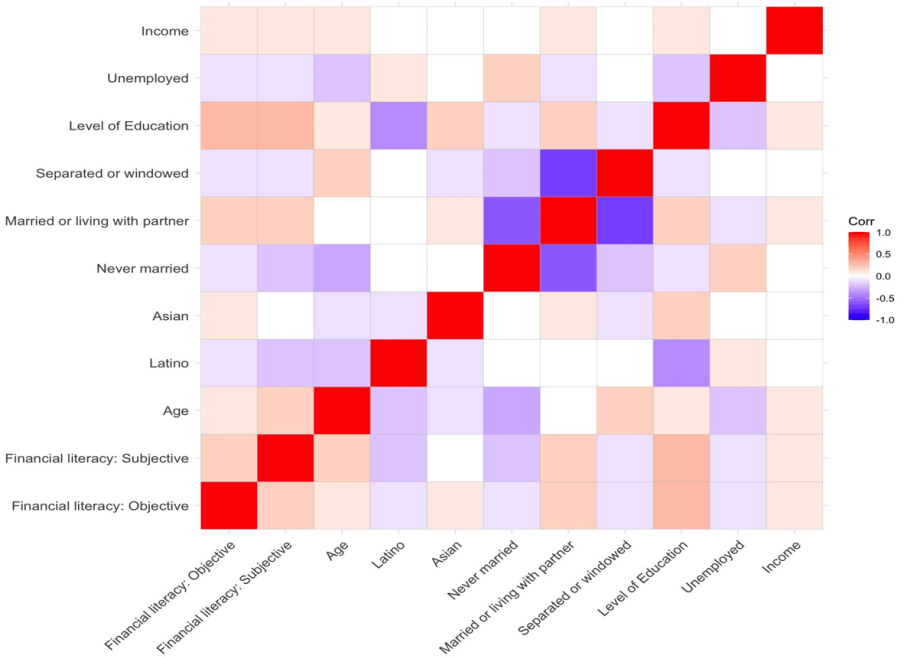

Figure 4 Correlation matrix: Independent variables. (Source: Author's analysis)

The Variance Inflation Factor (VIF) measures the impact of collinearity among the predictor variables in a regression model, reflecting how much the variance of an estimated regression coefficient is increased due to multicollinearity [76].

In the context of logistic regression, which models the log odds of a binary outcome based on predictor variables, the VIF for each predictor can still be calculated using the formula for linear regression, as it assesses multicollinearity independently of the model type. The formula for the VIF of the i^{th} predictor is given by:

$$VIF_i = \frac{1}{1 - R_i^2} \tag{7}$$

where R_i^2 is the coefficient of determination from regressing the i^{th} predictor on all other predictors. This R^2 value represents the proportion of variance in the i^{th} predictor that is predictable from the other predictors.

A Variance Inflation Factor (VIF) of 1 indicates no correlation between the i^{th} predictor and the other predictors in the model, meaning it has no impact on the variance. On the other hand, a VIF greater than 1 indicates the presence of multicollinearity, with higher values suggesting increased redundancy and potential complications in regression analysis.

The Generalized Variance Inflation Factor (GVIF) extends the use of VIF to models with categorical predictors, where a high GVIF value indicates greater multicollinearity. The term DF, which stands for degrees of freedom, varies depending on the type of predictor: it is greater than 1 for categorical variables, determined by subtracting one from the number of categories, and typically 1 for continuous variables.

The adjusted GVIF, represented as $GVIF^{\frac{1}{2 \cdot \mathrm{DF}}}$, normalizes GVIF by the degrees of freedom,

making it more comparable to the traditional VIF. This adjustment helps in interpreting the impact on the variance of model coefficients. Values close to 1 indicate minimal multicollinearity impact, while values significantly above 1 suggest high multicollinearity. Typically, values above 5—and in more lenient analyses, above 10—indicate substantial multicollinearity that may affect Ordinary Least Squares (OLS) estimates.

Table 1 displays the results of the Variance Inflation Factor (VIF) for the independent variables in four distinct Generalized Linear Models (GLMs). These models are designed for different categories of life insurance: overall life insurance, term insurance, cash value life insurance, and a combination of term and cash value life insurance. The VIF scores consistently remain low across all models, indicating that multicollinearity is not a significant concern in these analyses. Therefore, the stability of the VIF scores ensures that the regression coefficients derived from these models are reliable and robust, providing valuable insights into the factors that influence life insurance choices.

Table 1 VIF results for four models

Variable	Life Insurance			Term only			Cash Value only			Term & Cash Value		
	GVIF1	DF1	$GVIF1^{(1/(2\cdot DF1))}$	GVIF2	DF2	$GVIF2^{(1/(2\cdot DF2))}$	GVIF3	DF3	$GVIF3^{(1/(2\cdot DF3))}$	GVIF4	DF4	$GVIF4^{(1/(2\cdot DF4))}$
Financial Literacy: Objective	1.230	1	1.109	1.228	1	1.108	1.201	1	1.096	1.230	1	1.109
Financial Literacy: Subjective	1.221	1	1.105	1.200	1	1.095	1.240	1	1.114	1.221	1	1.105
Age Generation	1.343	5	1.030	1.339	5	1.030	1.469	5	1.039	1.343	5	1.030
Race	1.482	4	1.050	1.469	4	1.049	1.565	4	1.058	1.482	4	1.050
Marital Status	1.542	2	1.114	1.556	2	1.117	1.546	2	1.115	1.542	2	1.114
Education	1.575	1	1.255	1.585	1	1.259	1.579	1	1.257	1.575	1	1.255
Unemployment	1.114	1	1.056	1.116	1	1.057	1.151	1	1.073	1.114	1	1.056
Income	1.806	1	1.344	1.787	1	1.337	1.754	1	1.324	1.806	1	1.344

The 2022 Survey of Consumer Finances (SCF) provides valuable insights into the financial behaviors and conditions of U.S. households but does have some limitations. It relies on self-reported data, which can introduce biases like underreporting or overreporting due to memory recall issues or social desirability bias [77, 78]. The cross-sectional design captures data at a single point in time, which limits the ability to determine causality or observe changes over time [77]. Despite efforts to ensure a nationally representative sample, the SCF may not fully capture the diverse demographics of the U.S. population [79]. Additionally, the complexity and sensitivity of financial information can result in incomplete or inaccurate responses, which can affect the reliability of the data [80].

4 Results

The study utilizes logistic regression analyses to examine the correlation between financial literacy and ownership of various life insurance products. Table 2 displays the logistic regression coefficients, alongside their corresponding standard errors, for four dependent variables: possession of any life insurance, term life insurance only, cash value life insurance only, and both term and cash value life insurance. The intercepts of the models are significantly negative, indicating a generally low probability of owning life insurance when predictors are at baseline levels. Objective financial literacy has a modest impact, with statistical significance observed solely in the term life insurance model ($p < 0.05$), where coefficients range from 0.02 to 0.06. Conversely, subjective financial literacy consistently exhibits a significant positive correlation with life insurance ownership across all models ($p < 0.001$), with coefficients ranging from 0.04 to 0.13. The most significant effect is observed in the model evaluating ownership of both term and cash value life insurance. Figure 5 illustrates the predicted probabilities of selecting different types of life insurance based on individuals' self-rated financial knowledge. The graphs plot perceived financial knowledge against the likelihood of choosing life insurance, term insurance only, cash value insurance only, or both types. The x-axes quantify perceived financial knowledge on a scale from 0 to 10, while the y-axes represent the predicted probabilities of selecting insurance. Confidence intervals are visually depicted by shaded areas around the regression lines, demonstrating the precision of these predictions. The models reveal a positive correlation between perceived financial knowledge and the probability of selecting any form of life insurance, with all other variables held at their average values.

In terms of generational differences, all age groups, with the exception of those over 95, are more likely to own life insurance compared to Generation Z, as indicated in Table 2. Among the different generations, Generation X stands out as the most influential factor in predicting life insurance and term insurance ownership. When it comes to race, Black individuals are more inclined to own all types of insurance compared to White individuals. On the other hand, Latino and Asian individuals tend to have lower probabilities of obtaining life insurance. Marital status

Table 2 Logistic regression: Life insurance product uptake

Variable	Life Insurance	Term only	Cash Value only	Term & Cash Value
(Intercept)	-7.60***	-7.41***	-9.56***	-10.32***
	(0.30)	(0.32)	(0.51)	(0.68)
Financial literacy				
Objective Measurement	0.04	0.06*	0.02	-0.01
	(0.03)	(0.03)	(0.04)	(0.05)
Subjective Measurement	0.06***	0.04***	0.06****	0.13***
	(0.01)	(0.01)	(0.02)	(0.02)
Age generation (Gen Z)				
Gen Y (26-41)	0.37**	0.20	2.62***	1.62**
	(0.12)	(0.12)	(0.40)	(0.59)
Gen X (42-57)	0.60***	0.41***	2.89***	1.81**
	(0.12)	(0.12)	(0.40)	(0.59)
Baby Boomers (58-76)	0.35**	-0.13	3.58***	1.87**
	(0.12)	(0.12)	(0.40)	(0.59)
Silent Generation (77-94)	0.46***	-0.20	3.94***	1.12
	(0.14)	(0.15)	(0.41)	(0.61)
95+	0.82	0.87	-7.97***	-9.22***
	(0.67)	(0.66)	(0.51)	(0.65)
Races (White people)				
Black people	0.66***	0.55***	0.89***	0.23*
	(0.06)	(0.06)	(0.09)	(0.10)
Latino	-0.52***	-0.46***	-0.66***	-0.63***
	(0.06)	(0.06)	(0.13)	(0.17)
Asian	-0.26**	-0.20	-0.24	-0.40**
	(0.10)	(0.11)	(0.14)	(0.14)
Other	-0.20	-0.02	-0.31	-0.72*
	(0.14)	(0.15)	(0.31)	(0.36)
Marital Status (Never Married)				
Married or living with partner	0.64***	0.63***	0.60***	0.52***
	(0.06)	(0.06)	(0.10)	(0.14)
Separated or windowed	0.38***	0.31***	0.35**	0.49**
	(0.06)	(0.07)	(0.11)	(0.15)
Human Capital Measures				
Level of Education	0.05***	0.03***	0.07***	0.05**
	(0.01)	(0.01)	(0.01)	(0.02)
Unemployed	-0.77***	-0.86***	-0.25*	-0.65***
	(0.06)	(0.07)	(0.10)	(0.16)
Income (log value)	0.55***	0.55***	0.30***	0.36***
	(0.03)	(0.03)	(0.04)	(0.03)
Deviance	27322.62	22898.38	10481.90	10154.99
Dispersion	1.42	1.81	0.94	0.98
Num. obs.	22753	17904	12616	22753

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

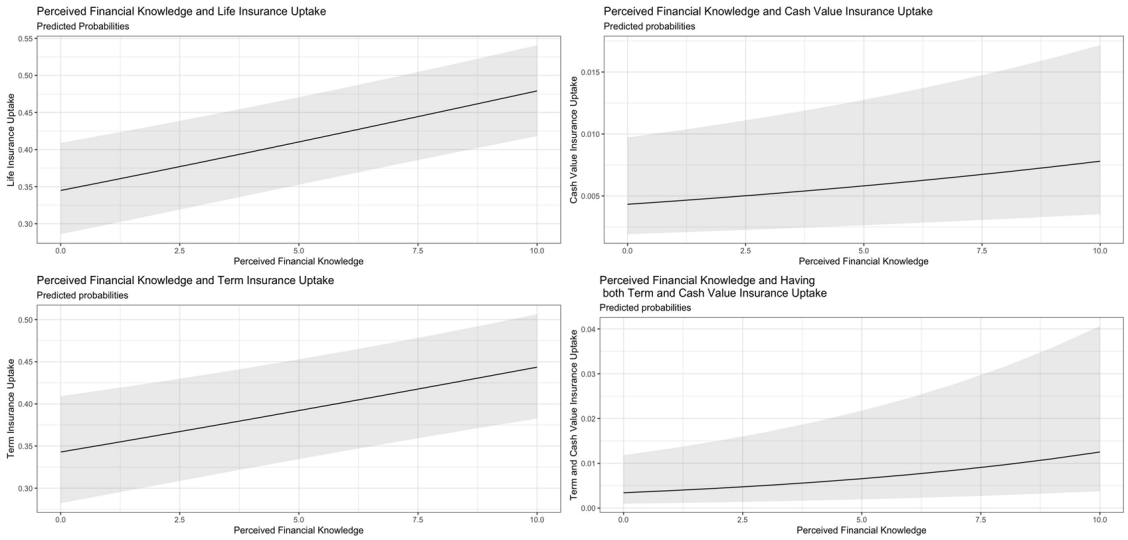

Figure 5 Predicted probabilities: Perceived financial knowledge by life insurance product. (Source: Author's analysis)

also has an impact on ownership, with married or cohabiting individuals showing a greater tendency to have life insurance compared to those who have never been married. Moreover, education level is positively correlated with life insurance ownership across all types. Employment status is also a significant factor, with unemployment being associated with lower chances of owning life insurance, especially term insurance. Finally, income level is a strong predictor for all types of insurance, emphasizing the connection between higher income and life insurance ownership.

5 Discussion

The findings of this study clarify the distinct roles of objective and subjective financial literacy in life insurance purchasing decisions. Subjective financial literacy, which refers to an individual's self-perceived understanding of financial matters, emerges as a more influential factor in these decisions. This observation is consistent with prior research suggesting that individuals' confidence in their financial knowledge, a component of subjective financial literacy, may be a better predictor of financial behaviors than objective measures of financial literacy [60,64,65]. The significant impact of subjective financial literacy on insurance uptake is likely due to its reflection of an individual's confidence in their financial knowledge, which may drive proactive financial behaviors such as the purchase of insurance [81]. This is particularly evident in the significant coefficient associated with the ownership of both term and cash value life insurance, suggesting that those with higher self-perceived financial knowledge are more likely to opt for more comprehensive insurance coverage.

Objective financial literacy, which is assessed through an individual's factual knowledge of finance, has a less consistent effect across the models. Its influence is significant only in the model predicting term life insurance ownership, indicating that while factual financial knowledge may impact the choice of simpler insurance products, it does not necessarily lead to more complex financial decisions, such as the purchase of combined insurance products. The analysis of predicted probabilities further illustrates the intricate relationship between perceived financial knowledge and the selection of life insurance products. Consistent with existing literature, the study finds that individuals' self-assessment of their financial expertise significantly impacts their insurance choices [62]. The steeper gradient observed in the graph for term insurance uptake suggests that individuals with higher perceived financial knowledge may prefer the affordability of term life insurance. This preference could arise from a more sophisticated understanding of risk and the benefits of diversifying insurance coverage.

Furthermore, the widening confidence intervals at higher levels of perceived financial knowledge for cash value life insurance uptake and combined insurance uptake may indicate variability in behavior among individuals with high self-assessed financial understanding, with some accurately assessing their financial capabilities while others may overestimate their knowledge.These insights underscore the importance of subjective financial literacy in financial decision-making and emphasize the need for financial education programs that enhance both knowledge and confidence in financial matters [59]. The study shows that the uptake of life insurance typically increases with age, reaching its peak among individuals in the Generation X demographic before sharply declining among the oldest age group. This trend could be attributed to changes in the availability, affordability, or perceived necessity of insurance as people get older.

When it comes to racial disparities in life insurance ownership, it has been observed that Black individuals have higher rates compared to White individuals. This difference may indicate cultural variations in the perception of financial security and the importance of life insurance. On the other hand, Latino and Asian individuals are less likely to have insurance, which could be influenced by factors such as limited access to financial products and cultural attitudes toward insurance. Another factor that seems to influence life insurance ownership is marital status. Married or cohabiting individuals are more likely to have coverage, possibly due to the financial responsibilities they have towards their dependents. Similarly, separated or widowed individuals show a higher propensity for insurance uptake, potentially due to an awareness of the financial vulnerability they face in the absence of a partner.

The positive relationship between education and insurance uptake aligns with research that suggests higher levels of education lead to more informed financial decision-making. Conversely, the negative correlation between unemployment and insurance uptake may indicate financial constraints or a decreased perceived need for insurance during periods of unemployment. The strong positive correlation between income and life insurance uptake confirms expectations, as individuals with higher incomes typically have greater financial means and consequently perceive a stronger need to protect their assets through insurance [27–29].

These findings underscore the importance of tailored financial literacy programs that take into account people's socio-demographic backgrounds in order to promote life insurance uptake. Furthermore, they draw attention to potential barriers to insurance access, particularly among certain racial and age demographics. In future research, it would be valuable to explore the causal mechanisms behind these associations and to examine the potential impact of financial literacy interventions in narrowing the gap in insurance uptake. The 2022 Survey of Consumer Finances (SCF) has some limitations that need to be acknowledged. These include relying on self-reported data, which can introduce biases like underreporting or overreporting due to memory recall issues and social desirability bias. Its cross-sectional design also limits the ability to make causal inferences. Additionally, the survey lacks detailed information on factors influencing insurance selection, which restricts the scope of analysis in this area. These limitations suggest policy implications, such as the need for improved data collection methods to capture more accurate information on insurance choices and the implementation of targeted financial literacy programs to address demographic disparities and enhance financial decision-making across diverse population segments.

6 Conclusion

This research examines the impact of financial literacy on acquiring life insurance, focusing on how subjective and objective knowledge influence insurance uptake. The findings demonstrate that an individual's perception of their financial knowledge is crucial in making insurance-related decisions, often overshadowing objective knowledge. Subjective understanding is particularly important in selecting term insurance, helping individuals choose coverage options that are both wise and affordable. For those who choose cash value insurance, their decision is influenced by a complex interplay of self-assessment and confidence in financial decision-making, reflecting a deeper engagement with concepts of financial security and legacy planning. The study also reveals generational trends in insurance demand, showing that the probability of insurance ownership increases with age, but then declines significantly for the oldest age group. This pattern reflects changing financial priorities at different stages of life. Racial disparities in insurance ownership suggest underlying societal dynamics. The higher inclination among Black individuals to obtain insurance may indicate a collective approach to mitigating financial vulnerabilities, while lower uptake among Latino and Asian populations could be attributed to cultural differences and access barriers. Marital status is closely linked to insurance ownership, with married or cohabiting individuals more likely to invest in life insurance, likely due to a shared concern for the financial well-being of partners and dependents. Similarly, separated or widowed individuals show a higher inclination towards insurance, possibly as a financial safeguard during more solitary phases of life. Educational attainment is positively associated with life insurance ownership, indicating that higher levels of knowledge facilitate navigating the complexities of financial products. Conversely, unemployment is linked to reduced insurance ownership, highlighting the financial challenges faced by those without employment. Income also plays a significant role, with higher earnings increasing the ability to afford insurance and enhancing the perceived need for financial protection. In conclusion, this study provides a comprehensive understanding of the relationship between financial literacy, demographic factors, and life insurance ownership. It emphasizes the importance of improving both subjective and objective financial literacy to enhance life insurance uptake, and suggests that tailored financial education programs could play a crucial role in addressing the observed disparities in insurance ownership among different demographic groups.

7 Future research

Future research should thoroughly investigate the causal mechanisms underlying the relationship between financial literacy and insurance purchasing decisions. This investigation should focus on how confidence derived from financial literacy influences consumer actions. Experimental designs or advanced statistical methods like structural equation modeling should be used to study this relationship. Additionally, it is necessary to assess how professional financial advice might complement or substitute for personal financial literacy in life insurance decision-making. Outcomes should be compared between individuals relying solely on their financial literacy and those seeking professional advice. Matched samples should be used to control for confounding variables.

Cultural factors impacting financial literacy and insurance behaviors, especially within diverse or minority populations, should be examined using qualitative methodologies. These methodologies will capture the nuanced ways cultural values and norms influence financial

decisions. This research will aid in the design of culturally sensitive financial education programs. Longitudinal studies tracking changes in financial literacy over time and their impact on life insurance uptake would provide insights into the long-term effects of financial education programs. Critical periods for effective interventions can be identified, and the stability of financial literacy's impact across different life stages can be observed.

Finally, with the rapid advancement of digital tools in finance, future research should explore how financial apps and online platforms influence the relationship between financial literacy and insurance purchasing habits. User interaction data should be analyzed to understand how technology-mediated education impacts insurance decision-making processes.

Conflicts of interest

The author declares that there is no conflicts of interest.

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COMMENTARY

The Chinese economic policy in African markets: An essay based on evidence and perspectives

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Abstract: This paper is an essay that aims to understand China's economic policy in the African markets. As a result, changes in international trade and foreign direct investments (FDIs) from the beginning of the new millennium and to the end of the last decade have been highlighted. The data have shown a clear intensification of Chinese trade and FDIs in African markets in 2017 compared to 2002. This international expansionism is a result of the economic policy adopted by China to gradually push firms to approach foreign markets. Therefore, it has been a consequence of the leading and supporting role of international trade played by Chinese governance.

Keywords: China, Africa, economic policy

1 Introduction

The attention to foreign direct investments (FDIs) towards African markets by major developed and developing economies – particularly China – has significantly increased over the last decade for at least two reasons. Firstly, to address the need to ensure that firms have stable supplies of raw materials and natural resources – such as rare earths – that are crucial for specific productions in strategic industries. Secondly, some African emerging economies – the so-called "African Lions" – have experienced significant growth (OECD, 2008; IMF, 2012). In other words, although at the beginning of the new millennium Africa presented weak growth and development prospects (The Economist, 2000), by the beginning of the past decade, these prospects had improved. As a result, trade with the rest of the world had gradually intensified (Obeng-Odoom, 2022; Scalamonti, 2023). The better prospects for growth have been revealed primarily for four reasons (World Bank, 2011): (i) average annual growth rates of around 5-6% in the first decade of the New-millennium, (ii) progress in achieving the Sustainable Development Goals (SDGs), (iii) favorable governance in promoting FDIs, and (iv) upgrading programs for market-oriented structural reforms. However, despite the better performances of some countries, many of them have continued to face several issues and challenges, especially countries situated in Sub-Saharan Africa (SSA) (UNCTAD, 2019).

On the other hand, the rapid development by Asian countries has imposed enormous challenges to both developed and developing economies. This novel geographical configuration can represent both a threat and a challenge to the established economic and political order. For instance, China may offer a rapidly growing consumer goods market for exporting countries, but it is also an exporter of cheaply labor-intensive manufacturing goods, and is a country perfectly positioned along the global value chains (GVCs) (Lall and Albadelejo, 2004; Amiti and Freund, 2010). Over the decades, the Chinese firms have intensified manufacturing exports of both low and high value-added products (Egziabher, 2006; Razmi, 2007; Schott, 2007). This has made China the world's second greater investor in R&D after Japan. Strengthened by this result, Chinese manufacturing has begun to export products with strong penetration in emerging markets – especially African ones, where, for example, the market shares held by main Western and Japanese firms may have been eroded. Consequently, the Chinese firms, being in many cases state-owned and benefitting from the advantages deriving from their size, may be less averse in incurring costs associated with the liability of foreignness deriving from operating in contexts with uncertainty and cultural diversity then their Western or Japanese counterparts (Nolan, 2005; Tull, 2006).

This work can be an essay that aims to understand China's economic policy in African markets. Overall, the paper situates among studies exploring the increasing economic and political interactions between China and African countries, the policies that have facilitated their relationships, and the implications that have arisen for both partners involved. The growth of Chinese presence in African markets has been particularly discussed over the years. China is among the investors that,

based on positioning along the global value chain of its manufacturing industry, is most actively seeking natural resources beyond its borders to sustain its growth (Asiedu, 2002; Taylor, 2006; Tull, 2006; Van Dijk, 2009; Gu, 2009; Ajakaiye and Kaplinsky, 2009; Rotberg, 2009; Dent, 2010; Kolstad and Wiig, 2011; Cheung et al., 2012; Alden, 2012; Eisenman, 2012; Brautigam et al., 2014; Zeleza, 2014; Ferrucci and Paciullo, 2015; Pigato and Tang, 2015; Henson and Yap, 2016; Mlambo et al., 2016; Regissahui, 2019; Kalu and Aniche, 2020; Feng and Xinying, 2022). Specifically, it highlights the intensification of Chinese trade and FDIs in the African continent in 2002 and 2017, and how Chinese international expansionism is a result of the economic policy adopted by China's governance to gradually engage firms in foreign markets. The rest of the paper has been structured as follows: (i) a brief overview of the reference literature, (ii) Chinese economic policy and the approach to the African markets, (iii) the empirical evidence from the African markets, finally, (iv) conclusions.

2 A brief overview of the reference literature

The Africa has become destination not only for big state-owned corporations looking for resources, but also for small and medium-sized enterprises (Wissenbach, 2007; Copley et al., 2014). China's economic relationships with Africa have intensified significantly over the last years, both through trade and financial ties, and development aids (Kaplinsky et al., 2010). Table 1 shows the empirical reference literature relevant to this essay is provided.

Table 1 A synopsis of the empirical reference literature on China's impact on growth in Africa

Authors	Main results
Shafaeddin (2004)	Few African countries affected by Chinese competition: Egypt and Malawi in clothing and textile; Tunisia in machinery and equipment; Kenya to a lesser extent in plastic and rubber.
Eifert et al. (2005)	Clothing and textile firms in Madagascar, Kenya, Ghana, Mozambique, and Lesotho had unit production costs up to 60% lower than Chinese firms in these countries.
Stevens & Kennan (2006)	SSA countries, except South Africa, benefited from trading with China due to lower import costs.
Goldstein et al. (2006)	Strong competition with Chinese firms in Burkina Faso, Ethiopia, Kenya, and Mali in leather; Lesotho and Malawi in clothing; Tanzania in textile.
Jenkins & Edwards (2006)	Imports and FDI inflows from China and India have positively impacted growth and development in SSA, enhancing firms' supply capacity in consumer goods markets and increasing revenues for African governance. Competition with Chinese firms posed a serious threat to productions in Lesotho, Zambia, Mozambique, Malawi, Namibia, and South Africa.
Zafar (2007)	"Winners and losers" from Chinese market entry: winners were resource-rich countries (e.g., Angola, Sudan, Gabon); losers were oil-importing and textile-exporting countries (e.g., Mauritius, Madagascar) and agri-food exporters (e.g., Ethiopia, Kenya, Malawi).
Broadman (2007)	Potential vertical productive complementarities between Chinese and African firms in clothing and textiles for Mauritius, Nigeria, and South Africa. Significant increase in natural resource exports to China and rise in intra-sectoral trade between Chinese and African firms, particularly in South Africa and Nigeria.
Geda & Meskel (2007)	Chinese exports of clothing and accessories crowded out local productions in African markets, especially in Niger, Zambia, and Burkina Faso, followed by Ghana, Algeria, Gabon, Ivory Coast, and Kenya.
Jenkins (2008)	Calculated a comparative threat index, identifying serious threats from Chinese exports to all African markets, especially Mozambique, South Africa, and Uganda. Emphasized the need for country- and sector-specific analysis to better understand the impact of Chinese productions.
Giovannetti & Sanfilippo (2009)	Significant evidence of the crowding-out effect of Chinese productions in African markets, affecting all sectors and levels, particularly clothing and textiles, footwear, machinery, and equipment. Chinese exports to SSA impacted intra-regional trade.
Yao et al. (2010)	Chinese firms supported by government credit access, benefitting from lower borrowing costs, have displaced competing firms in foreign markets.
Zhang et al. (2014)	Chinese FDI inflows overall did not have a significant effect on GDP growth in SSA and suggest that this is due to the crowding-out effect of domestic investments.
Yao and Wang (2014)	Chinese FDIs crowd-out FDI inflows from developed countries but do not displace them in resource-rich African markets like South Africa, Nigeria, Zambia, Algeria, Sudan, and Angola.
Lampert & Mohan (2017)	Success of Chinese firms in African markets promoted by agents with specific relationship networks within state institutions.
Donou-Adonsou & Lim (2018)	Foreign investments from advanced economies (e.g., US and Germany) have a higher positive impact on per-capita income in African countries than Chinese investments, which primarily displace FDIs from advanced economies. Investments from historical partners of African countries are motivated by more than just economic interests or business growth.
Zhang (2021)	Top-three industries receiving Chinese investments in SSA are renewable energy, automotive, and its components.

Source: Our elaboration.

Therefore, the reference theoretical framework for this paper concerns Chinese economic growth and the consequence of its economic expansionism in developing and emerging economies (Weber, 2004; Kaplinsky and Messner, 2008; Hölscher et al., 2010; Arora and Vamvakidis, 2011; Rubini and Barbieri, 2013; Di Tommaso and Bazzucchi, 2013; Frattini and Prodi, 2013; Anyanwu, 2014).

2.1 Discussion

China's growth has impacted the development of African countries and the economic policy adopted can be divide into direct and indirect. The direct effects are easier to measure and consequences of trade interaction across China and third countries. They can be complementary, if dictated by the increase in demand for Chinese exports, or competitive, if due to an increase in Chinese exports to target markets, which generate a substitution effect on local production and on those of international competitors. Instead, indirect effects are more difficult to measure as they result from China's non-commercial economic relations with other countries. However, it is not always possible to perform a detailed and accurate analysis of the Chinese presence impacts in the African markets, mainly due to data reliability lack, given the numerous firms involved in trade, especially medium and small-sized ones, which do not make available the trade and investment data (Kaplinsky et al., 2010; Mlachila and Takebe, 2011).

China's competitive impact, especially in SSA, is often indirect. It manifests itself in a reduction in the market shares held by firms in developed countries (Kaplinsky and Morris, 2009; Kaplinsky 2013). Several author have then suggested that a country- and sector-specific analysis could be more appropriate to better understand Chinese productions' impact in African markets, or which could be more useful to analyze the FDI inflows. Chinese firms have invested in telecommunications (Luiz and Stephan, 2012; Nasri and Charfeddine, 2012), tourism (Dieke, 2003), and household appliances (Spigarelli and Bellabona, 2006). Chinese FDI stocks, in addition to being substantial, have been mainly concentrated in mining, financial services, and infrastructure (Cheung et al., 2012; Leung and Zhou, 2014). The reference literature has shown that China's economic policy efforts around the world are not only focused on traditional manufacturing or natural resource exploitation. The difference with Western or Japanese firms – constituted in private legal forms – exactly lies in the legal form of Chinese firms, entirely or partially state-owned. When they are efficient, their financing and operating costs could be lower than those of their Western and Japanese counterparts. Furthermore, in studies the strategic role played by public actor through financial aid in supporting the Chinese firms' internationalization and in approach to international markets have been highlighted, and how this has been important for China's growth (Rasiah et al., 2010).

This assumption can be at the basis of China's economic policy and its economic expansionism in African markets. However, Chinese policies to foster the manufacturing system development have been broad, varied, and with mixed effects (Barbieri et al., 2010; Barbieri et al., 2015). Initially, economic policy efforts have been mainly focused on an imitation strategy of the various development models, such as the Japanese way. Only at a later stage, the creation of national champions has been facilitated. As a result, numerous medium and small enterprises have been clustered around these greater firms. This clustering process has led to the creation of significant economic districts, such as Special Economic Zones (SEZs) or Global City Regions (GCRs). In these economic districts, firms have benefited from the advantages of agglomeration economies and industrial specialization, accelerating China's economic growth (Rubini and Barbieri, 2013; Santangelo, 2018).

In conclusion, some authors have seen the Chinese presence in Africa as beneficial both to China and African contexts, while others have argued that China is contributing to the underdevelopment and de-industrialization of the countries (Adisu et al., 2010; Kolstad and Wiig, 2011; De Grauwe et al., 2012; Evans, 2021). As a result, there is no shared viewpoint in the literature that China's growing presence in Africa is sustainable for Africa or that such a partnership could be unsustainable (Ajakaiye and Kaplinsky, 2009; Zeleza, 2014; Mlambo et al., 2016; Feng and Xinying, 2022). Additionally, given the historical political and trade relationships that principal advanced economies once maintained in Africa markets, it might be assumed that these economies could still hold a significant presence, particularly in SSA, through their firms. However, this assumption may be contradicted by empirical evidence.

3 Chinese economic policy and approach to the African markets

The effects of the reforms and policies adopted by Beijing since the Eighties have been high growth rates and increased firms' productivity (Lin, 2012). As a result, the approach of Chinese

firms to African markets began with the implementation of robust state plans in supporting internationalization strategies, combined with an economic policy aimed in protecting the Chinese infant industry (Naughton, 2007; Gabusi, 2012). Looking back, the "Bandung Conference" of 1955 marks the beginning, in the modern era, of diplomatic relations between Chinese governance and African one through military assistance in exchange for political support in major international forums (Gagne, 2018).

More recently, the approach to African markets involves at least three periods starting from 1978 (Wu and Chen, 2001; Wong and Chan, 2003a; Wong and Chan, 2003b; Buckley et al., 2007; Gagne, 2018), when the Chinese governance began the structural reforms to facilitate China's economic transition and its global integration (Valli, 2008; Hölscher et al., 2010; Frattini and Prodi, 2013; Heilmann and Shin, 2013). Until the Eighties, Chinese firms mainly operated in a few industries, such as basic manufacturing and raw materials. It was only later that manufacturing expanded to include consumer and mass-market products. Therefore, China's economic relationships with African markets have been characterized from the beginning by a governmental thread aimed in increasing its political influence over the years (Table 2).

Table 2 The stages of Chinese economic policy

Period	Stage	Reform	Policy
[1] 1978-1992	market preparation	- double pricing system - private initiative authorization - foreign investor acceptance - state monopoly abolition - GATT adhesion - tariff barrier disposal	- SEZs activation - FDIs attraction - competitive devaluation - non-tariff barrier creation - import substitution - export support
[2] 1993-2001	market openness	- state ownership restructuring - business orientation - five-year planning - WTO adhesion	- state aid reduction - infant industry support - infrastructure
[3] Since 2002	mixed economy	- liberalization - State-owned assets supervision and administration commission - foreign trade reform	- go west strategy - go global strategy - incentive reduction - new technology attraction - foreign market control

Source: adaptation from Frattini and Prodi (2013).

3.1 Key points across stages

Special Economic Zones (SEZs) are designated areas managed as independent socio-economic entities to attract foreign investment and boost manufacturing employment. In China, SEZs have successfully integrated firms into GVCs, enhancing competitiveness and technological advancement. However, the effectiveness of SEZs varies and depends on countries' specific socioeconomic environment and political context (Farole, 2011). In 1979, the first SEZs were established following the "open door" policy adoption. In 1992, the definitive adoption of a mixed-economy model based on the principles of socialism and the free market followed. Among the most significant economic policies established in the Eighties and Nineties was the important dual-track system – which allowed state corporations to produce outside the five-year plans – the authorization to produce for private firms, and some economic liberalizations (Prodi, 2011). During those decades, China-Africa relationships shifted towards a cooperation-based model (Zeng, 2015). The state-owned corporations were the main investment promoters in African markets, as private firms were not yet capable of efficiently investing in foreign markets. They only became able to do so after China's initiation into the World Trade Organization (WTO) at the beginning of the new millennium (Buckley et al., 2007; Mavroidis and Janow, 2017).

On the domestic front, the Chinese economic policy was characterized by competitive devaluation, the establishment of a dual-pricing system, the implementation of non-tariff barriers, and public interventionism to support infant industry (Naughton, 2007). On the African front, the Chinese economic policy took two directions. Firms managed by local governance leveraged the conflictual and emergency state of many African contexts to extend their economic influence. Meanwhile, firms directly controlled by the central governance adopted an embassy strategy based on diplomatic efforts to sign numerous agreements with African partners (Gagne, 2018). In the early Nineties, Chinese state-owned corporations promoted and financed significant public and infrastructural investments in SSA while also engaging in the extraction of natural resources to meet growing domestic needs. By the mid-Nineties, the efficiency of the Chinese domestic market

increased, and the competitive selection in the market improved (Li and Putterman, 2008; Gabriele, 2010).

During this decade, FDI inflows in African markets also grew significantly, allowing China to establish an intricated production network both upstream and downstream in the supply chains, promoting development in these contexts (Girma et al., 2008; Brandt and Thun, 2010; Sun, 2012). For instance, the investment development path model can help highlight countries' economic growth through four stages by considering both FDI inflows and outflows (Dunning and Narula, 2003). In the first two stages, countries neither attract significant FDIs nor act as international investors due to factors and internal weakness or imbalances; firms focus on acquiring know-how for low-tech production. In the subsequent stage, FDI inflows rise as the country becomes more attractive to foreign investors, but outflows remain low. In the final stage, with developed manufacturing capabilities, FDIs in higher value-added industries increases, and mature firms begin to compete internationally, resulting in higher FDI outflows surpassing inflows. In 2001, with China's initiation to the WTO, a new phase began, consolidating many of the economic transformations initiated in the previous decade. Economic policy focused primarily on enhancing strategic sectors for the country's development and facilitating the international growth of state-owned corporations (Deng, 2009; Qin, 2010; Hemphill and White, 2013).

3.2 Discussion

The progressive saturation of the domestic market and increasing internal competition meant that China at the beginning of the new millennium had a diversified manufacturing, with numerous small and medium-sized private enterprises revolving around a few big market-leading state-owned corporations. These big state-owned corporations were the main promoters of Chinese investments in African markets and the rest of the world. Faced with this situation, the economic policies promoted by China enabled the development of the more backward internal rural areas and provided effective responses to the need to find new markets for the surplus manufacturing production resulting from the country's increased production capacity. Meanwhile, China undertook the search for raw materials in foreign contexts for its growth (Montinari and Prodi, 2011).

In other words, substantial resources were invested by Chinese firms and governance, overall, in technological upgrading to enhance the country's competitiveness, particularly, in developing strategic sectors for the economy. Additionally, many manufacturing activities were relocated to contexts with lower labor costs. The increasing number of Chinese firms in African markets is due to the activation of the Forum on China-Africa Cooperation (FOCAC) and, more recently, the launch of the One Belt One Road Initiative (BRI).

In 2004, China contributed to about 900 US$ million in investments to development in SSA (Abraham and Van Hove, 2005). Development loans provided to African countries represented about 50% of the total amount of international loans provided by Beijing in 2005 aimed to supporting (Kobayashi, 2008): (i) capacity-building, technical cooperation, assistance, and humanitarian aids, (ii) non-repayable loans for the public infrastructure constructions, (iii) subsidized loans to incentivize manufacturing investments or to guarantee the supply of machinery and electronic equipment. These initiatives aim to enhance China's economic and sociopolitical engagement worldwide and promote international openness (Taylor, 2010; Summers, 2016). They have enabled China to withstand the great global economic crisis and help revive the global economy (Hölscher et al., 2010). Chinese firms in African markets are primarily active in sectors such as communications, wholesale trade, manufacturing, and retail production and sales (Kaplinsky and Morris, 2009).

In 2015, at the sixth FOCAC meeting in Johannesburg, Chinese President Xi Jinping announced a 60 US$ billion allocation in aid and investment for development in African contexts. This commitment was reaffirmed in 2018 in Beijing. Therefore, these commitments are closely tied to the transformations in China's development path, its growth model, and its penetration and expansion strategies in foreign contexts (Barbieri et al., 2015; Zhang and Smith, 2017; Biggeri et al., 2018). Chinese governance viewed the global economic crisis as a good opportunity for Chinese firms engaged in doing business abroad and, consequently, provided them with financial and fiscal support (Xue, 2008).

In other words, financial institutions lowered interest rates and made access to loans easier (Yang, 2009; Sau, 2012). However, African contexts often encounter critical issues that can cause capital flight, such as: (i) political and social instability, (ii) labor markets inadequately regulated, (iii) logistical difficulties and infrastructural lacks, (iv) best practice absence (Singh and Jun, 1999; Ajayi and Ndikumana, 2014; Bende-Nabende, 2017). These concerns, both soft and hard, can increase perceived risk for investors, finally, raising transaction costs and the liability of foreignness from foreign operations (UNCTAD, 2017; UNCTAD 2019). In fact, it could happen that the actual

or potential costs outweigh the actual or potential benefits derived from seeking low-cost labor in underdeveloped or low-income countries.

In conclusion, the growth model adopted by Chinese governance has been characterized by decisiveness, an understanding of the technological development achieved by the country, and an openness to liberal transformations (Mahmood and Rufin, 2005; Lin, 2012). Nonetheless, China faces significant challenges for the future and economic sustainability (Frattini and Prodi, 2013; Heilmann and Shih, 2013). Specifically, the upgrading should involve liberalizations, more efficient resource allocation, stimulating domestic demand, last but not least, protecting intellectual property rights.

4 The empirical evidence from the African markets

With the adhesion to the WTO in 2001, China has increased the international trade linkages. Chinese investments have represented a development opportunity for African contexts, despite structural updates, have been less attracted compared to other areas of the world (UNCTAD, 2018). The great economic crisis in 2007-2008 can be a watershed to show how the economic interests in African markets have shifted from once-colonizing developed countries to those now developing (Grier, 1999; Bertocchi and Canova, 2002; Moussa, 2002; Lange et al., 2006; Kahn, 2011; Acemoglu and Robinson, 2012; Dallago and Guglielmetti, 2012; Zhao, 2014; Dallago and Casagrande, 2023).

The "Berlin Conference" on the African partitioning in 1884-1885 is often cited as the historical event that officially marked the division of Africa among the European economic and military emperors at the time (Hobsbawm, 1987). Therefore, we have decided of examining the economic interests of European colonizing countries in Africa until 1939: Great Britain, France, Germany, Italy, Belgium, Portugal, and Spain, to which the United States and Japan have been added as other developed economies, in addition to Brazil, India, and China since main developing economies.

The following section, after a quick look at the data and results collected in various studies, examines Chinese trade, FDI flows, and industrial specialization, in African markets by comparing the economic interests of some advanced and emerging economies in the African continent.

Overall, by comparing 2002 and 2017 in Table 3, a significant intensification of Chinese and Indian presence – measured by the country-specific average openness degree – can be clearly observed (Bardhan, 2010), especially in the SSA region.

Table 3 The average openness degree of North Africa and SSA in 2017 and 2002, percentage values.

Year	Country	North Africa	Export	Import	SSA	Export	Import
2017	France	5.56	2.79	2.77	1.28	0.54	0.74
	Italy	4.75	2.44	2.31	0.71	0.37	0.34
	Germany	3.72	1.49	2.23	1.72	0.77	0.95
	Belgium	1.1	0.39	0.71	1.12	0.5	0.62
	United Kingdom	1.37	0.79	0.58	1.18	0.73	0.45
	Portugal	0.37	0.11	0.26	0.34	0.1	0.24
	Spain	5.34	2.79	2.55	0.92	0.63	0.29
	United States	2.86	1.51	1.35	2.34	1.51	0.83
	India	1.21	0.54	0.67	3.14	1.93	1.21
	China	4.58	0.71	3.87	9.02	4.5	4.52
	Japan	0.36	0.14	0.22	0.8	0.44	0.36
	Brazil	1.37	0.58	0.79	0.4	0.12	0.28
2002	France	7.86	3.5	4.36	3.87	1.67	2.2
	Italy	6.56	3.84	2.72	2.11	1.23	0.88
	Germany	3.62	1.77	1.85	3.49	1.57	1.92
	Belgium	1.51	0.85	0.66	1.82	1.17	0.65
	United Kingdom	1.82	0.97	0.85	3.75	2.23	1.52
	Portugal	0.26	0.17	0.09	0.6	0.33	0.27
	Spain	4.16	2.75	1.41	1.7	1.31	0.39
	United States	4	1.97	2.03	7.06	5.35	1.71
	India	0.48	0.23	0.25	1.58	0.83	0.75
	China	0.99	0.15	0.84	2.93	1.46	1.47
	Japan	0.72	0.2	0.52	2.54	1.5	1.04
	Brazil	0.88	0.53	0.35	0.87	0.41	0.46

Source: Our elaboration on UNCTAD-Comtrade data.

4.1 Results and discussions

4.1.1 Previous significant data and results

In the mid-Nineties, the value differential between Chinese exports of manufacturing and agricultural products to African markets was modest. By the mid Two-thousands, it had more than doubled, surpassing that of the United States and France (He, 2013; UNCTAD, 2014). The products exported on average to each African country increased from just under 400 lines in the late Nineties to almost 2,000 in 2010. The broadening of the exported products range contributed to the overall growth of Chinese exports to African markets by more than 50%, with peaks of over 70% in Angola, Mozambique, Malawi, Zimbabwe, and Zambia (Edwards and Jenkins, 2014). The last decade has seen a rapid increase in Chinese economic interests and political influence in Africa. Between 2001 and 2011, total Chinese exports to SSA increased about 13-fold, moving from 4 to 53 US$ billion (UNCTAD, 2010; IMF, 2012). From 2000 to 2016, China invested as much as $30 billion in African markets, a value 60 times higher than at the beginning of the century (Gagne, 2018), and with more than 3,000 enterprises involved, representing about 9% of all Chinese firms abroad (UNCTAD, 2016).

Chinese exports to African markets have focused on machinery and manufacturing products, while African exports to China are dominated by raw materials, especially hydrocarbons (Ferrucci and Paciullo, 2015). The same applies to FDIs, which are primarily driven by oil and natural resources or directed towards the agricultural, manufacturing, and services (Broadman, 2007; Kaplinsky and Morris, 2009). Only recently have private Chinese firms taken the lead in foreign investments, both globally and in African markets. In 2016, the share of Chinese state-owned corporations with overseas activities was 54% (UNCTAD, 2016). Therefore, private Chinese firms began investing in African markets only after achieving – partly through significant state aid – a certain level of economic and financial stability, and sufficient experience to be competitive in international contexts.

In 2018, Chinese investments in African markets amounted to 46 US$ billion, an increase of over 50% compared to 2013 (UNCTAD, 2019). In addition to the traditional industries of construction, mining, and manufacturing – which collectively represented almost 70% of the FDI stocks in African markets (UNCTAD, 2016) – new industries have also developed. In 2018, trade between China and African markets (Figure 1) reached a value of over 200 US$ billion, with an average annual increase of 20% since 2010 (IMF, 2019). This trend has characterized the last decade, with Africa's weight in international transactions progressively increasing. Exports to SSA were 68 US$ billion, of which more than 40% were consumer goods, while imports were 71 US$ billion, of which 70% were raw materials (UNCTAD, 2019; IMF, 2019).

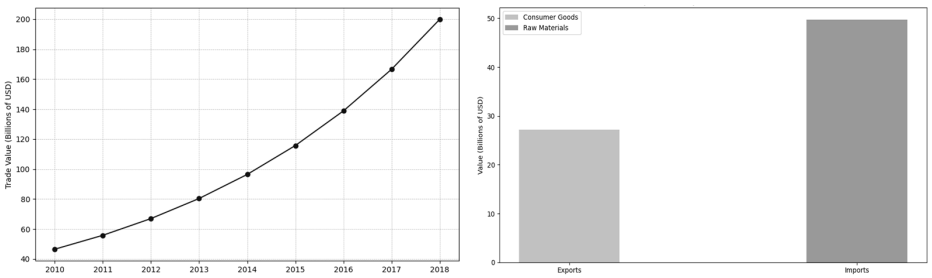

Figure 1 Trade between China and African markets. (Source: our elaboration)

Since 2015, it has been Africa's main partner, with its trade share rising from 2.5% in the Eighties to 25% (UNCTAD, 2016). Imports in SSA stood at 20%, mainly involving consumer goods and, to a lesser extent, assets, and intermediate goods. Chinese interest in African natural resources and the search for lower labor cost are the main economic drivers guiding Chinese interests in African markets. On the other hand, the need for financing to support the African countries' infrastructure has made the connection with Chinese partners very important for the countries' development, as China, through its major financial institutions (such as EXIM Bank of China, China Development Bank, and People's Bank) have financed – and continue to finance – many of the development projects (Shen, 2014; UNCTAD, 2015). Therefore, numerous Chinese firms have found – and are finding – new ways to invest capital in African contexts (UNCTAD, 2019; IMF, 2019).

4.1.2 International trade and foreign direct investments

In Table 4, the top two economies for merchandising trade in African markets are reported, while Table 5 lists the top two economies based on FDIs, both in comparison to 2017 and 2002. Across

these two time-units, a marked intensification of Chinese trade and investment can be observed in all areas of colonizing influence (Brandt & Thun, 2010; Farole, 2011; Sun, 2012; Zeng, 2015; Xing et al., 2016; Gray and Gills, 2018; Abodohoui and Su, 2020; Mazé and Chailan, 2021; Benfratello et al., 2023).

Table 4 The top-two economies for merchandise trade in 2017 and 2002, ranking from imports and exports.

Colonial Influences	IMPORTS				EXPORTS			
	2017		2002		2017		2002	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
French								
Algeria	China	France	France	Italy	Italy	Spain	France	Spain
Benin	China	India	China	France	India	China	India	Italy
Burkina Faso	France	China	France	Italy	India	Germany	Italy	France
Cameroon	China	France	France	USA	France	China	Italy	Spain
Central African Rep.	France	India	France	USA	China	Belgium	Belgium	Spain
Chad	China	France	France	USA	USA	China	Portugal	Germany
Comoros	China	France	France	India	India	France	France	Germany
Congo	China	France	France	Italy	China	Italy	China	USA
Ivory Coast	China	France	France	China	USA	France	France	USA
Gabon	France	China	France	USA	China	India	USA	China
Djibouti	China	India	USA	France	USA	UK	USA	France
Guinea	China	India	France	Italy	China	India	Belgium	Spain
Madagascar	China	France	France	China	USA	France	France	USA
Mali	France	China	France	Germany	India	China	Italy	India
Morocco	Spain	France	France	Spain	Spain	France	France	Spain
Mauritania	China	France	France	Belgium	China	Spain	Italy	France
Niger	France	India	France	India	France	China	France	Belgium
Senegal	China	France	France	Belgium	India	China	India	France
Tunisia	France	Italy	France	Italy	France	Italy	France	Italy
British								
Botswana	China	Belgium	USA	UK	India	Belgium	UK	USA
Egypt	China	Germany	USA	Germany	Italy	USA	USA	Italy
Gambia	China	India	China	UK	China	India	France	UK
Ghana	China	USA	China	UK	India	China	UK	France
Kenya	China	India	USA	UK	USA	UK	UK	USA
Lesotho	China	India	China	India	USA	Belgium	USA	Belgium
Malawi	China	India	India	USA	Belgium	Germany	USA	Germany
Mauritius	China	India	India	France	France	USA	UK	France
Nigeria	France	India	UK	USA	France	China	USA	Spain
Seychelles	Spain	France	France	Spain	France	UK	UK	France
Sierra Leone	China	India	Germany	UK	China	Belgium	Belgium	Germany
Sudan	China	India	China	UK	China	India	China	Japan
Swaziland	Portugal	China	India	USA	Spain	India	USA	UK
Tanzania	China	India	China	India	India	China	Japan	India
Togo	China	Belgium	France	China	India	China	India	Spain
Uganda	China	India	India	UK	Italy	Germany	Belgium	Germany
Zambia	China	India	USA	China	China	India	Japan	China
Zimbabwe	China	India	UK	USA	China	UK	China	UK
Portuguese								
Angola	China	Portugal	USA	Brazil	China	India	USA	China
Cape Verde	Portugal	Spain	Portugal	Brazil	Spain	Portugal	Portugal	UK
Guinea-Bissau	Portugal	China	Portugal	India	India	France	India	Portugal
Mozambique	China	India	France	USA	India	China	Belgium	Germany
São Tomé and Principe	Portugal	China	Portugal	UK	Spain	Belgium	France	Germany
Spanish								
Equatorial Guinea	Spain	China	USA	Spain	China	India	USA	Spain
Belgian								
Burundi	China	India	Belgium	France	India	USA	Germany	Belgium
Congo, Dem. Rep.	China	Belgium	Belgium	France	China	Italy	Belgium	USA
Rwanda	China	India	Belgium	Germany	USA	China	Belgium	Germany
Italian								
Eritrea	China	Italy	USA	Italy	China	Spain	Italy	Germany
Ethiopia	China	France	China	Italy	China	USA	Italy	Germany
Libya	Italy	China	Italy	Germany	Italy	Germany	Italy	Spain
Somalia	China	India	Brazil	India	China	Japan	India	Italy
Independent								
Liberia	China	Japan	Japan	France	Germany	USA	Germany	France
Namibia	China	USA	USA	Germany	Belgium	China	UK	Spain
South Africa	China	Germany	Germany	USA	China	UK	USA	UK

Source: Our elaboration on UNCTAD-Comtrade data.

Table 5 The top-two economies for FDIs in 2017 and 2002, ranking from inward and outward flows.

Colonial Influences	INWARD				OUTWARD			
	2017		2002		2017		2002	
	1st	2nd	1st	2nd	1st	2nd	1st	2nd
French								
Algeria	France	Italy	USA	France	Spain	Italy	France	
Benin	France	China	France		France	China	France	USA
Burkina Faso	UK	France	France		China	France	France	
Cameroon	France	Italy	France	USA	USA	Italy	France	
Central African Rep.	Italy	Brazil	France		China	Italy	France	
Chad	Belgium	France	France		USA	Italy	France	
Comoros			France		Italy		France	
Congo	France	Italy	France	USA	USA	Italy	France	
Ivory Coast	France	USA	France	USA	France	Belgium	France	USA
Gabon	France	USA	France	USA	France	China	France	USA
Djibouti	Germany	Italy	France	USA	China	Italy	France	
Guinea	Belgium	Italy	France		Italy	China	France	
Madagascar	Italy	Germany	France		Germany	China	France	
Mali	UK	France	France	USA	USA	Belgium	France	
Morocco	France	Spain	France	USA	France	Spain	France	Italy
Mauritania	USA	Belgium	France	USA	India	Italy	France	
Niger	China	France	France	USA	China	USA	France	
Senegal	France	UK	France	USA	India	Portugal	France	
Tunisia	France	Italy	France	USA	Portugal	China	France	Italy
British								
Botswana	UK	France	UK	USA	Belgium	India		
Egypt	USA	Italy	USA	UK	France	Italy	France	Italy
Gambia	India	Germany			China	India		
Ghana	France	USA	USA	UK	France	USA	USA	
Kenya	France	UK	UK	France	UK	Italy	France	
Lesotho	Italy	USA	USA		Italy	China		
Malawi	UK	USA	UK	USA	China	Italy		
Mauritius	UK	India	UK	France	India	China	France	
Nigeria	UK	USA	UK	USA	China	USA	France	USA
Seychelles	Brazil	France	France	USA	China	UK	France	
Sierra Leone	France	Italy	USA		Italy	China		
Sudan	France	Italy	USA	UK	Italy	China	France	
Swaziland	Italy	UK			China	UK		
Tanzania	USA	France	UK	USA	China	Italy		
Togo	France	Germany	France	USA	France	Italy	France	
Uganda	France	China	UK	USA	Italy	Germany	USA	
Zambia	China	UK	UK	USA	Brazil	France		
Zimbabwe	France	UK	USA	UK	China	Italy		
Portuguese								
Angola	Brazil	Portugal	USA	Portugal	USA	Portugal	USA	France
Cape Verde	UK	Spain	Portugal		Italy	Portugal	Portugal	
Guinea-Bissau	Portugal	USA	Portugal		China	Portugal	France	
Mozambique	France	USA	Portugal	UK	Portugal	Germany	Portugal	
São Tomé and Principe	USA	Portugal	Portugal		Portugal	Italy		
Spanish								
Equatorial Guinea	USA	France	USA	France	Spain	Portugal		
Belgian								
Burundi	Belgium	USA			Italy	China	France	
Congo, Dem. Rep.	Belgium	Germany	USA	France	Italy	China	France	
Rwanda	USA	India			China	Italy		
Italian								
Eritrea	Italy	USA	USA		Italy	China		
Ethiopia	Italy	Germany	USA	France	China	Italy		
Libya	India	Italy	France	USA	Italy	France	France	
Somalia	Italy		USA		Italy	China		
Independent								
Liberia	China	USA	USA	France	China	USA	USA	France
Namibia	Spain	Germany	UK	France	UK	China	France	
South Africa	UK	USA	UK	USA	China	USA	Germany	USA

Source: Our elaboration on OECD-Stat and IMF-Cdis data.

In SSA there is a great resource abundance, and the manufacturing industry represents a small output and employment share, which has further reduced compared to what it was in the Eighties and Nineties (Tull, 2006; Kaplinsky and Messner, 2008; Strauss and Saavedra, 2009; Kaplinsky

et al., 2010; Busse and Groning, 2011; Amendolagine et al., 2013; Edwards and Jenkins, 2014; Donou-Adonsou and Lim, 2018; Ado, 2020). By examining trade and FDI flows, it becomes evident that some countries are characterized by high levels of interdependence. This can be attributed to trade in intermediate goods within the GVCs, subsequently transformed into finished products in other countries (Zafar, 2007; Amiti and Freund, 2010; Goerzen et al., 2014; Zeng, 2015). However, these goods may escape national accounting records due to international harmonization lacks in computation criteria. In fact, goods can be double counted at customs (Koopman et al., 2012; Wang et al., 2013; Montalbano and Nenci, 2014; Los et al., 2015). Therefore, semi-finished products from another country that are in transit may have an increase in value equivalent to labor costs before being re-exported (Antràs, 2013, Antràs, 2020; Fernandes et al., 2022), likely even returning to the country of origin. Consequently, a "country-factory" could show a macroeconomic structure characterized by a saving deficit with only consumption (Kim and Lin, 2009). For instance, small economies, such as Liberia, Guinea, and Lesotho, focus on import-export and manufacturing, also acting as hubs for transit goods and commodities (Alesina and Wacziarg, 1998; Rodríguez and Rodrik, 2000; Pacheco-López, 2005; Cinar and Nulambe, 2018). The advanced economies more active along the GVCs might penetrate these contexts with their investments, aiming to influence the economic and social system (Cleeve, 2008; Tuomi, 2011; Nayyar, 2015; Iyke, 2017).

Additionally, some countries are also tax havens, like Liberia, Mauritius, and Seychelles. According to Lane and Miles-Ferretti (2018), many foreign investors do not adequately consider the real country risk. Instead, they argue that foreign investments often flow towards offshore financial centers, driven by fiscal policies aimed at minimizing tax pressure on capital gains. Furthermore, the harmonization system of national accounts developed by the UN-statistical commission has been stuck in its fifth version since 2008, as an upgrade from the previous one released in the early Nineties (Egger et al., 2019). It is also interesting to note that Chinese investments have been primarily directed towards resource-rich countries and that many of them are the main recipients. China imports raw materials from these countries and exports products and know-how utilized for infrastructure and telecommunications investments, often employing local labor force. The rooted French and British influences have diminished, while Chinese influence has surpassed even that of the United States (Donou-Adonsou and Lim, 2018). For instance, Liberia, Togo, Mauritania, Gambia, Ghana, Benin, Angola, and Congo are oil-rich countries. However, the high dependence on the raw material exports in SSA has historically contributed to inhibiting the manufacturing and trade diversification (Lall, 1995; Rodrik, 2016).

On the other hand, China understood the emergence of social and economic changing factors in the African contexts at least a decade earlier than its main Western competitors (Morvaridi and Hughes, 2018; Ziai, 2019; Mohan and Tan-Mullins, 2019; Taylor and Zajontz, 2020). The Chinese governance has been pragmatic and farsighted in seeing Africa as a nexus of markets, therefore, not only as a context burdened by strong uncertainties, but also and above all as extraordinarily rich in opportunities to be seized (Cellamare and Baheli, 2012; Eisenman, 2012; Obuah, 2012). The strengths have facilitated Chinese international expansion in African markets can be traced back to at least the following reasons: (i) firm competitiveness; (ii) diplomacy effectiveness; (iii) soft-power strengthening; (iv) development aid; (v) infrastructure investment; (vi) SEZ. Particularly, the soft-power can be defined as the political ability to persuade, convince, and attract through intangible resources such as culture, values, institutions, as opposed to the classical power, based only on quantitative indices such as population, military strength, wealth.

Chinese rapid economic expansion has consequently driven economic and political interests in Africa are strongly linked to the need to find natural resources and raw materials for its economic growth, therefore Chinese economic interests' consolidation in African markets has been clear since the new millennium (Bräutigam and Gallagher, 2014; Shen, 2014; Pigato and Tang, 2015). In other words, since the beginning of the 21st century, China has intensified its trade relations with African markets. Its fast economic growth and an increasing domestic demand for natural resources, food, and new markets for its products caused that African contexts became very important partners to ensure support on the international scenario (Mohamued et al., 2022).

Furthermore, the empirical evidence may be justified by the intensification of Chinese trade along the GVCs (Amiti and Freund, 2010; Tuomi, 2011; Goerzen et al., 2014; Zeng, 2015; Lane and Miles-Ferretti, 2018; Egger et al., 2019; Zeng and Aggarwal, 2020; Munjal et al., 2022; Goerzen et al., 2023). Some authors consider African markets as "China-dominated" (French, 2014; Alden and Large, 2018; Lee, 2018; Gallagher et al., 2019; Anshan, 2020). On the one hand, China is the main trading partner in the continent with a volume of about US$ 200 billion in 2020 from about US$ 10 billion in the early Two-thousands. On the other hand, Chinese FDIs in Africa have been steadily increasing flows surged from about US$ 75 million the early Two-thousands to about US$ 5 billion at the early Twenties (SAIS-CARI, 2021).

It is not surprising, then, that the second emerging economy with interests in former colonial areas has been India, the other Asian "giant" that has accelerated its growth since the early Two-thousands (Cheru and Obi, 2010; Marelli and Signorelli, 2011; Nowak, 2016; Basile et al., 2021). Additionally, it is interesting to note that Italian interests in African markets have also increased – especially in North Africa – albeit remaining modest compared to other countries (Biggeri et al., 2018).

Finally, Chinese penetration into African markets may have been facilitated by the weakness of the African political classes. At various levels, African institutional actors have actively contributed to the China's advance, negotiating, shaping, and even driving Chinese engagement in different ways across African markets (Sautman and Hairong, 2009; Mohan and Lampert, 2013). In fact, the African institutional actors that could have most benefited are the political and business elites. Therefore, this status quo tends to reinforce unsound political and economic governance, as well as highly uneven income distribution and power within countries (Tan-Mullins et al., 2010). However, Chinese governance and state capitalism have effectively intertwined economic freedom and state interventionism in a pragmatic way. China has established diplomatic relations in all African contexts and has been able to benefit from a broad political consensus in all international organizations.

4.1.3 Industrial specialization

The industrial specialization in relation to China is shown (Table 6). The revealed comparative advantage index or Balassa index (1965) is the share of a sector in a country divided by the corresponding world share. This index is interesting because it allows comparisons both over time and across countries. Another indicator frequently used in analyzing the international trade is the Grubel-Lloyd (1971) index, and it is useful for assessing of the extent of industry trade. However, it has been computed for aggregate sectors and therefore should be interpreted with caution.

It is noteworthy that in almost African countries the first industry for specialization with China is almost always agriculture or row materials for all macro-areas. Furthermore, in some African countries, a specialization with China in technologically advanced productions has also been highlighted. In fact, it is known that China has become specialized in high-tech productions. However, China is also specialized in machinery and transport equipment have placed within the low-skill and technology-intensive productions. Additionally, China is also specialized in electronic data processing, office equipment, telecommunication equipment, integrated circuit, and electronic component. Particularly, in consumer electronic, Cina is no longer a simple component assembler, but it has exploited the integration along the GVCs.

In other words, China has upgraded from mere assembly of imported inputs to the manufacturing of high-tech intermediate and finite products, now making it one of the top world exporters of high value-added productions (Amighini, 2005). China's specialization in high value-added products is the consequence of the economic policies adopted in developing these sectors. Chinese economic policy adopted in supporting advanced production has been a mix of promotion and protection, at least in a first stage, rather than a complete liberalization, as happened for the "Asian Tigers" (Rodrik, 2006). Emerging economies usually product and export labor-intensive goods during the early stages of their development-path. Instead, developed countries are more specialized in production and export of human or physical capital-intensive goods. Therefore, according to new trading theories the North-North trade relations across developed countries typically characterize the intra-industry trade model, while the inter-industry trade model is typical of North-South trade relations in the world (Krugman and Obstfeld, 2021).

While enjoying a comparative advantage in some sectors, such as agricultural productions and raw materials, SSA countries may have lost competitiveness in others. Exports from African countries could be hindered by tariff barriers, or high transport costs (Subramanian and Matthjis, 2007). The increased competition between developing and emerging economies' productions and those of developed economies can then be attributed at least to following three factors (Di Tommaso and Baradel, 2008): (i) the exchange rate appreciation and pegging to strong currencies, (ii) the natural resource exploration and the raw material imports, (iii) development assistance and international aid to countries. Therefore, at the basis of the China-Africa economic cooperation there is often the search for comparative economic advantages stem from utilizing by China's firms of strategies to obtain low labor- and managerial-costs (Baliamoune-Lutz, 2011; Montinari and Prodi, 2011; Obuah, 2012; He, 2013; Kummer-Noormamode, 2014). Finally, the Chinese diplomacy has adequately supported numerous projects for development in African contexts and the Chinese financial institutions have ensured low-interest loans to the African counterparts (Alden, 2015).

Table 6 Leading sector by specialization with China in 2017 and 2002, indices in comparison.

Sector	Country	Balassa index[a]				Grubel-Lloyd index[b]			
		2017		2002		2017		2002	
North Africa	Algeria	C	1	C	1	B	0.44	DB	0.41
	Egypt	C	3.3	B	5.7	B	0.91	C	0.92
	Libya	C	1.1	-	-	B	0.02	DD	0.13
	Morocco	B	3.2	DD	4.4	DD	0.55	B	0.84
	Tunisia	DD	1.3	DD	9.1	B	0.66	DD	0.84
Sub-Saharan Africa	Western								
	Benin	B	2.4	B	1.7	B	0.38	A	0.05
	Burkina Faso	B	3.3	B	2	DD	0.01	DD	0.01
	Cape Verde	DD	2	DD	1.5	A	0.05	DB	0.01
	Ivory Coast	B	5.4	B	4.6	B	0.06	A	0.14
	Gambia	B	2	DA	2.1	A	0.02	A	0.05
	Ghana	C	3.9	B	8.8	A	0.52	A	0.61
	Guinea	B	2.5	A	1.5	C	0.11	A	0.32
	Guinea Bissau	-	-	-	-	B	0.08	B	0.15
	Liberia	B	4.6	B	5	C	0.05	A	0.95
	Mali	B	3	B	1.4	A	0.19	DA	0.08
	Mauritania	B	2.2	A	2.2	A	0.89	A	0.77
	Niger	B	9.9	-	-	DD	0.03	B	0.09
	Nigeria	C	1	C	1	A	0.27	B	0.62
	Togo	B	3.8	A	4.9	C	0.41	A	0.85
	Senegal	B	7.7	A	2.5	A	0.45	A	0.83
	Sierra Leone	B	1.7	A	5.6	A	0.01	B	0.93
	Central								
	Cameroon	B	2.2	B	2.4	A	0.06	DA	0.06
	Chad	C	1.2	B	1.1	B	0.26	-	-
	Congo	C	1.5	B	2.3	A	0.33	A	0.51
	Gabon	B	3.1	B	5	A	0.82	A	0.44
	Equatorial Guinea	B	1.8	C	1	DD	0.89	DA	0.62
	Central African Rep.	B	1.7	B	3.3	DD	0.01	DD	0.01
	Congo, Dem. Rep.	-	-	B	7.5	A	0.08	DD	0.01
	São Tomé and Principe	A	1.3	-	-	A	0.01	-	-
	Eastern								
	Burundi	B	7.8	B	10	A	0.21	-	-
	Comoros	DD	4.5	-	-	DD	0.01	-	-
	Eritrea	B	1.4	B	10	DD	0.01	DB	0.01
	Ethiopia	B	3.6	DA	4.1	A	0.97	A	0.1
	Djibouti	-	-	B	7.8	A	0.07	A	0.67
	Kenya	B	3.3	B	6.4	A	0.68	A	0.6
	Madagascar	B	3.6	B	6.4	A	0.53	A	0.97
	Rwanda	B	4.5	B	5	DA	0.3	DA	0.01
	Seychelles	A	1.3	DD	5.5	A	0.88	A	0.83
	Somalia	B	2.2	A	1.6	A	1	-	-
	Sudan	C	4.9	C	1.1	A	0.76	B	0.3
	South Sudan	C	1	-	-	B	0.5	-	-
	Tanzania	B	5.9	B	2.7	A	0.97	A	0.1
	Uganda	DA	2.1	B	5.6	A	0.59	DB	0.23
	Southern								
	Angola	C	1.1	C	1.1	B	0.97	B	0.99
	Botswana	-	-	-	-	A	0.23	DD	0.01
	Lesotho	B	7.5	DA	0.9	DC	0.9	DA	0.01
	Malawi	A	1	A	1.2	A	0.31	B	0.05
	Mauritius	DA	1.6	A	2	A	0.47	A	0.87
	Mozambique	B	9.2	B	4.8	A	0.99	A	0.08
	Namibia	DD	3.2	-	-	DD	0.83	DC	0.1
	South Africa	B	3.2	B	2.3	DB	0.96	A	0.97
	Swaziland	B	6.8	B	4.8	A	0.45	DA	0.56
	Zambia	-	-	-	-	A	0.29	DB	0.97
	Zimbabwe	A	1.4	A	1.9	A	0.65	DB	0.87

Note: sectors according to the SITC-1 standard and manufactured goods by degree of manufacturing. A: Food and live animals, animal and vegetable productions, beverages and tobacco; B: Crude materials and inedible; C: Mineral fuels, lubricants and related materials; D: Manufactured goods by degree of technology (Pavitt, 1984): A: Labor and resource intensive; B: Low-skill and technology-intensive; C: Medium skills and technology intensive; D: High skills and technology intensive. (a): BI = $(X_{ki} / X_{kw}) / (X_i / X_w)$, where X_{ki} are exports of *i*-country and *k*-sector, X_{kw} the world exports in *k*-sector, X_i total exports of *i*-country, and X_w total world exports. If BI > 1, the *i*-country is specialized in this sector; if BI $\approx$ 1, the *i*-country is close to the world's sectorial structure; if BI < 1, there is de-specialization. (b): GL = $1 - (|X_{ki} - M_{ki}|) / (X_{ki} + M_{ki})$, and it ranges from 0 to 1. The closer GL is to 0, the greater the extent of inter-industry trade; the *i*-country is completely specialized or de-specialized in the *k*-sector. The closer GL is to 1, the heavier the weight of intra-industry trade; the value of exports X and imports M of the *k*-sector are quite close. Source: our elaboration on UNCTAD-Comtrade data.

5 Conclusions

5.1 Concluding remarks

5.1.1 The international expansionism based on institutional and market networking and public support for firms' internationalization

Chinese growth has been sustained by solid economic policies and by firms in important strategic industries (Rubini and Barbieri, 2013; Barbieri et al., 2015). This means that Chinese investments worldwide, and particularly in Africa, have not simply been the result of uncoordinated and individualistic economic strategic choices by business decision makers. While, the entire country system has been activated to support Chinese investors, aiming to achieve an expansionist strategy globally and in African markets through the establishment of numerous institutional and non-institutional channels. This has entailed significant commitment from Chinese governance in facilitating the acquisition of capital for the firms' internationalization in the form of development aid and loans. At the same time, it has also contributed to the creation of secondary channels have eased the entry of smaller Chinese firms into African markets. This has been achieved by creating a nexus of diplomatic and personal relationships with economic and political actors to help Chinese investors manage and mitigate business environment risks associated with instability in operating and trading in various African markets, such as *guanxi* (Ado, 2022; Scalamonti, 2023; Scalamonti, 2024a; Scalamonti, 2024b). In Chinese culture, *guanxi* is an important informal asset. It can be defined as a major social capital for establishing rewarding business relationships with people and governance. This social capital has crossed borders and Chinese investors in African markets utilized it during their business and trading with African partners.

China has thus directed its investments towards African markets through the establishment of high-profile bilateral negotiations managed by its diplomacy, providing economic aid to the countries' governance in the form of loans and funding for infrastructural projects. These loans have then been repaid by exporting raw materials and natural resources (Corkin, 2012; Ferrucci and Paciullo, 2015). The firms have benefited from public support in implementing projects in African markets have been the big state-owned corporations and private national champions. These are characterized by strong political support, low levels of risk aversion, and unlimited budgets, due to their growing importance in sustaining the Chinese economy (Buckley et al., 2007; Jakobsen, 2009; Morrissey, 2010; Fessehaie, 2012; Clò, 2015; Gagne, 2018). On the one hand, the Chinese Ministry of Commerce tends to deny that firms have received public subsidies for their overseas development, but this has been contradicted by empirical evidence (Sheng, 2010). On the other hand, it is true that firms have not always fully adhered to government directives (Gill and Reilly, 2007). This is a result of the new configuration assumed by Chinese capitalism, being a mix of socialism and free market principles.

Subsequently, smaller firms have also been able to internationalize and finance their development in African contexts thanks to public subsidies (Alon et al., 2014). In other words, by benefiting from the system of intergovernmental relations promoted by Chinese diplomacy and the bandwagon effect produced by bigger firms, smaller firms have also been able to effectively approach African markets. These firms can operate as subcontractors to bigger ones, therefore contributing to the internationalization of the entire Chinese manufacturing system (Morrissey, 2010; Corkin, 2012; Fessehaie, 2012). Interviews with government officials in African markets suggest that Chinese economic policy may better align with countries' development aims (Rasiah et al., 2010). The willingness to provide economic and financial aid to African countries has highlighted the Chinese governance intent to establish a strong links in African markets through dedicated cooperation forums (Alden, 2005). However, this does not negate the fact that there have also been negative effects in many contexts due to the Chinese presence (Titiloye-Ademola et al., 2009).

However, an insightful perspective on how Chinese economic and political engagement has succeeded in African markets has been provided by Carmody (2011). It has highlighted how China holds an advantage over other developing economies and developed economies through the use of soft-power in establishing institutional networks with African governance. This advantage stems from China's lack of historical colonial baggage, unlike the former colonial countries that may still seek specific benefits in their former colonies. For example, Italy may do it with oil in Libya, or France with uranium in Niger. In contrast, only starting from the Nineties with the acceleration of globalization, China began to seek the raw materials necessary for its growth, both Asia and Africa (Rasiah et al., 2010).

Over decades, the Chinese governance has formulated several policies to provide substantial aid to African development by establishing agreements to create preferential channels of access to

markets (OECD, 2006; Alden, 2007; Morrissey, 2010; Sanfilippo, 2010; Corkin, 2012; Edwards and Jenkins, 2014). Specifically, China's presence in African markets has been characterized by a systemic approach, synergistically combining three complementary channels: (i) public support, (ii) FDIs, and (iii) trade and diplomatic relations maintained by the central governance and financial institutions to facilitate the economic links with the local partners, therefore with the aim of consolidating its presence in Arican markets (Biggeri et al., 2018). This has posed a significant challenge to the governance of developed economies. To ensure them a stable presence in African markets and to guarantee international competitiveness for their firms, these economies must pragmatically rethink the cooperation from a geo-strategic perspective, seeking new positions or consolidating existing ones. Therefore, policy makers should implement appropriate economic policies that do not overlook the important role of firms as actors of countries' development (Liu, 2019; Cherif and Hasanov, 2019; Chang and Andreoni, 2020; Aiginger and Rodrik, 2020; Cornia et al., 2022). This includes the strengthening of the dedicated institutions and diplomacy to establish international agreements aimed at achieving a mutual economic satisfaction between the involved partners.

Over the past two decades, China-Africa relations have grown rapidly through the establishment of bilateral forums, such as the "Go Out Strategy", the establishment of the first China Development Cooperation Agency (CIDCA) in 2018, the launch of the "Belt and Road Initiative" in 2013-2014, the creation of the Asian Infrastructure Investment Bank (AIIB). Signs of the role that China wants to play as the new world leading player in international cooperation (Hodzi, 2019). More specifically, the "Belt and Road Initiative" (BRI), relaunched in 2017 by Chinese President Xi-Jinping, represents a globally and strategically determining effort (Fardella and Prodi, 2017; Selvatici, 2018). It could even pose a challenge to established development-path by creating preferential economic corridors and bilateral intergovernmental relations, therefore strengthening Chinese hegemony. This initiative was devised by Chinese governance to achieve the following strategic aims: (i) rural area development, (ii) export increasing, (iii) economic, financial, and political expansion, (iv) supply chain strengthening, (v) land grabbing and infrastructural project promotion, (vi) achieving economies of scale, and (vii) enhancing the know-how held of firms' and their competitiveness in international contexts. Regarding this last but no less important point, in 2015 the Chinese governance also launched the "Made in China 2025" initiative to rapidly elevate the technological level of its manufacturing system and boost high-tech production (Petti et al., 2017). As a result of these initiatives, China is rapidly positioning itself to become a leading economy in high-tech products (Veugelers, 2017).

In other words, there is a relatively small group of advanced economies that have reached the technological frontier – such as United States, United Kingdom, Japan, Germany, and France – and then there are emerging economies like China, have caught up them, albeit through a protected business environment or by engaging in not always transparent overseas activities. Chinese investors may prefer contexts with reduced political stability to secure resources and raw materials, more or less legitimately, by circumventing competitive rules (Wall et al., 2018). At instance, Canfei and Shengjun (2018) have shown that while Chinese firms have contributed to development in African contexts, the results have been contentious due to precarious working conditions and insufficient corporate social and environmental responsibility. These firms often export and use not always advanced technology in local subsidiaries. This means that, the Chinese international expansionism in African markets is far from being politically neutral (Alden et al., 2008). Chinese big corporations are willing to partner with and shore up some of most African autocratic regimes, showing little interest in countries' sound governance, civil rights, information transparency and environmental issues. In fact, this economic expansionism has been characterized by power relations with African elites that have involved changes in global geopolitics and development economy globally (Lederman et al., 2013; Pigato and Gourdon, 2014; Wei and Zhao, 2015; Wang et al., 2020).

5.1.2 The crowding-out effect of competing productions and the industrial specialization model across underdeveloped countries

Studies have investigated the relationship between foreign investments and domestic investments in diverse regions and elucidated the crowding effect of foreign investments on domestic investments. This effect has been widely debated in the literature, and sometimes with inconclusive or partial results (Wang, 2010; Morrissey and Udomkerdmongkol, 2012; Sahoo et al., 2013; Farla et al., 2016; Chen et al., 2017; Ahmad et al., 2018; Ali et al., 2019; Akin and Avci, 2020). On the one hand, some authors have concluded that foreign investments into host countries have crowded-in domestic investments. On the other hand, other authors have suggested a crowding-out effect. However, the crowding-out effect of domestic investments may happen in numerous ways. The domestic firms could not be as competitive as foreign firms because these could be more

experienced or efficient in producing products and selling them, or, charging comparatively cheaper prices than domestic firms. In addition, foreign firms could also hire skilled or more efficient workers away from domestic firms, adversely affecting the domestic firms' productivity.

Studies have shown that the exports of various countries have been crowed out by the strong price competitiveness of Chinese productions (Alden, 2007; Burke et al., 2008; Corkin, 2008; Edwards and Jenkins, 2014). Particularly, productions from United States and European firms have been most affected (Kaplinsky and Morris, 2009; Giovannetti and Sanfilippo, 2009). Moreover, big Chinese corporations primarily tend to re-export goods as intermediate inputs for domestic productions (Zafar, 2007; Kaplinsky et al., 2010). According to Hailu (2010), FDI inflows have also had a negative impact on the trade balance in many African countries. Kaplinsky and Santos-Paulino (2005) have shown how exports from the European Union have concentrated on low-tech productions in lower-income countries to achieve cost advantages and began to reduce since the Nineties, suffering the Chinese productions' expansion (Kaplinsky, 2006). In other words, by introducing new products or entering markets, Chinese exporters and investors have crowed out the productions of other firms in African contexts or made it unprofitable for them to remain in the market. The economies that may better resist the crowding-out effect associated with Chinese competition are those with diversified manufacturing systems or whit firms that can export higher value-added products (Hummels and Klenow, 2005; Chen, 2015). When a country's technological capacity is limited, it may be more convenient to import goods from a country with a not-too-high technological level rather than from a country with a significantly larger technological gap (Amighini and Sanfilippo, 2014). This describes a "South-South" trade system, as opposed to a "North-South" one.

In other words, over the last decades the major changes in the international cooperation architecture have been related to the consolidation of cooperation across "South-South" economies, as opposed to vertical relations across "North-South" economies (Biggeri and Sanfilippo, 2009; Gardelli, 2010; Gray and Gills, 2016; Grimm, 2017; Mawdsley, 2018; Mawdsley, 2019; Huang et al., 2019). Since the African socioeconomic systems may not possess an adequate technological level, they could more successfully accommodate products with modest technological content. In other words, technologically less advanced products would be better received by consumers in African markets. The difference, therefore, lies in the techno-economic paradigm for production in the host-country, which is why Chinese products have adapted better to African contexts compared to those from advanced economies.

At the enterprise level, the entry of Chinese exporters and investors into African markets – seen as particular product/market combinations – has influenced the level of competition and reduced the likelihood that incumbent or newly established firms can profitably sell their products. In fact, the import-export shares and foreign investments held by several countries in African markets have suffered a slow but rather inexorable erosion in the long run. Among developing countries, China held the global leadership in low-tech and low-cost manufacturing for long time. Nowadays, given its techno-economic upgrading, China has become a leader country in development. However, the partner firms' involvement in China's manufacturing may be modest and have limited spillover effects (Morris and Staritz, 2016). In fact, spillovers to host-country firms could be elusive, but this could non-concern the spillovers to firms involved in Chinese supply chains (Geng and Saggi, 2019).

According to Kokko (1994), and Glass and Saggi (1998), the technological gap between countries must be sufficiently small to allow host-country firms to imitate the technology held by foreign firms and therefore benefit from the technological spillovers (Girma, 2005). This means that, due to the limited absorptive capacity of underdeveloped countries, spillovers from more developed countries may not be very successful (Cohen and Levinthal, 1990). Due to absorptive capacity, technological spillovers across countries with a large gap in terms of know-how held, could not be working (He, 2013). Therefore, the technological gap across the local firms and the foreign ones must be small enough to allow imitation process. Additionally, there is to consider the substitution effect on local productions with imported products replacing obsolete products with more technologically advanced goods (Sandrey and Edinger, 2011; Guo et al., 2014; Guillaumont and Hua, 2015; Oqubay and Lin, 2019).

In other words, in advanced countries, technological innovation is largely incremental, and upgrading would require substantial investments. These countries have experienced a lengthy industrialization process and a long development-path. This means that firms are positioned along the technological frontier. Conversely, a country lagging in development and industrialization can more easily benefit (low costs and risks) from knowledge and technology spillovers from developed countries. When a developing country manages to leverage the downgrading advantage,

development and growth can proceed at a much higher average annual rate than that of developed countries, even to the point of bridging the existing gap. This will lead to higher incomes, higher employment rates, and products with a higher value-added content. As a result, there will be a relocation of the more labor-intensive manufacturing phases to other countries that are technologically behind and have lower incomes (Broadman, 2007). However, many African markets, especially in SSA, may not yet be ready to reap the benefits of productive and trade specialization, nor from the international division of production and labor along GVCs (Du et al., 2014).

Diversifying production could be easier when products incorporate similar know-how. In other words, shifts towards productions relatively similar to what countries already produce well are more likely to occur (Scalamonti, 2024a). However, how exactly this shift occurs, and particularly what role governance and industrial policy play is difficult to establish (Scalamonti, 2024b). An industrial policy enabling this change should allow firms to develop their capabilities but should also include a set of liberal interventions fostering worker migrations and encouraging investments, as well as a set of regulatory interventions correcting economic externalities and market failures, or incentivizing investments in seeking particular skills (Kichou, 2011; Bernard et al., 2011; Testas and Karagiannis, 2012; Mako, 2012; Loewe, 2013; Rossi, 2013; El-Mokri, 2016; Ayadi and Mattoussi, 2016; Gignoux and Suwa-Eisenmann, 2017; Farzanegan et al., 2020; Grumilleret al., 2020). This literature has demonstrated that production tends to diversify in terms of the variety of products offered as income increases for less developed economies, or, at higher levels of income, production tends to concentrate due to specialization. It can be argued that a country with a diversified import structure has more secure supply links as well as more affluent consumers who value this variety. Similarly, trading with a diversified range of partners is a sign of competitiveness and it can be seen as an indicator of a lesser vulnerability to external shocks.

The most economically developed countries can produce a large and diverse productions, including unique products (Poncet and Starosta De Waldemar, 2013; McMillan et al., 2014; Jouini et al., 2016; Zhu and Li, 2017; Diaz-Mora et al., 2018; Fernandes et al., 2019). As a result, the country's export heterogeneity positively influences growth and per-capita income (Aditya and Acharyya, 2012; Felipe et al., 2012; Jankowska et al., 2012; Ourens, 2013; Bartley et al., 2018), reducing output volatility and income inequality (Akhtar and Freire, 2014; Manama, 2016; Hartmann et al., 2017; Gala, 2018). Finally, the ability of emerging economies to improve their manufacturing systems and to diversify into more heterogenous production is among the other key factors determining why development in some economies takes off while other countries remain underdeveloped.

In other words, knowledge that a country needs to develop does not reside in few individuals, which have a lot of different kind of capabilities, but rather resides within organizational structures that can cooperate with each other creating human connections, in which individuals are highly specialized and draw on knowledge of others who specialize in different activities.

5.1.3 The Africa's natural resource abundance and the China's need for raw materials

The growing demand for natural resources by developed and developing economies, was one of the main factors driving Africa's geo-strategic importance and economic growth over the last two decades. In terms of raw materials, the continent has 10% of the world's proven oil reserves, about two-thirds of which are situated in Nigeria, Algeria, and Libya. Furthermore, 8% of proven gas reserves are in Africa, about 80% of which lie in Nigeria, Algeria, and Egypt. Possessing 60% of the world's diamonds, 40% of its phosphate, and 30% of its cobalt resources, Africa's abundance in mineral and crude resources, coupled with the current commodity boom, has also contributed to recent growth (Giroux, 2008). In Africa, not only does it produce oil that is easily refined, but there could still be large undiscovered oil fields with immense potential (Figure 2).

In West Africa much of its oil is in offshore areas easily accessible, where oil extraction is cost-effective and relatively safe. Additionally, some African countries can be less characterized by petro-populism than other oil-producing countries (Matsen et al., 2016). The African petro-states or resource-dependent countries have authoritarian governance or have experienced a very slow process of institutional and political reforms (Jensen and Wantchekon, 2004). Generally, African countries can offer foreign investors a nexus of contacts to stipulate favorable profit-sharing agreements within limited regulatory frameworks.

The impact of natural resource abundance on the country growth has been extensively analyzed in the literature (De Melo et al., 2001; De Gregorio, 2005; Asiedu, 2006; Asiedu and Lien, 2011; Ruta and Venables, 2012; Anyanwu, 2014; Bjornland et al., 2019; Asiamah et al., 2022). Studies

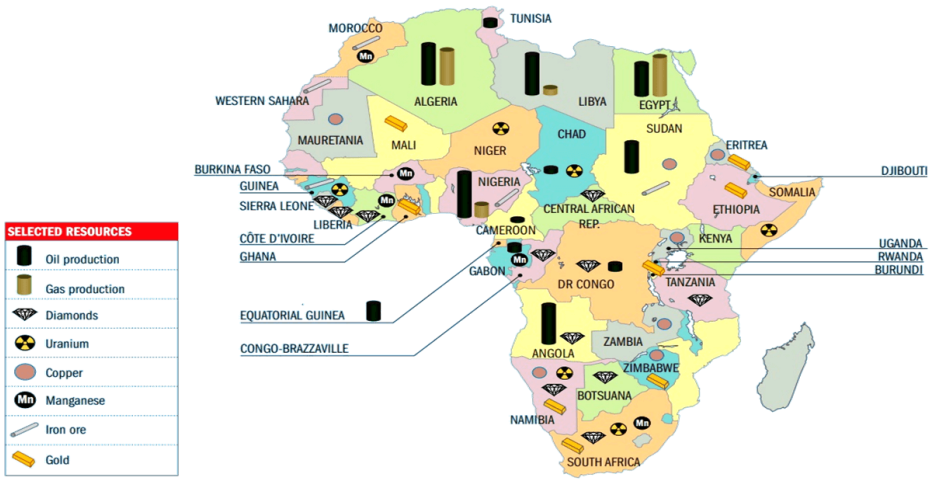

Figure 2 The main natural resources in African contexts. (Source: from Giroux (2008))

have shown that countries with abundant natural resources may grow more slowly than those with poor resources (Corden and Neary, 1982). The phenomenon is called the resource curse or Dutch disease. It effects manifest when the quality of country's institutions and governance rapidly declines and negatively impacts growth (Sachs and Warner, 2001; Busse and Groning, 2011; De Rosa and Iootty, 2012; Sala-i-Martin and Subramanian, 2013; Jude and Levieuge, 2016; Hayat, 2018; Barbier, 2019).

In other words, sound governance can often be associated with countries having poor natural resources, particularly oil (Auty and Gelb, 2001; Jensen and Wantchekon, 2004). In contrast, countries rich in resources may be governed by predatory governance (Acemoglu et al., 2001). The explanation for this associations can be twofold (Ranis and Mahmood, 1992). On the one hand, low-resource countries' governance has little incentive to engage in rent-seeking compared to high-resource countries' governance, as low per-capita incomes derived from subsistence activities are not associated with the extraction and retention of rent, which the presence of abundant natural resources guarantee. Low-resource countries' governance is more likely to promote development policies, such as providing public goods and services, and to create effective incentives to attract private investments. In other words, a low rent allows the low-resource countries' governance to devise appropriate economic policies for long-term development, using the poor resource endowment effectively and efficiently. On the other hand, the reduced reliance on natural resource exports allows low-resource countries to benefit from public sector support for development without encountering resistance from elites. The resulting industrialization will thus be more aligned with the growth aim. The manufacturing system will be able to absorb a wider portion of the workforce from rural areas settling in urban centers, thus triggering rapid development, and increased per capita incomes. Consequently, as the market develops, the need for rent-seeking by elites diminishes (Aslund, 2000; Ross, 2001). Meanwhile, efforts are made by entrepreneurs and individuals to establish a rule of law protecting private property. Finally, the increase in per-capita incomes will also have fiscal repercussions, with the implementation of income and value-added taxes public revenues will increase. These structural changes will also contribute to wider accountability within the political class.

In other words, low-resource countries' governance aligns the interests with those of the population at a much higher rate than that of high-resource countries (Tollison, 1982). Conversely, a high dependence on natural resources delays economic and social progress in resource-rich countries (Olson, 2000). The governance, in such countries, risks becoming predatory, using power to seize rent from trading natural resources and maintaining monopolistic control over them, ultimately perpetuating a cannibalistic development model. Another feature of resource-rich countries is the tendency for states to become overextended to maintain control over rent extraction, ultimately distorting the economic system, slowing growth, and creating unemployment (Acemoglu et al., 2001; Auty and Gelb, 2001; Jensen and Wantchekon, 2004). Predatory elites are the architects of poverty and wars in African contexts (McGowan, 2003; Mbeki, 2009). In other words, the elites hold a "plundered wealth" and block any political and economic reform processes to continue in rent-seeking and in protecting the acquired privileges (Collier and Venables, 2011). This status-quo is typical of all "bunker states" having politically failed in creating inclusive institutions and in promotion citizens' rights, and which often are devastated by bribery and conflicts (Sen, 1999; Collier, 2000; Gaibulloev and Sandler, 2011).

In countries governed by autocratic regimes and where corruption is high, collusive relationships between private actors and the political élites are more likely to form with the purpose of increasing personal wealth and power (Blumenthal, 1982). In the presence of unsound governance, weak and poorly regulated financial institutions, or those concentrated in the hands of a few, with big corporations forming the core of the clientele, collusive arrangements aimed at sharing wealth and power may more easily arise. This represents a model of crony capitalism where economic and institutional actors are constantly seeking a perpetual rent (Schneider et al., 1998; Rosenbaum, 2006; Zakaria, 2007; Kholdy and Sohrabian, 2008; Adam and Tweneboah, 2009; Adjasi et al., 2012; London, 2016). As a result, the coexistence of efficient financial institutions and sound governance are fundamental prerequisites for promoting growth in African contexts (Fedderke and Luiz, 2008). This would lead to an improvement in the availability of information flows necessary for business decisions (Reinhart and Rogoff, 2003; Akinlo, 2004; Bertocco, 2008; Papaioannou, 2009; Assane and Malamud, 2010; Adusei, 2014; Ndako, 2017). However, outcomes of the studies can also be contradictory (Ghali, 1999; Harrison, 2004; Quartey and Prah, 2008; Al Nasser and Gomez, 2009; Esso, 2010; Buchanan et al., 2014; Nyasha and Odhiambo, 2015). A feasible way to stimulate growth in such contexts could be through the creation of a favorable institutional and business environment with the active involvement of the private sector in the countries' democratization and liberation process (Doner and Schneider, 2000; Fox, 2001; Rondinelli, 2002; Gwartney and Lawson, 2003; Andrews and Edwards, 2004; Busse and Groizard, 2008; Leftwich and Wheeler, 2011; Gohou and Soumaré, 2013; Furstenberg, 2015; Makgala and Botlhomilwe, 2017).

Driven by China's need for natural resources, more than two-thirds of imports from African markets consist of raw materials (Wei and Zhao, 2015). In exchange for this, China has provided African countries with generous aid packages, trade deals, and assistance to build infrastructure, such as roads and power plants. This made Chinese investors particularly attractive partners for African governance because they worked with it without demanding significant political and economic reforms (Lederman et al., 2013; Pigato and Gourdon, 2014; Canfei and Shengjun, 2018; Wang, 2024). The Chinese policy of non-interference in domestic affairs within African countries and the close relations interwoven with autocratic regimes have been the basis of the success of Sino-African cooperation (Alden et al., 2008). This status-quo has also nourished Western concerns that efforts to promote sound governance in African contexts have been gradually undermined (Figure 3). Many African contexts are characterized by corruption, loosening borders, informal or illicit economy, political instability, conflicts and wars (Carmignani, 2003; Asiedu, 2006; Heidelberg Institute, 2018).

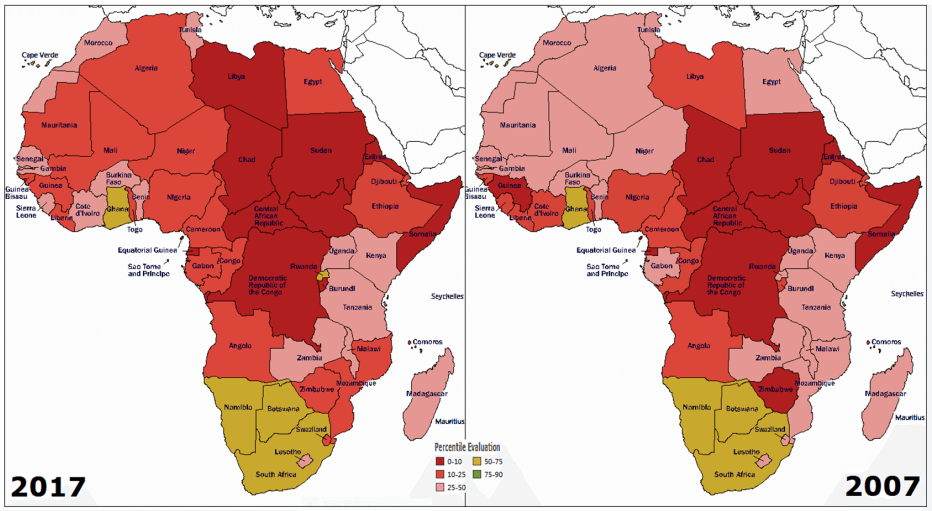

Figure 3 The governance climate in African contexts, comparison at ten years for average values. (Source: our elaboration from World Governance Indicators (WGI) World Bank dataset.)

The engagement degree of economies with interests in African markets has clearly increased. Therefore, there is a danger of a new neo-colonialism era, with China and other emerging and advanced economies carving up Africa to exploit its resources and growth potential. However, it is in the African governance hands to decide how to shape their own future. While the growing inflow of external aid and investment has provided an opportunity in many African contexts to foster economic growth and political stability, such progress may be short-lived, if they choose to take advantage of Chinese cooperation to escape political reform (SAFERWORLD, 2015).

China and the Western economies pursuing different development models. On the other hand, the economies with interests in African markets should have the responsibility of rendering their engagement a positive impulse for Africa's development. This engagement could consist in increasing the accounting transparency of the firms engaged in the African markets, as well as their transparency in social and environmental policies.

5.2 Policy implications

China's interest in African markets has been primarily driven by the need for Chinese productions to circumvent international restrictions imposed by the United States and the European Union. In fact, products exported from African markets, especially from SSA, have benefited from numerous commercial and fiscal advantages in Western markets. China's interest in Africa has focused not only on the markets' growth potential with cost savings, but also on the advantage derived from the favorable positioning of these markets along the supply chains of advanced manufacturing systems.

Since China entered the WTO in 2001, it has become heavily involved in the establishment of international agreements and has significantly increased its influence in global forums over time (Baroncini, 2013). This has allowed China to re-shape international cooperation, not only in trade but also in politics, and strategic relations across developed and developing countries (Haass, 2005; Humphrey and Messner, 2006; Qin, 2010; Mavroidis and Janow, 2017; Marelli and Signorelli, 2022). However, China's performance in trading since its acceptance to the WTO has been a source of increasing tension with other competing countries. In a few years, it has achieved a leading position in exporting low-cost products and has recently successfully positioned itself in higher-tech production. From this perspective, a possible way forward could be to re-negotiate the WTO agreements to allow all countries to reap the potential gains from globalization (Hoekman and Mavroidis, 2015). In fact, the competition between countries in the technology field (González, 2018), even geopolitical and military (Ciuriak, 2018), for global cybersecurity (Madnick et al., 2019), and that between different capitalist development models (Ikenberry, 2018; Hurley et al., 2019), are the main challenges to the new global architecture. In other words, China has challenged the pre-established economic and political power of the main developed countries in African contexts (Tull, 2006; Gu et al., 2009). Consequently, China-Africa cooperation has created strong tensions with Western economies, especially with the United States, which has seen its economic and political influence eroded.

The "African Lions" countries and others in SSA have shown positive performances in the last decade (Doing Business, 2019; IMF, 2019). While numerous investors abandoned African contexts in the face of the global economic crisis, Chinese investors have instead continued to invest in Africa, encouraged by governmental incentives and supported by diplomacy. Chinese investors have mainly focused on M&A operations, with government support providing loans and funding for the infrastructural development of African countries. Much employment was created, especially in the extraction, labor-intensive manufacturing, and business services sectors. Nonetheless, the presence of Chinese investors has not always generated spillover effects for host-country firms (Farole and Winkler, 2014; Sattar et al., 2022). However, it is possible that foreign investment in developing countries is greenfield. This involves the establishment or expansion of new foreign subsidiaries, especially by big corporations. These have increased the investments in research facilities in various parts of the world and collaborations with local firms in host-countries (Geng and Saggi, 2019).

M&A operations have the potential to yield productivity improvements through changes in affiliate firms' management or organization, while greenfield investments can lead to the transfer of technology and know-how by initiating new productions in the host country or by introducing improvements in existing productions. The socio-economic reforms are another fundamental prerequisite for growth and to attract international investors. However, it is possible that increased FDI inflows will go to countries with an unsound governance climate.

With globalization, the gains from international trade and the fragmentation of production along the GVCs have been distributed much more unequally across developed and developing countries. Of the latter, only a few have experienced effective industrialization (Baldwin, 2016). Rather, many others have experienced a premature industrialization form with rapid liberalizations and wide political commitment, then turn to a de-industrialization form, equally rapidly (Rodrik, 2016). While it is true that China's domestic demand growth and its economic dynamism are gradually leading to a shift away from the export-oriented model on which China founded its international economic expansion (Barbieri et al., 2010; Heilmann and Shih, 2013), it is also true that China could slow down its global economic expansion, depending significantly on the adequacy of the policies adopted (Lawrence, 2020).

Finally, African markets can represent an important opportunity for international business growth if appropriately approached (Ferrucci and Paciullo, 2015; Dei Ottati, 2017; Tassinari et al., 2018). Given the liability of foreignness (Eden and Miller, 2004; Pattnaik and Elango, 2009; Yildiz and Fey, 2012), firms are not always able to enter these markets effectively (Nummela, 2004; Bonaglia et al., 2007; Brouthers, 2012; Matarazzo and Resciniti, 2014; Cantele and Campedelli, 2016; Ruzzier et al., 2017; Delbufalo and Monsurrò, 2019). Especially for small firms, it is crucial to leverage the networking capabilities of large firms and the institutions, along with a mix that effectively combines product and service adaptation and standardization to meet the consumer needs in the target markets (Kraidy, 2005; Hakansson et al., 2009; Alcácer et al., 2016; Tarek et al., 2017; Ferrucci et al., 2018; Peng and Lin, 2019). The awareness of rapidly growing regions worldwide has increasingly driven firms to reconsider the risks associated with international business (Scalamonti, 2024b). This is no longer seen only as a negative condition but rather as an incentive to seek new business opportunities. In other words, foreign investors have realized that the liability of foreignness is an intrinsic feature of the risk of doing business in foreign markets (Corcoran and Gillanders, 2014). They have understood the need to re-consider context-specific risks and consequently adopt the most appropriate choice about market entry modes.

5.3 Future studies

A possible development of this essay could involve the use of analysis techniques other than narrative. For instance, future studies could focus on the economic impact of the policies implemented through programmatic-cost analysis and cost-benefit analysis, which have the advantage of guiding policy-making and evaluating policy effectiveness, respectively. Additionally, these analyses could uncover patterns of dependency or mutual benefit between countries, shedding light on the balance of power and reciprocal influence. In other words, integrating these analyses could yield valuable insights into the political-economic relationships intertwined between China and its African partners. By analyzing and understanding the outcomes or implications of the policies implemented, analysts could have more complete insights into the dynamics of their bilateral cooperation.

Overall, employing programmatic-cost analysis and cost-benefit analysis could enrich the understanding of the socio-economic impact of Chinese policies into Africa and provide a robust framework for evaluating their effectiveness. Particularly, analyzing the cost-effectiveness of Chinese investments in African infrastructure projects could reveal the extent to which these initiatives contribute to local economic development and political stability.

Conflicts of interest

The author declares that there is no competing financial interests or personal relationships that could influence the work in this paper.

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RESEARCH ARTICLE

Post-ACA health insurance decisions: A survey on risk attitudes and consumer confidence

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Abstract: Objective: This study investigates the reluctance of individuals in the United States to get health insurance, specifically examining the psychological and sociodemographic aspects that contribute to this reluctance within the Affordable Care Act (ACA) framework. The research objective is to ascertain the behavioral factors contributing to insurance hesitation and offer valuable perspectives for decreasing the number of individuals without health insurance and enhancing health security. Methodology: The study uses data from the 2022 Survey of Consumer Finances to analyze the impact of specific variables such as risk tolerance, consumer confidence, income, education, age, and marital status on health insurance coverage choices. We also address issues related to cost, perceived health requirements, previous experiences, and misunderstandings about eligibility. Conclusion: The study demonstrates that higher customer confidence, frequently associated with financial stability, decreases reluctance to obtain insurance. By contrast, individuals with more risk tolerance exhibit more hesitancy, opting to depend on internal resilience. Furthermore, substantial demographic disparities indicate the presence of several obstacles in acquiring comprehensive coverage. Implications and Recommendations: The results underscore the necessity of tailored policy interventions that address the unique requirements of different demographic groups. It is crucial to consider both psychological and sociodemographic aspects to promote insurance adoption and ensure universal health security. The present study makes a valuable contribution to the current body of literature by offering a comprehensive examination of health insurance hesitation following the Affordable Care Act (ACA) implementation.

Keywords: health insurance, ACA, insurance hesitancy, racial disparities, consumer confidence, risk tolerance

1 Introduction

The Affordable Care Act (ACA) has emerged as a transformative force in the American healthcare sector since its introduction in 2010. It aimed to overcome accessibility gaps in healthcare and decrease the unisurance rate in the US, especially among underserved communities [1]. However, despite these developments, there are still significant obstacles and inequalities in terms of access to healthcare. Uneven Medicaid expansion among states highlights the complex character of the ACA's impact, underscoring the ongoing work required to achieve equitable health coverage for all Americans. Under the Affordable Care Act (ACA), the literature reveals complex consumer attitudes and behaviors around health insurance. The ACA's objective to ensure universal coverage for all American citizens brought about a range of responses and differing levels of acceptability [2]. Health insurance hesitation is driven by factors like as distrust in medical services, the perceived seriousness of health concerns, and emotional obstacles like fear and denial [3]. Although there has been much study on the sociodemographic characteristics linked to access to healthcare, there is a lack of comprehensive studies on health insurance hesitancy, specifically within the context of the Affordable Care Act (ACA).

Existing research frequently emphasizes the benefits of health insurance in providing access to medical treatments and protecting against the financial burden of disease [4]. However, a large information gap exists in understanding the precise causes of health insurance hesitancy under the ACA, including worries about affordability, skepticism about the value of insurance, and the psychological foundations of such hesitancy. This gap is especially relevant considering the continuing arguments surrounding universal coverage, which faces criticism for potential

rationing and reduced reimbursement for healthcare professionals [5]. Bridging this gap could reveal ways to increase healthcare coverage and amplify the ACA's efficacy.

This study's scope is designed to focus on the psychological and sociodemographic aspects that influence people's health insurance decisions. This study examines risk tolerance, consumer confidence, and sociodemographic variables like income, educational attainment, age groups, and marital status. These sociodemographic characteristics were selected for their well-documented impact on insurance uptake and attitudes in the existing literature [6, 7]. This study carefully avoids discussing political preferences, ideologies, and the impacts of partisanship. Although these elements have influence, they are outside of this study's analytical framework and objectives. The geographical focus of this study is limited to the United States during the COVID-19 pandemic. The study uses data from the 2022 Survey of Consumer Finances, ensuring that the conclusions are relevant to current economic situations.

The research problem of this study is based on the current literature on health insurance behavior. It investigates the psychological and sociodemographic elements contributing to Health Insurance Hesitancy in the U.S. population. Existing research has found several obstacles to acquiring health insurance, such as worries about the cost, doubts about the worth of insurance, and misunderstandings about qualifications [8, 9]. Building upon these findings, this study examines how consumer confidence, risk tolerance, and sociodemographic traits impact reluctance to obtain health insurance.

This study helps understand the mechanisms that drive uninsured rates, which have profound implications for community health and economic stability. The study aims to extensively investigate the relationship between an individual's unwillingness to accept risks and their hesitation to obtain health insurance. Furthermore, a major focus of the research is to examine the trajectory of consumer confidence and how this economic aspect influences one's willingness to buy health insurance. This inquiry component is significant since it contains the Consumer Confidence Theory, which states that people whose incomes have outpaced inflation are more likely to have strong consumer confidence. This improved confidence, resulting from perceived financial security and purchasing power, may positively impact their decision to get health insurance.

Furthermore, this study aims to identify behavioral impediments to health coverage by investigating the relationship between consumer confidence and health insurance acquisition. This research is useful in developing measures to reduce the uninsured rate, promoting greater health security and economic stability within communities.

Research Question: How does the interaction of risk aversion and consumer confidence, affected by income level, impact an individual's decision to obtain health insurance? This study investigates the delicate relationship between an individual's view of financial stability and risk, as determined by consumer confidence relative to inflation and subsequent confidence in making health insurance decisions. Furthermore, it seeks to understand the impact of intrinsic risk aversion in these decisions and the larger implications for devising successful policy initiatives to enhance health insurance coverage.

This study's main hypotheses are to examine the complex dynamics of health insurance hesitancy in the context of the Affordable Care Act (ACA) and to develop effective techniques for promoting health insurance adoption. The study attempts to:

Hypothesis I: There is a link between consumer confidence and health insurance hesitancy, with people with more consumer confidence tending to have less hesitancy about health insurance than those with less.

Hypothesis II: There is a link between risk aversion, as measured by the risk tolerance scale, and health insurance hesitancy. Individuals with lower risk tolerance are likelier to have less hesitancy toward health insurance than those with higher risk tolerance.

Hypothesis III: Certain sociodemographic traits, such as higher income and educational attainment, are associated with a decreased likelihhod of health insurance hesitation.

2 Background

2.1 Overview of the ACA

The Affordable Care Act (ACA), which was enacted in 2010, represents an essential moment in American healthcare policy. The objectives are to increase health insurance coverage, manage healthcare prices, and improve healthcare delivery [10–12]. The primary goal is to enhance insurance coverage, especially for those without employer-sponsored policies, through

expanding Medicaid and establishing health insurance markets [13, 14]. These platforms let people to purchase insurance through federal subsidies, solving the issue of affordable healthcare access.

The ACA prohibits insurers from denying coverage due to pre-existing conditions (guaranteed issue) and requires all plans to provide essential health benefits [10, 15]. This provision assures full coverage, which includes preventative care, mental health treatment, and maternity care. The ACA also prohibits insurers from discontinuing coverage due to an unexpected illness [16]. While the legislation assures coverage, it also incorporates a semi-community rating system based on age and geographic area, which affects price and premiums. The ACA has provisions to reduce copayments for low-income individuals (those earning less than 250 percent of the Federal Poverty Level). The legislation also encourages methods to reduce healthcare expenses, such as incentivizing healthcare professionals to prioritize the quality of treatment above the quantity of services delivered. Although the Supreme Court repealed the coercive nature of this requirement in NFIB v. Sebelius, Medicaid expansion to 138% of the Federal Poverty Level, as recommended by the ACA, has been effective in reducing the number of uninsured individuals in states that implemented this recommendation [17].

The ACA has changed U.S. health insurance. Medicaid expansion in states and marketplace health plans have reduced uninsured Americans by millions [18–20]. Expanded healthcare access benefits diverse demographics, including low-income persons and those previously uninsured owing to cost or pre-existing conditions [21, 22]. The ACA's preventative care focus and more competitive insurance markets have promoted health equity and access. Moreover, the Affordable Care Act (ACA) aimed to lower healthcare costs by expanding delivery, improving network adequacy, and implementing telehealth services [23].

The ACA expanded family coverage to 26-year-olds, reducing uninsured Americans. Despite these efforts, a large segment of the U.S. population lacks health insurance, underlining the continued issue of universal coverage. Uneven health insurance coverage highlights the need for a universal payer system in the U.S. Unlike other advanced nations with single-payer systems, the U.S. uses private insurers and government programs. Sheils and Haught (2000) [24] suggests that single-payer systems simplify payment structures and may lower administrative costs.

An examination of the 2022 Survey of Consumer Finance (Figure 1) indicates that health insurance continues to be a noteworthy concern in Latino and Black communities, with uninsured rates of 16.45% and 11.52%, respectively. African Americans and individuals of Hispanic origin regularly exhibit lower insurance coverage rates across all age categories when compared to non-Hispanic white individuals. To comprehend the causes of these discrepancies in health insurance coverage, one must consider structural issues associated with socioeconomic class, individual choices, and market dynamics. In contrast to numerous Western nations, the healthcare system in the United States encompasses a blend of public and private organizations. Medicare and Medicaid are government-funded insurance programs, while the private sector provides most health insurance in the U.S. [25, 26].

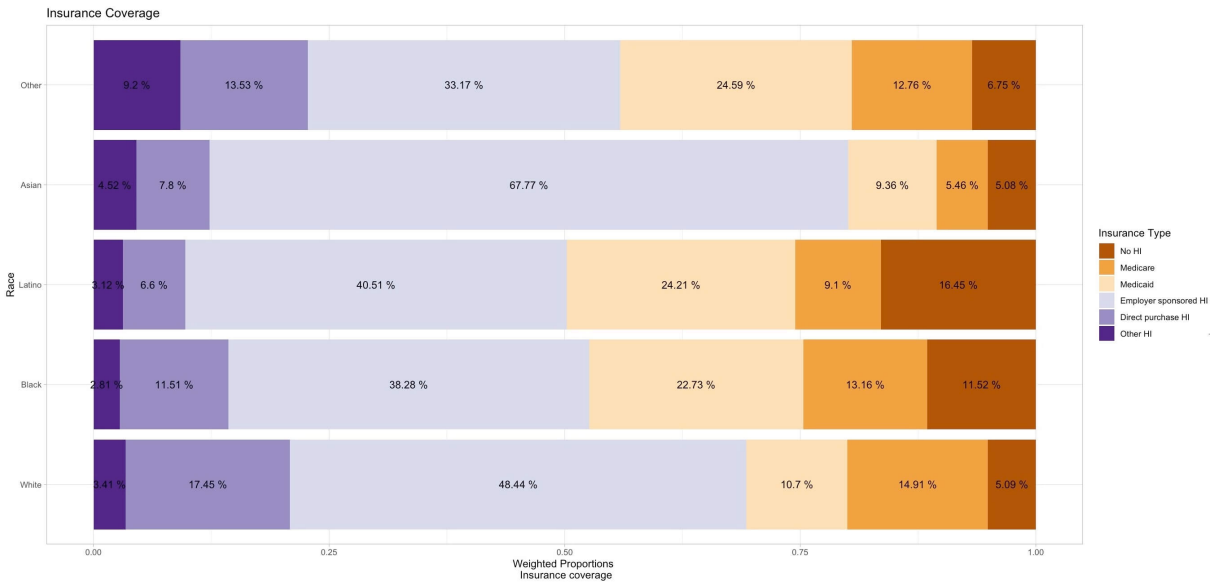

Figure 1 Relative proportion of health insurance type by race. (2022 Survey of Consumer Finance. Source: Author's analysis)

Based on Figure 1, Medicaid is crucial in providing health insurance coverage for Latino and Black households, with rates of 24.21% and 22.73%, respectively. These percentages reflect the fact that these communities have lower median earnings compared to Asian and White populations. Non-White Americans typically have more diverse health insurance coverage, often depending on public health insurance or having no coverage at all, in contrast to White Americans [27]. Medicare is a significant coverage provider for White and Black adults, with coverage percentages of 14.91% and 13.16%, respectively.

In addition, insurance through a workplace is the most common way for people of all races to get coverage. However, it is more common for Asians and Whites (67.77%) and less common for Latinos (40.51%) and Black Americans (38.28%). Asians and White people have more job possibilities than Latinos and Black people. This difference is due to these racial groups' different social structures of income and employment coverage. Black and Latino individuals may have lower incomes and less access to health care through their jobs, as pointed out by Artiga et al. (2022) [1]. Also, black and white people seem to be more inclined than Asians and Latinos to purchase health insurance through the marketplace (11.51% vs. 17.45%, respectively).

Baumgartner et al. (2023) [28] and Buchmueller & Levy (2020) [32] point out that the ACA has resulted in greater increases in health coverage for Black and Hispanic individuals compared to White individuals. While the ACA has brought about some improvements, there are still underlying differences that affect Latinos and Black individuals in different ways.

2.2 Reasons related to uninsurance

There are many aspects to the problem of people in the United States not having health insurance. Many studies have examined the socioeconomic factors that affect the number of people without health insurance [29–33]. On the other hand, this study looks at other behavioral factors that play a role in the problem. The analysis of the 2022 Survey of Consumer Finance (Figure 2) suggests that people do not have health insurance for several reasons, including thinking that the premiums are too expensive, not believing that health insurance is useful, thinking that they are healthy enough not to need insurance because they do not need hospital services very often, being unhappy with their past health insurer, waiting to get insurance until they get a job, and wrongly believing that they do not qualify for health insurance coverage.

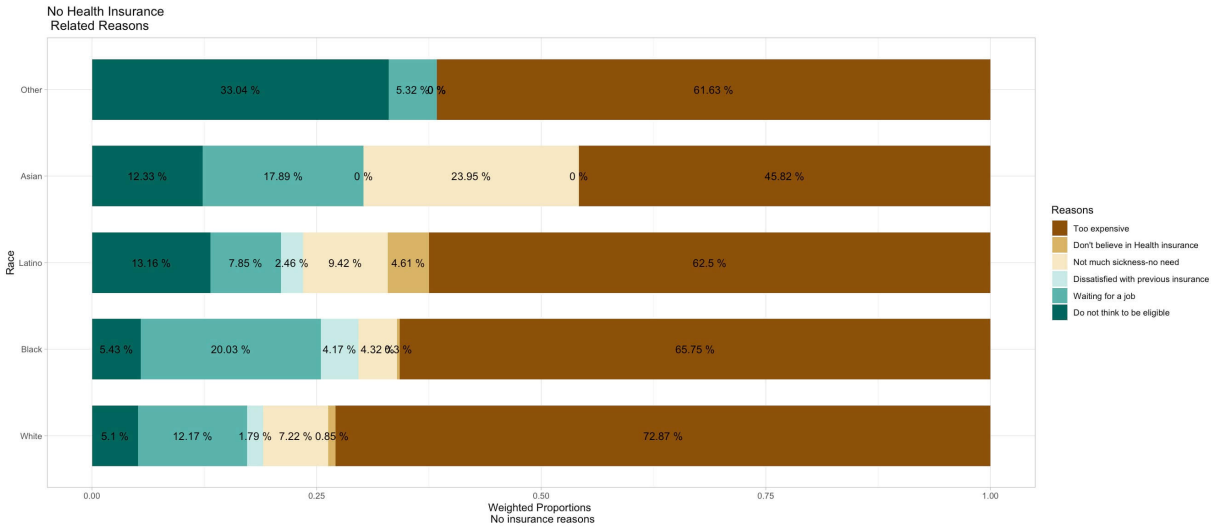

Figure 2 Reasons for insurance hesitancy by race. (2022 Survey of Consumer Finance. Source: Author's analysis)

All of these reasons make people less likely to get health insurance. The high cost of health insurance rates can make people hesitant to buy coverage because they are out of reach financially or think they are not worth the money. You need to believe that health insurance works, trust it, and understand how it can protect your finances and give you access to medical care. People often overestimate the danger and overconfidence in their ability to stay healthy, leading them to think they do not need insurance. People who have had bad health insurance experiences may lose faith in the system as a whole and not want to deal with it again. The choice to wait for health insurance through work shows how dependent people are on stable jobs for getting coverage, which can leave them vulnerable when they are out of work. Lastly, people who think they can't get health insurance may be misinformed or need more information

about their choices, such as government programs that help people in need. All of these things show how complicated the web of ideas and views leads to people not having insurance in the U.S.

The data presented in Figure 2 highlights significant variations across racial groups regarding the reasons behind health insurance hesitancy in the United States, emphasizing the multifaceted nature of this issue. The cost of health insurance emerges as a predominant factor across all racial categories, with the highest reluctance noted among White individuals at 72.87%, followed by Black individuals at 65.75%, Latinos at 62.5%, and Asians at 45.82%. This variance underscores the critical impact of financial barriers on insurance coverage decisions, illustrating how economic factors play a pivotal role in health insurance hesitancy.

Another notable reason is the perception of being in good health and therefore not needing insurance, with Asians reporting this as a reason 23.95% of the time, significantly higher than Latinos (9.42%), Black individuals (4.32%), and White individuals (7.22%). This difference reflects varying levels of health perception and risk assessment among racial groups, influencing their decision-making process regarding health insurance.

Dissatisfaction with previous health insurance experiences also contributes to hesitancy, albeit to a lesser extent, demonstrating the importance of consumer experiences and trust in insurance providers. Employment status further affects health insurance decisions, with notable percentages of individuals across racial groups waiting for employment to obtain insurance. This is most pronounced among Black individuals (20.03%) and Asians (17.89%), highlighting the link between employment and insurance coverage.

Perceptions of ineligibility for health insurance differ among different racial and ethnic groups. Asians (12.33%) and Latinos (13.16%) are more prone to consider this as a justification for not having insurance compared to Black (5.43%) and White folks (5.1%). This suggests a potential requirement for increased awareness or comprehension of eligibility criteria among specific demographics.

These observations demonstrate the intricate interaction of economic, cultural, and institutional elements contributing to reluctance to acquire health insurance. Comprehending these differences is essential for addressing inequalities in healthcare coverage and guaranteeing that initiatives to boost insurance enrollment are customized to the distinct requirements and perspectives of various ethnic groupings.

2.3 Health insurance hesitancy

Health insurance hesitancy and reluctance describe delaying or refusing to acquire health insurance, even when it is readily accessible and there is a possible need for it. This phenomenon is impacted by many factors, including psychological, economic, social, and structural influences. Psychological variables encompass individual attitudes or anxieties regarding the healthcare system, doubts about the importance or effectiveness of insurance, or a general lack of confidence in insurance providers. From an economic standpoint, the expense of health insurance premiums and the belief that one should receive greater value for the money spent can discourage individuals from buying coverage. From a social perspective, cultural norms and the influence of peers can significantly impact individuals' attitudes regarding health insurance. Structural complexities, enrollment process challenges, and past unfavorable encounters with health insurers can all lead to uncertainty in understanding insurance policies. Furthermore, research has demonstrated a correlation between having health insurance and reduced levels of vaccine reluctance, suggesting that insurance can have a beneficial impact on individuals' inclination to seek healthcare [34–37].

Health insurance hesitancy, like vaccination hesitancy, denotes the unwillingness or postponement of acquiring health-related services despite their accessibility and the monetary safeguard they provide against medical expenses. This reluctance becomes especially apparent with the implementation of the Affordable Care Act (ACA), which sought to enhance coverage by expanding Medicaid and establishing health insurance markets [38–40].

3 Theory

This study primarily attributes the hesitancy of individuals purchasing insurance to two pivotal factors: consumer confidence and risk tolerance. Consumer confidence pertains to the collective opinions and outlooks of the general population regarding the present and future state of the economy. It substantially impacts decision-making processes, notably those pertaining to

insurance. Risk tolerance, in contrast, relates to the extent to which individuals are prepared to embrace unpredictability in anticipation of either negative or positive outcomes. It has a significant impact on their probability of choosing insurance coverage. Combining these aspects provides an extensive comprehension of why particular consumers may be reluctant to purchase insurance policies, emphasizing the complex link between economic views and personal risk evaluations.

3.1 Consumer confidence theory

The concept of consumer confidence, crucial for comprehending economic dynamics, originates from the broader economic and psychological research framework that became prominent in the mid-20th century. George Katona, along with other pioneering individuals, made substantial contributions to conceptualizing and quantifying consumer sentiment. They integrated psychological insights with economic data to assess consumer sentiment regarding the economy's future. The term "consumer confidence" is a combination of the word "consumer," which refers to persons who buy products and services, and the word "confidence," which represents their emotions regarding their financial stability or instability [41,42]. This dichotomy captures the fundamental concept of consumer confidence theory, which posits that the psychological condition of consumers plays a crucial role in shaping their economic actions. This hypothesis originated during a time characterized by an increasing fascination with the interaction between psychology and economics. The significance of consumer views on economic well-being is emphasized, resulting in tools such as the Consumer Confidence Index (CCI) to measure these attitudes and their effects on economic activity [43, 44]. The Consumer Confidence Index (CCI) is a significant economic indicator that aims to quantify consumers' optimism about the economy's general condition and financial circumstances. The CCI operates under the assumption that consumer sentiment directly impacts economic activity, particularly in terms of consumer spending and saving patterns. It plays a crucial role in forecasting future economic activity by assessing consumer attitudes and expectations through surveys. The Consumer Confidence Index survey comprises four fundamental subjective inquiries. Participants furnish demographic data, including age, gender, marital status, occupation, and location. The survey then explores the following questions:

(1) Has your household's financial status improved or decreased compared to six months ago?

(2) Over the next six months, do you expect your household's financial status to improve, stay the same, or worsen?

(3) What are your predictions about job opportunities and employment in your area in the next six months?

(4) Do you think it is prudent or imprudent for individuals to invest in assets such as houses, vehicles, or other significant purchases?

These inquiries are vital since they offer valuable insights into:

(1) Evaluations of previous financial advancements: This component assesses changes in individuals' purchasing power over time by comparing their current financial condition to that of six months earlier, which may be influenced by inflation. This demonstrates the direct influence of economic volatility on customers.

(2) Anticipated projections for future financial advancement: This component assesses individuals' outlook on their financial situation, specifically regarding inflation, and determines whether they are optimistic or pessimistic. It provides a direct assessment of customer expectations, which might have an impact on consumer purchasing and saving habits.

(3) Perspectives on Credit and Borrowing: This evaluates customers' preparedness to assume financial risks via borrowing. The readiness to participate in credit transactions implies a sense of assurance in one's future financial stability, whereas hesitancy may indicate apprehensions about economic circumstances or personal financial well-being.

Collectively, these elements play a crucial role as a reliable indicator for understanding consumer confidence. They not only reflect current financial conditions and expectations but also serve as indicators of broader economic sentiments. These insights can significantly influence governmental decisions and economic predictions. The evolution in the Conference Board Consumer Confidence Index from 1977 to August 2024 is illustrated in Figure 3, which emphasizes the variations in consumer attitude. Significantly, in 2022, consumer confidence substantially

decreased, with levels remaining at approximately 90.6. This decline results from economic uncertainty, most likely caused by inflationary pressures and difficulties in recovering from the pandemic, which greatly affected people's financial prospects. The diminished confidence levels observed in 2022 are essential for comprehending the reluctance to undertake substantial financial obligations, such as obtaining health insurance. These findings are consistent with the research objectives, which investigate the impact of customer confidence on the probability of acquiring health insurance.

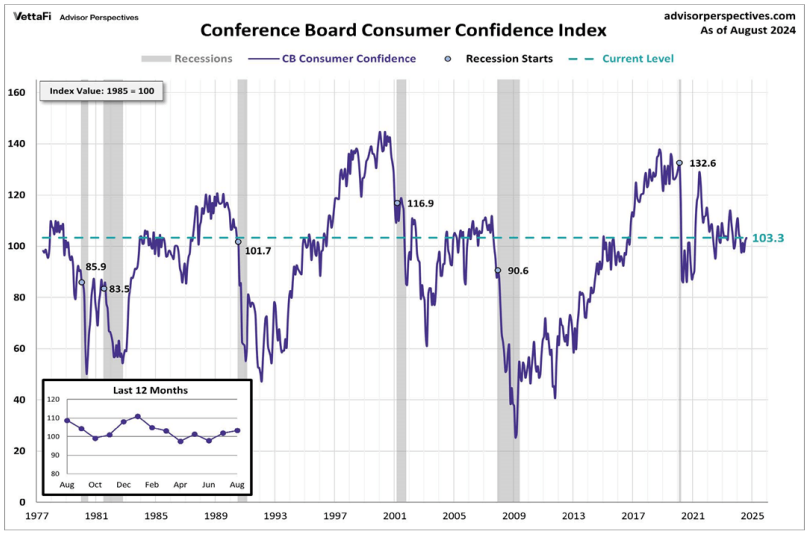

Figure 3 Conference board consumer confidence index

Consumer confidence theory examines the degree of optimism or pessimism that consumers possess regarding the general condition of the economy and their financial circumstances. It serves as a significant gauge that mirrors the state of the economy by assessing consumer expenditure and saving patterns. The Consumer Confidence Index (CCI) assesses consumer sentiment by analyzing their views on present economic conditions and their predictions for the upcoming six months [45]. A greater confidence level implies that consumers have a positive outlook on their financial prospects and are more inclined to increase their expenditures.

In contrast, a lower confidence level signifies pessimism and may lead to reduced spending. One aspect of this study's objective is to determine how customer confidence influences the likelihood of having health insurance. This idea is predicated on the premise that customers with higher confidence levels are more likely to engage in substantial purchases and investments, such as acquiring health insurance, due to their perception of financial security in meeting both present and future expenses.

3.2 Risk aversion

Risk aversion has a strong foundation in economics and psychology, as it pertains to humans' inclination to favor certainty rather than uncertainty when making choices. The concept is derived from the anticipated utility theory formulated by Von Neumann and Morgenstern (2007) [46], which established a mathematical framework for making decisions when faced with uncertainty. In the 18th century, Daniel Bernoulli made a crucial contribution by introducing the St. Petersburg conundrum. This dilemma introduced the concept of diminishing marginal utility and examined risk aversion.

Economists such as Paul Samuelson, Milton Friedman, and Leonard Savage advanced the profession by enhancing and broadening the anticipated utility theory. The authors of the cited studies introduced more intricate perspectives on risk. Kenneth Arrow and John Pratt created the Arrow-Pratt measure of absolute and relative risk aversion during the 1960s and 1970s [47–49]. The insights provided by diverse economists have enhanced our comprehension of risk aversion in economic conduct, exerting an influence on numerous schools of thought, such as behavioral economics. Richard Thaler and other economists have advocated for this discipline, which explores psychological insights to elucidate deviations from conventional economic forecasts of rational behavior [50–54].

In economics and finance, the concept of risk aversion suggests that individuals favor options

with less uncertainty compared to those with higher uncertainty, even if the later options could provide similar or higher financial gains. This notion emphasizes a common tendency to choose stable scenarios that offer a consistent, but occasionally lower, financial return instead of engaging in more unpredictable investments that could generate more significant profits and carry a higher chance of monetary loss [55]. An example that demonstrates this behavior can be seen in investment decisions. Individuals who display risk aversion may choose to deposit their savings in a savings account that offers a moderate and guaranteed rate of return rather than investing in the stock market. Although the stock market has the potential for significant gains, it also carries the risk of substantial financial loss.

Individuals' decision-making processes, particularly about health insurance enrollment, are highly influenced by risk aversion. Individuals with a greater inclination towards risk aversion generally choose the assurance and stability insurance offers to minimize potential monetary setbacks resulting from unexpected medical costs. On the other hand, those less willing to take risks may be reluctant to get health insurance because they prioritize immediate cost savings over the possible long-term advantages of having coverage. This reluctance may arise from misinterpreting or undervaluation of risk, resulting in an inclination to prioritize liquidity over investing in proactive financial measures. One aspect of this study's objective is to examine the relationship between risk aversion and the likelihood of obtaining health insurance. Hence, it is essential to comprehend the intricate correlation between an individual's risk tolerance level and their propensity towards health insurance. This comprehension is vital for overcoming obstacles to insurance coverage and fostering more comprehensive health security.

4 Methodology

This study uses data from the 2022 Survey of Consumer Finances (SCF) to investigate the determinants of health insurance hesitancy. Logistic regression is employed to establish a mathematical model that describes the correlation between health insurance hesitation (the dependent variable) and important independent variables like consumer confidence, risk tolerance, and specific sociodemographic parameters. By employing suitable weighting and considering multicollinearity, the methodology guarantees a rigorous study that thoroughly comprehends the behavioral and economic factors influencing insurance choices.

4.1 Data source and sample design

This study's data was acquired from the 2022 Survey of Consumer Finances (SCF), an extensive survey carried out by the Federal Reserve Board. The SCF compiles comprehensive data on the financial status of American households, encompassing income, assets, liabilities, and perspectives on risk and financial decision-making. The Federal Reserve Board compiled the data over the period of March to December 2022. The questionnaire comprised a combination of open-ended and closed questions, including some with answer scales specifically crafted to encompass a broad spectrum of financial practices and views. The SCF's meticulous data gathering and weighting procedures guarantee that the survey precisely reflects the U.S. population, increasing its credibility as a source for examining the determinants of health insurance choices in the U.S.

In addition, the SCF utilizes an advanced weighting structure that is thorough and comprehensive, thereby improving the accuracy of survey findings. This approach integrates the original selection probability with supplementary data and aggregated statistics from the Current Population Survey. Although this methodology is thorough, it is crucial to recognize the existence of multiple variables in the SCF data. Certain variables may have a low occurrence rate or be prone to extreme values, which has the potential to distort the results. In order to tackle this problem, especially when dealing with variables that are heavily skewed such as income, the analysis step includes the use of logarithmic transformations to reduce these inequalities [56, 57].

Regarding missing data, the SCF utilizes a technique known as multiple imputation. This technique generates five distinct datasets for each missing value, aiming to replicate the original data distribution closely. The dataset is expanded by including 23,010 entries from the initial pool of 4,602 respondents, significantly improving the statistical analysis's reliability and precision.

In this context, the R "survey" package plays a critical role in managing the complexities of the augmented dataset resulting from multiple imputations. It ensures that the data remains properly weighted throughout the analysis process, even when adjusted by a factor of five for certain evaluations. This tool is essential for reducing bias and producing estimates that more

accurately reflect the true characteristics of the population. Working in conjunction with the "mitools" package, the "survey" package effectively handles data with multiple imputations, facilitating accurate and minimally biased analyses [58].

4.2 Main variables

4.2.1 Dependent variable

This study aims to explore the factors contributing to individuals' reluctance to acquire health insurance by requesting them to select the most relevant explanation from a provided list. The list elucidates why they or someone in their family does not own insurance. The poll offered 17 predetermined choices for participants, subsequently classified into six primary groups for examination. The categories encompass concerns regarding the affordability of insurance, skepticism towards the value of health insurance, the perception that insurance is unnecessary due to the family's good health, dissatisfaction with past insurance experiences, job-related challenges such as unemployment or lack of employer-provided insurance, and doubts about eligibility for insurance coverage.

The categorizing procedure played a crucial role in simplifying the issue and making it more manageable for analysis. It consolidated the various reasons into more general themes, particularly in cases where individual responses were infrequent or insignificant. This method led to a clearer understanding of the main elements contributing to hesitation towards health insurance. By categorizing numerous distinct reasons into broader categories, we made the issue more digestible and easier to handle.

The study employed a dummy variable to measure the extent of health insurance hesitation among the participants. Consequently, those who provided an explanation for lacking health insurance were designated with a code of 1. This coding methodology quantifies the level of reluctance towards health insurance across the surveyed population, providing valuable insights into the different obstacles individuals encounter while attempting to obtain health coverage. The systematic methodology employed in this study allows for a comprehensive understanding of health insurance hesitation, revealing the various complex factors contributing to the absence of insurance within specific demographic groups.

4.2.2 Independent variables

In this study, the primary factors used to understand reluctance to obtain health insurance include the Consumer Confidence Index (CCI) and risk tolerance. Risk tolerance serves as an indirect measure of an individual's aversion to risk. The Consumer Confidence Index (CCI) is calculated based on survey responses to three key questions: past and future income expectations relative to inflation, and views on credit usage. This report presents the methodology and the calculated CCI.

The CCI is calculated as an average of responses to the following questions, with each question equally weighted:

(1) Over the past five years, did your total (family) income go up more than inflation, less than inflation, or about the same as inflation? (Coded as 1 = Up less, 2 = About the same, and 3 = Up more)

(2) Over the next year, do you expect your total (family) income to go up more than inflation, less than inflation, or about the same as inflation? (Coded as 1 = Up less, 2 = About the same, and 3 = Up more)

(3) In general, do you think it is a good idea or a bad idea for people to buy things by borrowing or on credit? (Coded as 1 = Bad idea, 2 = Good in some ways, bad in others, 3 = Good idea)

The calculated Consumer Confidence Index (CCI) for our sample is presented below:

$$CCI = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{Q1_i + Q2_i + Q3_i}{3}\right) \quad (1)$$

where N is the number of respondents, and $Q1i$, $Q2i$, and $Q3i$ are the responses to questions 1, 2, and 3, respectively, for each respondent i.

Risk tolerance, utilized in this study as a measure of risk aversion, is a significant topic in economics and finance. It signifies an individual's inclination towards certainty rather than

uncertainty. The Survey of Consumer Finances (SCF) assesses individuals' propensity for financial risk-taking by inquiring, "On a scale ranging from zero to ten, where zero signifies a complete aversion to risk, and ten signifies a strong inclination towards risk, what is your (and your partner's, if applicable) position?" The ten-point scale is effective for measuring risk tolerance as it directly and quantifiably assesses individuals' comfort level with risk. The uncomplicated architecture of the system facilitates the collection of information from multiple individuals, allowing for easy comparisons between different responses. Furthermore, this approach provides a more comprehensive comprehension of an individual's risk tolerance than only requesting them to select 'yes' or 'no.' It aligns effectively with research methodologies in psychology and economics, where self-rating scales are extensively employed to investigate individual attitudes and preferences [59].

This research uses various control variables to strengthen the credibility of how primary independent variables relate to the dependent variables, considering other potential explanations and demographic factors. It categorizes age into six groups, from young adults (18-29) to those in advanced age (85-100), and classifies marital status into three groups: never married, married or cohabiting, and separated or widowed. The level of education is assessed on a scale from elementary education to a doctoral degree, and employment status is coded as either employed or unemployed. Additionally, the study measures financial knowledge with two specific questions: one about the growth of money in a savings account over five years at a 2% interest rate, and another on the buying power of money in an account with a 1% interest rate in an environment where inflation is 2% per year. Answers are coded to determine participants' understanding of these financial concepts. The study also takes into account participants' self-assessed financial knowledge, rated on a scale from zero (no knowledge) to ten (very knowledgeable).

The investigation explores how income influences the need for life insurance, using data from the Survey of Consumer Finances (SCF) and applying a logarithmic transformation to income figures to reduce the skewing effect of outliers. It also adjusts for racial differences and analyzes the data by race to identify how these main variables differ among racial groups once other factors are accounted for. This systematic approach helps understand the intricate dynamics of income's role in life insurance demand across different demographic segments.

4.3 Research method

The present study examines the influence of respondents' economic confidence and risk aversion on their hesitancy to acquire health insurance. Participants were queried about if they had any justifications for their lack of health insurance. To facilitate statistical analysis, all categories associated with the reasons for not having insurance were consolidated into a single binary variable. A value of "Yes" (1) denotes that individuals had a reason (namely, insurance hesitancy), while a value of "No" (0) shows that they did not have insurance. Insurance reluctance can be attributed to several causes, including chiefly financial obstacles, the belief of being in good health and so not requiring insurance, discontentment with past insurance encounters, and the delay in securing coverage due to waiting for an employment. Given the low frequencies of certain categories, such as discontent with previous experiences and waiting for a job, the categories were consolidated to guarantee statistical reliability. By adopting this strategy, the analysis is enhanced, thereby increasing the strength and methodological rigor of the results. This, in turn, guarantees the reliability of the conclusions made, especially in cases when the original categories have unequal distributions. The data was analyzed using logistic regression, a statistical method well-suited for predicting outcomes that fall into categories based on various predictors [60]. This technique is particularly useful for estimating the likelihood of individuals having health insurance, taking into account factors such as consumer confidence, risk tolerance, demographic influences, and other essential variables.

Incorporating weights in logistic regression is crucial for ensuring that the sample represents the broader population's demographics more accurately. This step helps address any biases in the sample and provides a more precise depiction of people's perspectives on health insurance. The "survey" package in R software plays a vital role in this analysis, providing the necessary tools to apply these weights and enhance the study's accuracy and reliability.

The logistic regression model can be expressed as:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n \tag{2}$$

Where:

(1) p is the probability of the dependent variable equaling a case (e.g., 1);

(2) β_0, β_1, ..., β_n are the coefficients;

(3) x_1, x_2, ..., x_n are the independent variables.

And the probability p can be expressed as:

$$p = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n)}} \tag{3}$$

In the context of multiple logistic regression analysis, it is essential to address multicollinearity, which occurs when independent variables are closely related. This step ensures the validity and comprehensibility of the model's results. Experts often use a rule where a Pearson correlation coefficient exceeding 0.7 suggests a strong relationship between variables [61]. Setting this 0.7 benchmark strikes a balance between strictness and leniency in identifying multicollinearity, making the detection process effective and balanced [62]. Choosing a 0.7 cutoff helps identify strong correlations between variables without removing valuable insights. At this level, the problem of multicollinearity, which can cause exaggerated fluctuations in regression coefficients, is less likely to occur. A correlation up to 0.7 means that while variables may share some common information, they are not nearly identical. This balance maintains the integrity of the model without sacrificing critical data that could enhance predictive accuracy and insights [63].

In logistic regression models, which predict binary outcomes, the focus is on how well the entire model forecasts outcomes rather than the contribution of each predictor variable. If the overall model can make accurate predictions, predictors that are somewhat related to each other, shown by correlation values up to 0.7, usually do not harm the model's effectiveness or comprehensibility (Figure 4).

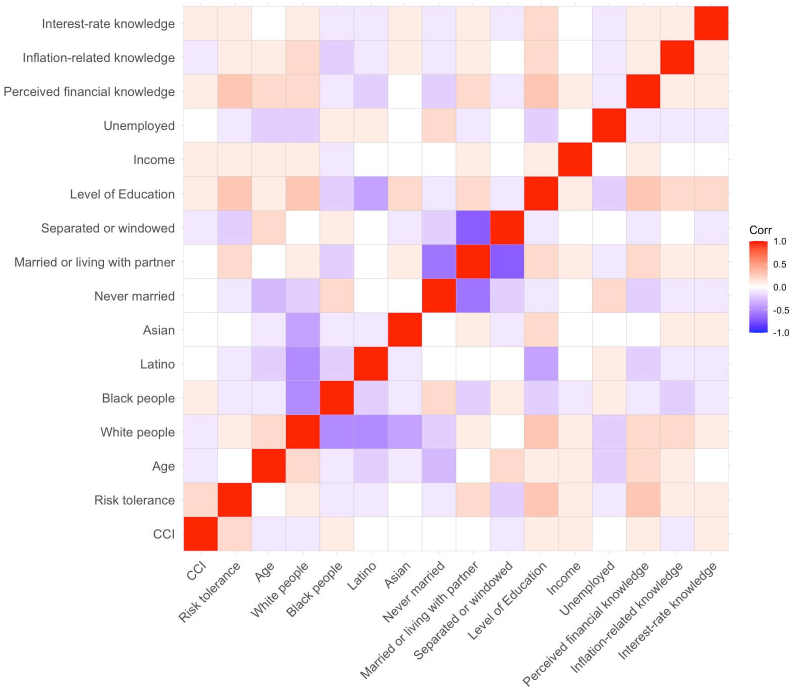

Figure 4 Correlation matrix: Independent variables. (2022 Survey of Consumer Finance. Source: Author's analysis)

The Variance Inflation Factor (VIF) is a valuable tool in logistic regression models as it aids in detecting multicollinearity among predictor variables, which can impact the stability and reliability of the model's coefficients. While logistic regression generally emphasizes the predictive ability of the model, the presence of substantial multicollinearity can cause the standard errors of the coefficients to increase, resulting in reduced reliability and interpretability. Using VIF (Variance Inflation Factor), researchers can identify the presence of multicollinearity and subsequently implement measures to mitigate its effects. This leads to the development of more robust and understandable models. It is especially relevant when the model's interpretability is crucial for comprehending the connections between predictors and the outcome variable, even if multicollinearity does not impact the predicted accuracy. Figure 5 demonstrates that all predictors in this model have VIF values below 2, indicating that multicollinearity is not a concern. The variance inflation generated by predictor correlations may not affect the model.

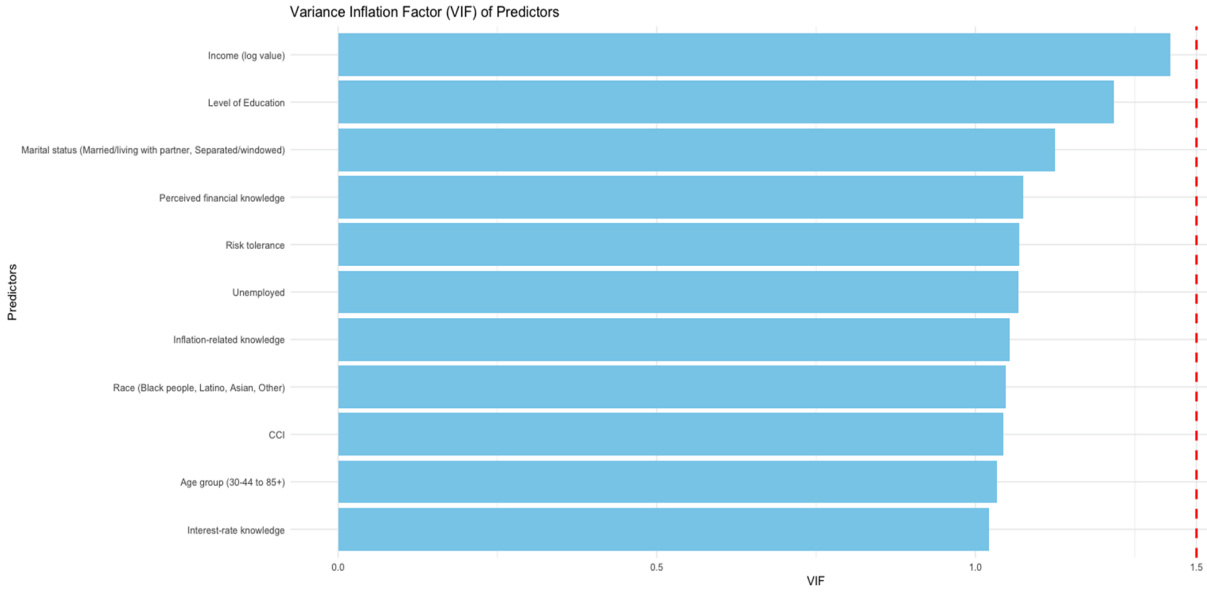

Figure 5 Variance inflation factors. (2022 Survey of Consumer Finance. Source: Author's analysis)

5 Result

Table 1 displays the logistic regression analysis findings that examine the impact of the Consumer Confidence Index (CCI) and Risk Tolerance on health insurance hesitation among various racial groups. The investigation uncovers intricate connections between these parameters and views towards insurance, emphasizing notable disparities among different demographic groups. The intercept values suggest a prevailing inclination towards reluctance to acquire health insurance among most racial groupings, except Asians. This outlier may suggest that cultural or structural factors influence how Asians perceive health insurance.

Table 1 Logistic regression: Health insurance hesitancy

	Full Model	White People	Black People	Latino	Asian
(Intercept)	4.21*** (0.37)	4.68*** (0.43)	4.47*** (0.92)	4.75*** (0.92)	1.70 (1.83)
Consumer Confidence Index	-0.13* (0.06)	-0.23** (0.08)	-0.32* (0.13)	0.30** (0.11)	-0.33 (0.29)
Risk tolerance	0.06*** (0.01)	0.08*** (0.02)	0.08*** (0.02)	-0.02 (0.02)	-0.08 (0.06)
Age group – comparison group: 18-29					
30-44	-0.29** (0.10)	-0.30° (0.15)	0.35° (0.19)	-0.81*** (0.16)	-0.99** (0.36)
45-59	-0.32** (0.10)	-0.36* (0.16)	0.38° (0.20)	-0.84*** (0.18)	-1.13** (0.42)
60-74	-1.20*** (0.12)	-0.92*** (0.16)	-0.56* (0.25)	-2.60*** (0.27)	-4.17*** (0.69)
75-84	-1.91*** (0.19)	-1.66*** (0.25)	-1.10* (0.50)	-3.32*** (0.37)	-17.06*** (0.49)
85+	-2.76*** (0.48)	-2.58*** (0.50)	-13.89*** (0.34)	-15.68*** (0.36)	-18.76*** (0.64)
Marital status – comparison group: Never married					
Married or living with partner	0.35*** (0.09)	0.10 (0.14)	0.46** (0.17)	0.52** (0.16)	0.61* (0.30)
Separated or windowed	0.36*** (0.10)	0.30* (0.15)	0.12 (0.18)	-0.02 (0.18)	2.36*** (0.39)
Level of Education	-0.17*** (0.01)	-0.26*** (0.02)	-0.09** (0.03)	-0.11*** (0.02)	0.06 (0.06)
Income(log value)	-0.40*** (0.04)	-0.32*** (0.04)	-0.57*** (0.09)	-0.43*** (0.09)	-0.34* (0.15)
Unemployed	0.59*** (0.08)	0.83*** (0.11)	0.54*** (0.15)	0.09 (0.13)	-0.51 (0.56)
Perceived financial knowledge	-0.001 (0.01)	-0.04° (0.02)	0.08** (0.03)	0.01 (0.02)	0.11° (0.07)
Financial Knowledge Test – comparison group: failed					
Inflation – related knowledge	-0.24*** (0.07)	-0.29* (0.11)	-0.26° (0.14)	-0.22° (0.13)	0.37 (0.46)
Interest – rate knowledge	-0.19** (0.07)	-0.27** (0.10)	0.20 (0.15)	-0.28* (0.11)	-0.42 (0.36)
Race – comparison group: White people					
Black people	0.28*** (0.08)				
Latino	0.51*** (0.08)				
Asian	0.17 (0.17)				
Other	0.43° (0.22)				
Deviance	13758.08	6899.23	2792.39	3039.32	951.17
Dispersion	1.01	1.00	0.94	1.05	1.38
Num. obs.	22753	14051	3572	3124	1746

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; ° $p < 0.1$.

The Consumer Confidence Index has different impacts on different racial groupings. The White and Black populations exhibit a negative correlation between heightened economic confidence and decreased reluctance, which is consistent with consumer confidence theory. On the other hand, Latinos demonstrate a contrasting impact, indicating intricate socioeconomic relationships. The statistical clarity of the Asian group's response to this index is uncertain.

The Full Model analysis indicates that there is a positive correlation between risk tolerance and insurance reluctance. This correlation holds true for both White and Black groups. These findings suggest that those who are more tolerant of Risk are more likely to hesitate when it comes to getting health insurance. The reversal or absence of this tendency among Latinos and Asians suggests that there are varying interpretations of Risk within different cultural groups. The data also demonstrates that socioeconomic considerations are essential in affecting the adoption of insurance. Hesitancy is negatively correlated with higher education and income levels, while unemployment has a strong positive impact on hesitancy. Surprisingly, the perception of one's financial knowledge has little impact, in contrast to the substantial effects of one's real financial understanding on attitudes towards insurance. Age is a significant influence, as persons who are 75 years old and older tend to have reduced levels of reluctance. Marital status also affects reluctance, with married persons or those cohabiting with a spouse showing higher levels of hesitancy compared to individuals who have never been married.

Racial analysis reveals significant disparities, with Black and Latino individuals showing higher levels of hesitancy compared to their White counterparts, indicating systemic differences in health insurance access and attitudes. Figure 6 illustrates the connections among CCI, risk tolerance, and insurance hesitation. As consumer confidence rises, the level of hesitation diminishes, declining from 12.3% at the lowest Consumer Confidence Index (CCI) to 9% at the highest. On the other hand, when risk tolerance improves, the level of hesitation also increases, going from 8% for the individuals most averse to danger to 15% for those most tolerant of risk. These findings underscore the complex interplay of psychological, economic, and cultural factors in shaping health insurance decisions. They suggest that tailored approaches may be necessary to effectively address hesitancy across different demographic groups.

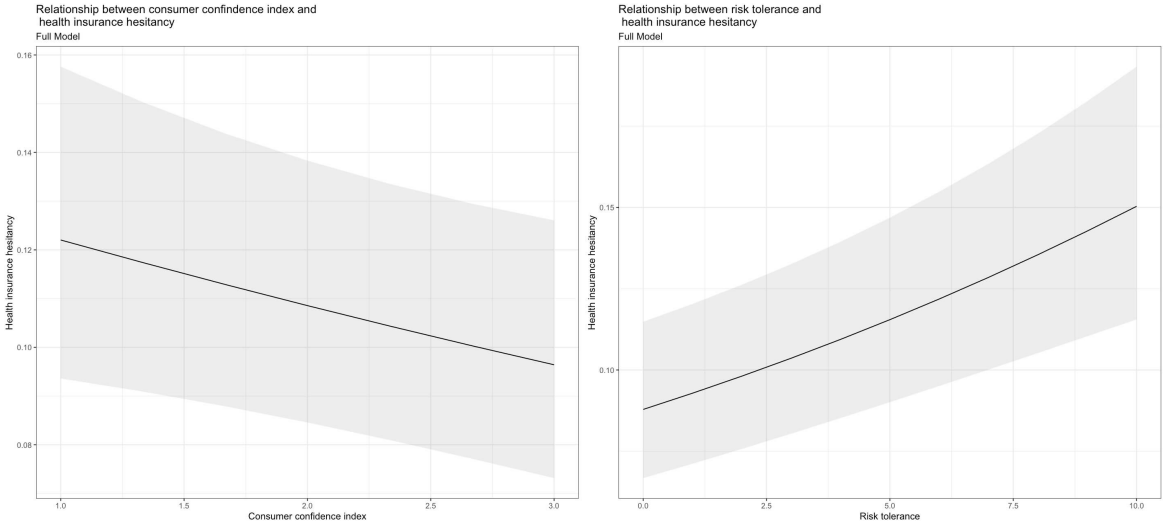

Figure 6 Predicted probabilities: Risk tolerance and Consumer confidence index. (2022 Survey of Consumer Finance. Source: Author's analysis)

6 Discussion

The logistic regression analysis results, a significant milestone in the research, validate the research hypotheses. They indicate that customer confidence and risk tolerance strongly influence health insurance hesitation across various racial groups, providing a robust foundation for the findings.

6.1 Validation of Hypothesis 1

The correlation between risk aversion and the probability of acquiring health insurance was established. Overall, The results demonstrate a distinct positive association between risk

tolerance and health insurance reluctance, particularly among White and Black populations, suggesting that persons with a greater capacity to tolerate risk are more prone to hesitancy when acquiring health insurance. This finding corroborates the notion that persons with lower risk aversion tend to give higher importance to immediate financial savings rather than the possible long-term advantages of insurance. In contrast, the reduced reluctance identified among persons with a greater aversion to risk indicates that they highly appreciate the financial stability offered by insurance.

6.2 Validation of Hypothesis 2

The impact of consumer confidence on purchasing health insurance was also validated, namely within the White and Black demographic segments. The observed inverse relationship between the Consumer Confidence Index (CCI) and health insurance hesitancy within these groups suggests that persons with greater confidence in their economic circumstances are less likely to hesitate to acquire insurance. These findings support the study's hypothesis that a positive economic outlook promotes a higher readiness to make significant financial obligations, such as obtaining health insurance. Notably, the Latino population exhibited a direct relationship between consumer confidence and reluctance, indicating that other socioeconomic variables could influence their insurance choices.

The investigation underscores the substantial influence of sociodemographic variables, including income, education, and unemployment, on the reluctance to obtain health insurance. Individuals with higher income and education levels exhibit less reluctance, supporting the notion that those with greater financial resources and education are more inclined to appreciate and acquire insurance. Conversely, unemployment amplifies reluctance, strengthening the correlation between economic stability and insurance purchasing. Additionally, age and marital status are important factors that significantly influence people's choices regarding health insurance. Elderly individuals aged 75 and above are more inclined to seek insurance, possibly due to increased health concerns commonly associated with this age group. However, married or cohabiting individuals show higher hesitancy levels than those who have never been married. This could be related to a perceived reliance on spousal support or shared financial responsibilities.

Analysis of racial disparities has shown that Black and Latino persons have greater degrees of reluctance to obtain health insurance in comparison to White individuals. This observation highlights systemic problems in healthcare accessibility and attitudes toward insurance among different racial groups. The existence of these inequalities highlights the necessity of implementing focused policy measures to mitigate the obstacles these groups encounter.

Subsequent investigations should employ longitudinal studies to monitor the enduring impact of the ACA on health insurance coverage and healthcare access in various states, particularly those with disparate Medicaid expansion. Conducting such studies would offer valuable information on the long-term effects of the ACA and help uncover ongoing issues related to healthcare coverage and access. Furthermore, studying the psychological obstacles that hinder individuals from enrolling in health insurance, such as fear, denial, and distrust of the healthcare system, could aid in creating interventions aimed at boosting enrollment rates. Examining the cultural and systemic elements that impact how different racial and ethnic groups perceive health insurance, especially in communities with hesitancy or unequal access to coverage, would establish a basis for developing policies and outreach initiatives that are culturally sensitive and aimed at expanding coverage.

7 Conclusion

This study aims to clarify the influence of consumer perceptions of economic conditions and personal risk preferences on the choices made about health insurance. The results validate that persons with greater optimism over their financial prospects are more inclined to obtain health insurance. In contrast, those with a more substantial capacity to accept risk tend to exhibit reluctance. Age, marital status, income, and education are significant socioeconomic determinants of attitudes toward insurance. Younger persons and those experiencing financial instability tend to exhibit greater degrees of reluctance. These findings emphasize the need to implement focused measures that tackle issues related to affordability and encourage thorough financial education.

An inherent constraint of this analysis is its exclusive concentration on the United States amidst the COVID-19 epidemic, exploiting data derived from the 2022 Survey of Consumer Finances. Furthermore, the study refrains from engaging in debates on political preferences,

ideologies, and the consequences of partisanship, as these aspects are not directly within its analytical framework. Notwithstanding these constraints, the research offers pertinent and practical observations on health insurance behavior, so helping endeavors focused on decreasing the number of individuals without health insurance and promoting macroeconomic stability.

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Conflict of interest

The author declares that there is no conflicts of interest. All research was conducted under the highest ethical standards, ensuring complete integrity and transparency.

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RESEARCH ARTICLE

Impact of online advertising on consumer buying behavior in Saudi Arabia: The moderating role of brand image

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Abstract: Online advertising plays a crucial role in shaping consumer buying behavior by influencing awareness, preferences, and purchase decisions. Building on the theory of planned behavior (TPB), this research examined the direct influence of online advertising dimensions of informativeness, credibility, creativity, entertainment, interaction, and integration on consumer buying behavior in Saudi Arabia, emphasizing the moderating impact of brand image. Using a quantitative research method, convenience sampling technique, and a survey questionnaire, 200 valid samples were collected and analyzed to fulfill the research objectives. The structural equation modeling findings showed that informativeness, credibility, creativity, and interaction had a significant influence on consumers buying behavior, while entertainment and integration had no significant impact. The moderating analysis indicated that brand image only strengthens the impact of informativeness, credibility, and interaction on consumer buying behavior. The findings of this research validate the importance of online advertising in influencing consumers' buying behaviors and urge online stores or e-commerce platforms to consider the informativeness, credibility, and interaction dimensions of their online advertising.

Keywords: online advertising, consumer buying behavior, brand image

1 Introduction

The development of e-commerce has caused a paradigm change in shopping from offline to online [1]. As a result, more people are becoming interested in making purchases online. Approximately 64% of the world's population utilizes the internet, and the number of people purchasing online is rising [2]. Online advertising often incorporates social proof elements, such as customer reviews, ratings, and endorsements [3]. Positive feedback and recommendations from others can significantly impact customers' trust and confidence in a product or service, leading to increased purchasing behavior. Online advertising enables customers to make purchases conveniently anywhere and anytime. Customers can explore products, compare prices, read reviews, and purchase online with just a few clicks. This accessibility and convenience play a significant role in influencing customers' purchasing behavior. When a consumer goes through Google or any other search engine, the different organizations advertise similar products simultaneously. Online advertising has a significant relationship with consumer buying behavior as it is very effective in changing the consumer's perception [4].

In the contemporary market, a consumer's perception, experience, feeling, or level of pleasure with a brand-equity product, along with their tastes and preferences, all play a significant role in determining their trends [5]. Dehghani and Tumer (2015) [6] explored the influence of Facebook advertising on consumer purchase intentions. They found that interactive and engaging advertising significantly increased consumers' buying intentions. Their study highlighted that consumers' familiarity with the brand, visual appeal, and interactive elements of Facebook ads positively influenced purchase behavior, suggesting that social media ads can effectively drive purchase intent when encouraging user interaction.

According to Hui and Salman (2023) [7], a customer's inclination to purchase is influenced by how they view a brand. Customers are more likely to interact and make purchases from a brand when they form a favorable association with it. Customers are likelier to stick with a brand after a good experience. Organizations that want to establish a strong brand image should create a favorable impression of their business through marketing initiatives, public relations,

and advertising [8]. As is evident, a brand represents more than just a company's or product name; it also connotes a culture, values, vision, mission, and personality. Another element influencing the company's brand equity is its image [9].

The current study contributes to extant online marketing and consumer behavior literature by examining the impact of online advertising on consumer buying behavior in Saudi Arabia, focusing on how brand image moderates this relationship. This study contributes to the literature by extending the Theory of Planned Behavior (TPB) through the integration of brand image as a moderating variable, offering a deeper understanding of how brand perceptions influence the impact of online advertising on consumer behavior. It enriches the cross-cultural applicability of TPB by focusing on Saudi Arabia, a context with unique cultural, social, and digital advertising dynamics, thereby addressing a gap in non-Western consumer behavior research. The study provides practical insights for marketers by highlighting strategies to optimize online advertising campaigns, emphasizing the importance of building a strong brand image to amplify advertising effectiveness. Additionally, it offers valuable guidance for businesses in emerging markets and informs policymakers on fostering ethical and effective online advertising practices. By exploring the interplay between online advertising, brand image, and consumer behavior, the study delivers theoretical, practical, contextual, and managerial contributions to the field.

2 Theoretical framework: Theory of planned behavior

This research employs the theory of planned behavior (TPB) to explain the impact of online advertising on consumers' buying behavior in Saudi Arabia, emphasizing the potential role of brand image. According to Kamal et al. (2021) [10], online advertising that resonates with personal values or preferences is particularly effective at increasing positive consumer attitudes, making them more likely to develop an intent to buy. Social media ads and influencer endorsements also serve as subjective norms, influencing consumers by aligning products with perceived social acceptance and popularity [11]. Additionally, perceived behavioral control, or consumers' confidence in their ability to complete online purchases, is heightened through ease-of-access features in online ads, such as simple checkout processes and mobile-friendly interfaces. As George (2004) [12] explains, consumers who feel empowered by the convenience and accessibility of online shopping are more likely to act on purchase intentions. Thus, online advertising effectively aligns with TPB principles to drive consumer buying behavior by addressing attitudes, subjective norms, and perceived control. Consumer purchasing behavior is a collection of mental, emotional, and physical processes people use to choose, acquire, use, and discard goods and experiences to satisfy their needs and desires [13]. For effective advertising, customer behavior needs to be investigated to comprehend why customers behave a certain way in different circumstances [14]. Digital advertising is the most effective technique to reach final consumers since consumers use digital tools and networks more than before [15]. Idow (2023) shows that while commercials greatly influence how consumers behave, such influence is not absolute. Even though ads can influence attitudes, raise awareness, use persuasion, and instill a feeling of urgency, they are not always able to accomplish their intended goals due to several obstacles and constraints [16].

This research argues that TPB provides a robust framework for understanding the impact of online advertising on consumer buying behavior in Saudi Arabia, with brand image as a moderating factor. TPB posits that behavior is influenced by three components: attitude toward the behavior, subjective norms, and perceived behavioral control (PBC), all of which shape behavioral intention and actual behavior. Online advertising can enhance positive attitudes by delivering engaging and informative content, align with subjective norms by leveraging social proof and cultural influences, and improve PBC by addressing barriers such as trust and accessibility. In this context, brand image plays a critical moderating role, amplifying or dampening the influence of these components. A strong brand image can strengthen the effects of attitudes, norms, and PBC on buying intentions, leading to higher purchase likelihood. Integrating TPB into your study offers a culturally relevant framework for analyzing the interplay between online advertising, consumer behavior, and brand image in Saudi Arabia.

3 Hypothesis development

This study predicts that the five dimensions of online advertising: informativeness, credibility, creativity, entertainment, interaction, and integration influence the Saudi consumers' buying behavior. Additionally, this research hypothesize that positive brand image might strengthen the positive influence of online advertising on consumers' buying behaviors in the Saudi context. In

a rapidly transforming digital market, Saudi consumers may respond uniquely to online ads, and this study sheds light on how a strong brand image could enhance ad effectiveness in this region. This insight provides value for marketers seeking to tailor online advertising strategies to Saudi consumers and researchers looking to expand the TPB in diverse cultural contexts, ultimately supporting more effective, culturally relevant digital marketing strategies. Figure 3.1 visualizes the conceptual framework and hypothetical relationships.

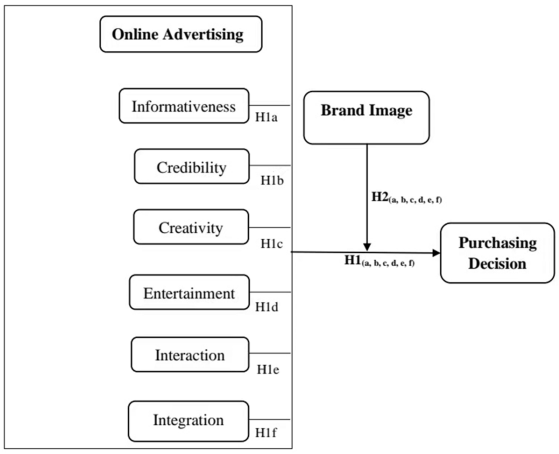

Figure 1 Proposed conceptual framework

3.1 Online advertising dimensions and consumer buying behavior

The ability of online vendors to generate and present creative and beneficial information to customers understandably is referred to as informativeness [17]. In online purchasing behavior, advertisement informativeness relates to how much information about goods and services is timely, relevant, correct, and valuable. It is centered on the educational and informative value of Internet ads for customers when they are making purchases. In their study on the effect of advertising value on user attitudes in Chinese online shopping, Zha et al. (2015) [18] identified informativeness and amusement as the characteristics of advertising value. Hidayat (2022) [19] shows that when consumers are presented with easy-to-access, helpful information about products and services through advertising, they are more inclined to conduct more research and make purchases immediately. Özturk et al. (2021) [20] put forth a pretty instructive statement regarding product offerings and encouraged customers to purchase the products immediately. According to Malafe et al. (2023) [21], inadequate information could disrupt customers' online buying patterns and prevent them from purchasing impulsively. Consequently, we put up the following hypothesis:

H1a: Informativeness has a positive influence on purchasing decisions among online buyers in Saudi Arabia.

Credibility refers to the audience's sense of dependability, integrity, confidence, and trust in advertising. Internet ads' general reliability and influence on customer behavior are called advertisement credibility. It considers how convincing the advertisements are at persuading people to buy things, how credible they are, how effective they are at influencing decisions, and how credible they are at causing impulsive purchases. Prior research [16] has demonstrated that trustworthiness can influence consumers' subsequent actions, which may include obtaining more information and ultimately deciding to purchase [22]. According to Qiu et al. (2021) [23], there is little doubt that the message's believability has the greatest impact on consumers' purchasing decisions.

H1b: Credibility has a positive impact on purchasing decisions among online buyers in Saudi Arabia.

The originality and inventiveness of advertising content that makes it visually appealing, captivating, uncommon, and unexpected is advertising creativity in online buying. Innovative concepts and narrative strategies are used in creative ads to make them stand out and sway impulsive purchases. In addition to meeting consumer demands, well-crafted creative ads provide pertinent information and focused solutions that encourage impulsive purchasing. Numerous more studies [24, 25] have demonstrated that inventive advertising may grab and hold customers' attention, resulting in immediate purchases. Creative advertising with enticing promotional offers pushes internet shoppers to purchase things so they may start enjoying them

right away [26]. Consequently, we put up the following hypothesis:

H1c: Creativity has a positive impact on purchasing decisions among online buyers in Saudi Arabia.

Since online shopping has become a form of entertainment, shopping is a latent kind of entertainment mirrored by the hedonic tendency, shown by heightened stimulation and association [21]. The goal of entertainment through advertising is to maintain viewer interest and elicit positive consumer feelings toward specific goods and services [27]. Zhang et al. (2023) [28] further note that hedonistic internet shoppers seek distinctive experiences that heighten their enjoyment of online buying. As a result, we put up a hypothesis that goes as follows:

H1d: Entertainment has a positive effect on purchasing decisions among online buyers in Saudi Arabia.

The user's involvement in prompt conversation with mediated others is known as interactivity. In the context of online purchasing behavior, "advertising interaction" refers to consumers' individualized relationship and interaction with adverts. Customers see advertising as a way to enhance their quality of life, and interactive ads present creative fixes that can raise their living standards. Online communities' participatory environment affects social consciousness and pushes customers to make impulsive, unplanned purchases [29]. As a result, more engagement with online merchants can lead to a happier experience. People are more likely to make impulsive purchases if the online seller brand is highly engaging, according to Gligor and Bozkurt (2021) [30]. Consequently, we put up the following hypothesis:

H1e: interaction has a positive influence on purchasing decisions among online buyers in Saudi Arabia.

In the context of advertising, social integration is the process of incorporating marketing messages into social media platforms and utilizing user-generated content, social media influencers, and other strategies to expand the visibility and impact of those messages. The benefit of this integration is that it may reach a broad and interested audience in a trustworthy and tailored way, increasing brand knowledge and loyalty and eventually driving sales. According to earlier studies, social integration favors advertisement environments [31]. Social integration positively impacts advertising, which influences customers' impulsive purchasing behavior [32]. Thus, given that people view advertising messages as genuine, the following hypothesis is put forth:

H1f: Integration has a positive impact on purchasing decisions among online buyers in Saudi Arabia.

3.2 Moderating role of brand image

The characteristics of a brand that determine its placement in the market and have the potential to influence its performance are its strength, distinctiveness, and quality [33]. The brand image holds that various elements, such as product packaging, product experience, brand awareness, consumer confidence, etc., substantially impact purchasing behavior. A strong and positive brand image acts as a catalyst, reinforcing the credibility of the advertised content and fostering a sense of trust. In such cases, online advertising serves to create awareness and leverage the existing positive associations with the brand, influencing purchasing behavior in a more direct and impactful manner. Conversely, a negative or inconsistent brand image can be a moderator in the opposite direction.

Nonetheless, if the customer feels that the brand image is consistent with their self-idea, they will have a more positive perception of the brand in whatever context [7]. Businesses can assess how brand image affects customer satisfaction by comparing the views of current and prospective customers. Customer satisfaction highly depends on brand image in the grocery shop, bank, landline, mobile, and electronic banking industries. The study confirmed the dominating value of the brand image in predicting consumer contentment in the hotel business. The four components of store image were classified as shop infrastructure, convenience, store service, and sales activities [34].

According to a brand image study, customers think highly of how a business displays itself to the public. Grocery stores must have a good reputation to draw in and keep consumers. E-commerce companies' surveys have verified that customer loyalty to a brand, even when shopping online, is correlated with how consumers perceive that brand [5]. A product's image among consumers is influenced by its advertising. Because advertising presents a positive or negative impression of a product and is the most effective marketing technique, it significantly impacts customer purchases [35]. Online advertising efforts that consistently align with and

reinforce the established brand image help create a sense of stability and reliability for consumers. This stability can moderate the impact of external factors on purchasing behavior, as consumers may be more likely to rely on their perceptions of the brand, shaped by a consistent brand image when making purchase decisions.

According to Guliyef (2023) [36], brand image greatly influences customers' purchasing decisions and behaviors. Azerbaijani consumers, particularly the younger generation, strongly prefer branded products due to their awareness of their social position, which also greatly influences their brand perception and shopping habits. The perception that a certain group has of a product, brand, policy, business, or event nation is the focus of the brand image [37]. Brand image is the foundation for more informed strategic marketing decisions concerning a product's positioning and market segmentation.

This study argues that brand image can play a moderating role in online advertising and consumer behavior. In conclusion, a positive brand image can enhance the effectiveness of online advertising by influencing consumer perceptions, attitudes, and behaviors. It acts as a filter through which consumers interpret and respond to advertising messages, ultimately shaping their actions and decisions. Based on the above argumentations, this study intends to empirically test the following sub-hypotheses:

H2a: brand image has a positive moderating influence on the relationship between advertising informativeness and purchasing decisions.

H2b: brand image has a positive moderating influence on the relationship between advertising credibility and purchasing decisions.

H2c: brand image has a positive moderating influence on the relationship between advertising creativity and purchasing decisions.

H2d: brand image has a positive moderating influence on the relationship between advertising entertainment and purchasing decisions.

H2e: brand image has a positive moderating influence on the relationship between advertising interaction and purchasing decisions.

H2f: brand image has a positive moderating influence on the relationship between advertising integration and purchasing decisions.

4 Methods

This study uses a quantitative research method to examine the direct relationship between online advertising and customer purchasing behavior and the indirect effect of brand image as a moderating variable on this relationship. The data collection will be undertaken using a survey questionnaire with a sample size of 200 customers in Saudi Arabia. Convenience sampling was used to select the research respondents. SPSS will be used to analyze data and report findings using descriptive statistics and regression analysis.

4.1 Target population and sampling approach

Given the main aim of this research, which is to examine the impact of online advertising on consumer purchasing decisions, the target population would typically include individuals exposed to online advertisements. Additionally, the target population would encompass individuals actively engaged with online platforms and exposed to various online advertisements. This group could consist of internet users across different demographics, such as age, gender, income level, geographic location, and online shopping behavior. Researchers would aim to study how online advertising influences the purchasing decisions of this specific group to draw meaningful insights and conclusions.

This study used a convenience sampling technique. When using a convenience sample to examine the impact of online advertising on purchasing decisions, researchers typically opt for a readily available group of participants who are easily accessible or convenient to reach. Convenience sampling can be efficient and cost-effective but may not always represent the broader population accurately. In the context of online advertising impact, a convenience sample could involve individuals accessible through online platforms or social media channels, such as participants from an online community or followers of a specific brand's social media page. This sample consists of 200 consumers who are already active online consumers and regularly interact with digital advertisements. By focusing on this group, researchers can potentially gain insights into how online advertising influences the purchasing decisions of individuals

more inclined to engage with such content. However, the findings may not be generalizable to the broader population as convenience samples often lack diversity and may not adequately represent varying demographics or consumer behaviors.

4.2 Survey questionnaire and data collection procedure

The first part of the questionnaire requested the respondents to reveal their socio-demographic characteristics, such as gender (male or female) and age group (18-25, 26-35, 36-451, Above 45). In addition, education level (high school /diploma, Bachelor's degree, Master's degree, and Doctorate/Ph.D), and occupation (government sector, private sector, and self-employed), as well as monthly income range (Saudi Riyal), (Less than 5000, 5000-10000, 10000-15000, and above 15000). The second part of the questionnaire asked participants to rate their responses based on the five-point Likert Scale (1 Strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree).

Given their widespread use in Saudi Arabia, a total of 319 surveys were distributed using social media tools such as Facebook, WhatsApp, and Instagram. Out of the 319 surveys, 223 were returned. After data cleaning and removing the incomplete questionnaires, a total of 200 samples (response rate 62.6%) were used for data analysis.

4.3 Measures

The construct of online advertising was measured using six dimensions, namely informativeness, credibility, creativity, entertainment, interaction, and integration, developed by Wang and Sun (2010) [38]. Consumer buying behavior was measured using three items designed by Duffett (2015) [39]. Finally, this study adopted the four items of brand image construct developed by Spears and Singh (2004) [40].

5 Findings

5.1 Socio-demographic characteristics

Table 1 lists the socio-demographic characteristics of the respondents. For participant's gender, 74% of the valid sample are males while 26% are females. Such findings indicate that males are more active online shopping than females in Saudi Arabia. For respondents, 36% were aged between 26 and 35 years, followed by 32% aged between 18 and 25. Such findings indicate that the majority of online consumers are categorized as the young generation. For educational background, 73% of the participants hold a bachelor's degree, followed by 15% with a master's degree. For occupation, approximately 63% work in the private sector, while 28% work in the government sector. Finally, 47% of the study sample receives individual income ranging between 10000 and 15000 Saudi riyals, followed by 32% with income levels of 5000 and 10000 Saudi riyals.

Table 1 Socio-demographic characteristics (n = 200)

Characteristics	Categories	Frequency	Percent
Gender	Male	148	74
	Female	52	26
Age	18-25	64	32
	26-35	72	36
	36-45	42	21
	Above 45	22	11
Education Level	High school/ diploma	16	8
	Bachelor's degree	146	73
	Master's degree	30	15
	Doctorate/Ph.D.	8	4
Occupation	Government Sector	56	28
	Private Sector	126	63
	Self-employed	18	9
Monthly income range (Saudi Riyal)*	Less than 5000	16	8
	5000-10000	64	32
	10000-15000	94	47
	More than 15000	26	13

Note: 1 Saudi Riyal = 1.92 Yuan.

5.2 Descriptive and correlations analysis

AMOS 24.0 and SPSS 25 were used for data analysis. The SPSS results for the correlation analysis and descriptive statistics are shown in Table 2. This study used Herman's one-way test, based on the research of Podsakoff et al. (2012) [41], to investigate the possibility of common method bias. Common method variance and confirmatory factor analysis tests were performed to ensure that the results were unaffected by common method effects, given the self-reported character of the employed measurement scales.

Table 2 Descriptive and correlations analysis

Variables	M	SD	1	2	3	4	5	6	7	8
1. INFR	3.79	1.12	–							
2. CRDB	3.88	1.14	0.037	–						
3. CRTV	3.72	1.023	0.016	0.218	-		.			
4. ENTR	3.77	1.072	0.050	0.104	0.429	–				
5. INTR	4.01	1.524	0.077	0.077	0.080	0.104	–			
6. INTG	3.84	0.984	0.099	0.036	0.102	0.077	0.080	–		
7. BRIM	3.69	1.373	0.106	0.439**	0.328**	0.036	0.102	0.079	–	
8. PRBH	3.75	1.129	0.226**	0.329**	0.226**	0.439**	0.228**	0.193*	0.211**	–

Note: n = 200. INFR = informativeness, CRDB = credibility, CRTV = creativity, ENTR = entertainment, INTR = interaction, INTG = integration, BRIM = brand image, and PRBH = purchasing behavior. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

AMOS 24.0 was used to design and test the structural equation model, in which the dependent variable was the consumer purchasing decision, and the independent variables were informativeness (INFR), credibility (CRDB), creativity (CRTV), entertainment (ENTR), interaction (INTR), and integration (INTG). Finally, the moderating variable is the brand image. The results of the correlation, standard deviation, and mean scores are summarized in Table 3. According to correlation analysis, consumer purchasing decision was positively associated with informativeness ($r = 0.226$, $p < 0.01$), credibility ($r = 0.329$, $p < 0.001$), creativity ($r = 0.226$, $p < 0.01$), entertainment ($r = 0.228$, $p < 0.01$), interaction ($r = 0.193$, $p < 0.05$), and integration ($r = 0.211$, $p < 0.01$).

5.3 Confirmatory factor analysis

To investigate the discriminant validity between the constructs and the associated measurement parameters of each construct, CFA was carried out using AMOS 24.0. Accordingly, major fit indices such as RMSEA, IFI, TLI, and CFI were used to compare the model fits of various models [42]. The one-way Herman test was used to perform the confirmatory factor analysis.

Table 3 Results of confirmatory factor analysis

Model	x^2	df	x^2/df	RMSEA	IFI	TLI	CFI
Three-factor model	1,738	344	5.052	0.124	0.764	0.749	0.761
Two-factor model	2,209	347	6.366	0.149	0.631	0.618	0.643
One-factor model	3,258	351	9.282	0.175	0.472	0.456	0.485

According to the findings, the six factors had eigenvalues greater than 1, and their cumulative variance was 69.271%. Furthermore, the first factor's reported cumulative variance was 29.825%, less than the crucial figure of 40%. Thus, our study did not contain the common technique bias. The six constructs are empirically distinct, according to the CFA results displayed in Table 3. Additionally, the three-factor model's results better fit the data when compared to alternative models ($X^2 = 1.738$, df = 344, RMSEA = 0.124, IFI = 0.764, TLI = 0.749, CFI = 0.761).

5.4 Hypothesis testing

AMOS 24.0 version was used to conduct path analysis to test research hypotheses. The H1a hypothesis predicted that informativeness positively influences consumers' purchasing decisions in Saudi Arabia. Structural equation modeling findings shown in Table 4 indicated that informativeness significantly influences consumer purchasing decisions ($b = 0.262$, $p < 0.001$). Hence, H1a is accepted. The H1b hypothesis suggested that credibility positively affects consumers' purchasing decisions in Saudi Arabia. SEM results indicated that credibility had a significant positive impact on consumer purchasing decisions ($b = 0.418$, $p < 0.001$); therefore, H1b is approved. The H1c hypothesis predicted that creativity positively impacts consumers' purchasing decisions in Saudi Arabia. The SEM findings revealed that creativity

significantly impacted consumer purchasing decisions (b = 0.217, p < 0.001). Such finding leads to accepting hypothesis H1c. The H1d hypothesis predicted that entertainment positively affects consumers' purchasing decisions in Saudi Arabia. SEM findings showed that entertainment was not significantly influencing consumer purchasing decisions (b = 0.103, p < 0.218), and therefore, H1d declined.

Table 4 Results of the hypotheses testing

Path relationship	Coeff	SE	t	P-value	Results
INFR → PRBH	0.356***	0.078	4.761	0.000	Supported
CRDB → PRBH	0.418***	0.088	5.216	0.000	Supported
CRTV → PRBH	0.217***	0.131	2.447	0.002	Supported
ENTR → PRBH	0.103	0.678	1.261	0.218	Declined
INTR → PRBH	0.315***	0.139	3.418	0.000	Supported
INTG → PRBH	0.097	0.886	0.956	0.317	Declined

Note: n = 200. INFR = informativeness, CRDB = credibility, CRTV = creativity, ENTR = entertainment, INTR = interaction, INTG = integration, and PRBH = purchasing behavior. * p < 0.05, ** p < 0.01, *** p < 0.001.

H1e hypothesis suggested that interaction has a positive influence on the purchasing decisions of consumers in Saudi Arabia. SEM findings (see Table 5) reported that interaction had a significant positive impact on consumer purchasing decisions (b = 0.315, p < 0.001), and therefore, H1e is accepted. The H1f hypothesis predicted that integration positively impacts the consumers purchasing decisions in Saudi Arabia. The SEM findings revealed that integration had no significant on consumer purchasing decisions (b = 0.097, p < 0.317). This leads to rejecting hypothesis H1f.

Indirect path analysis was employed to investigate the moderating effect of brand image. According to Hypotheses H2a, H2b, H2c, H2d, H2e, and H2f, the degree of evaluating the importance of brand image determines the strength of the impact of online advertising dimensions on the consumer's purchase decision in the Saudi context. The moderating effect of brand image was computed based on 95% confidence intervals and 5,000 bootstraps. The findings showed brand image strengthens the impact of that informativeness, credibility, and interaction on consumer purchase decisions (effect value = 0.228, with a 95% confidence interval of LLCI value 0.115 and ULCI 0.322), (effect value = 0.351, with a 95% confidence interval of LLCI value 0.179 and ULCI 0.406), (effect value = 0.234, with a 95% confidence interval of LLCI value 0.192 and ULCI 0.462) respectively.

Table 5 Results of testing the hypotheses (moderating effects)

Path relationships	SE	Effect	P-value	Bootstrapping 95% CI		Result
				LLCI	ULCI	
INFR * BRIM® PRBH	0.069	0.228	0.002	0.115	0.322	Supported
CRDB * BRIM → PRBH	0.084	0.351	0.000	0.179	0.406	Supported
CRTV * BRIM → PRBH	0.058	0.672	0.438	-0.046	-0.037	Declined
ENTR * BRIM → PRBH	0.172	1.425	0.087	-0.013	-0.018	Declined
INTR * BRIM → PRBH	0.195	0.234	0.026	0.192	0.462	Supported
INTG * BRIM → PRBH	0.058	0.583	0.283	-0.067	-0.043	Declined

Note: n = 200. INFR = informativeness, CRDB = credibility, CRTV = creativity, ENTR = entertainment, INTR = interaction, INTG = integration, and PRBH = purchasing behavior. * p < 0.05, ** p < 0.01, *** p < 0.001.

On the other hand, the bootstrapping results indicated that brand image had no significant influence on the relationship between creativity, entertainment, and integration; and consumer purchasing decision (effect value = 0.672, with a 95% confidence interval of LLCI value -0.046 and ULCI -0.037), (effect value = 1.425, with a 95% confidence interval of LLCI value -0.013 and ULCI -0.018), (effect value = 0.583, with a 95% confidence interval of LLCI value -0.067 and ULCI -0.043) respectively.

6 Discussion

The empirical findings showed that informativeness, credibility, creativity, and interaction positively impacted purchasing decisions among online buyers in Saudi Arabia. In contrast, entertainment and integration dimensions had no influence. The important role of online advertising creativity in driving customer purchasing decisions is well recognized in the extant literature [24–26]. The findings of the positive impact of informativeness on consumers purchasing decisions are consistent with extant literature [18–20,39]. Similarly, the positive influence of

the credibility of online advertising on consumer purchasing decisions is well established in the academic literature [16, 22, 23]. Credibility and creativity are two characteristics of advertising value that academics have included in their studies of how advertising value affects impulsive purchasing [21].

Surprisingly, the entertainment of online advertising had no significant influence on purchasing decisions. This finding is incompatible with the relevant studies that advocate the importance of entertainment [21, 28]. Similarly, integration had no significant effect on purchasing decisions in Saudi Arabia. This finding contradicts existing literature [31, 32]. Finally, the interaction dimension of online advertising influences customers' purchasing decisions. These results are consistent and similar to current studies [29, 30]. According to Feng et al. (2023) [43], Chinese consumers' online buying behavior is favorably influenced by informativeness, credibility, creativity, entertainment, integration, and the desire to make an online purchase. These factors also significantly impact the impulse to make an online purchase. Advertisers must balance engaging their audience and respecting their privacy to maintain a positive user experience. As the digital landscape evolves, staying informed about emerging trends and technologies is crucial for advertisers to adapt and stay competitive in the dynamic online advertising space. According to Emuobosa et al. (2023) [44], consumers are aware of the several types of digital advertising available, including pay-per-click, social media, email, pop-up, and search engine optimization. Hence, we may argue that online advertising has revolutionized how businesses connect with their target audience.

Wang and Sun (2010) [38] examined consumer attitudes toward online advertising across the U.S., China, and Romania to assess how beliefs and cultural differences affect behavior. They found that consumers in different countries respond uniquely to online ads based on their cultural and social attitudes. Positive attitudes toward online advertising were associated with an increased likelihood of buying behavior, while negative beliefs about ad intrusiveness or dishonesty reduced ads' effect on buying decisions. Boateng and Okoe (2015) [45] investigated consumer attitudes towards social media advertising and its impact on buying behavior. They found that consumers who viewed social media ads as informative and credible were likelier to respond positively and consider purchasing.

The moderating analysis underlined that brand image strengthen the positive impact of informativeness, credibility and interaction on the purchasing decisions among online buyers in Saudi Arabia. Different studies acknowledged the importance of brand image in positively influencing customers' decision-making [7, 33, 35, 36]. Hence, this study validates the positive moderating impact of brand image on the relationship between online advertising and customer purchasing decisions.

7 Implications

The structural equation modelling results revealed that consumer behavior is positively associated with the four dimensions of online advertising: informativeness, credibility, creativity, and interaction. Hence, online stores or e-commerce platforms need to enhance informativeness by providing detailed product information, specifications, and reviews to help customers make informed purchase decisions. In addition, build Credibility by Showcasing customer testimonials, reviews, and ratings to establish trustworthiness. Further, foster creativity by designing an engaging, visually appealing website layout that reflects your brand identity. Moreover, encourage interaction by providing multiple channels for customer support, including live chat, email, and social media, to address queries and concerns promptly. Finally, online stores or e-commerce platforms need to consider the importance of brand image as perceived by the customer and acknowledge its importance in driving their purchase decisions. Therefore, firms must ensure that your brand message is clear, cohesive, and consistent across all communication channels, including website content, social media, advertising, and customer interactions. Firms can strengthen the image of their brads by monitoring online reviews, feedback, and social media mentions to address any negative feedback promptly and maintain a positive brand reputation. In sum, online stores need to engage with your audience through interactive and personalized experiences, such as social media contests, user-generated content campaigns, and loyalty programs.

The study concludes that online advertising presents most of the consumer's buying behavior and is a significant factor in predicting consumer behavior. This implies that companies should invest more in online advertising to increase their market share and conduct market research on the different markets in various countries to ensure that the online advertisement initiatives being implemented suit the targeted markets to improve product purchases. By focusing on

these recommendations and continuously improving the informativeness, credibility, creativity, and interaction aspects of your e-commerce platform, you can effectively influence purchasing decisions among online buyers in Saudi Arabia and enhance their overall shopping experience.

8 Limitations and future research

This study uses convenience sampling that restricts the generalization of the results. Future studies using ransom sampling will reveal a realistic scenario for the phenomenon. More demographic characteristics of the sample may be included in future research. In addition, choices regarding media preferences and purchasing practices can be a new avenue for further research. A potential limitation of this study is its focus on consumer buying behavior in Saudi Arabia, which may limit the generalizability of the findings to other cultural or regional contexts with different consumer dynamics and digital advertising trends. Additionally, the study primarily examines the moderating role of brand image, potentially overlooking other influential factors such as consumer trust, product quality, or price sensitivity that could mediate or moderate the relationship between online advertising and buying behavior. Future research could explore these additional variables to provide a more comprehensive understanding of consumer responses to online advertising. Moreover, cross-cultural comparative studies could assess whether the proposed model holds across different regions or industries, offering broader insights into the effectiveness of online advertising in diverse market environments.

9 Conclusion

This research examined the direct impact of online advertising dimensions of informativeness, credibility, creativity, entertainment, interaction, and integration on the Saudi consumer buying behavior with an emphasis on the potential moderating role of brand image. Building on a quantitative research method, convenience sampling technique and use of survey questionnaires, a total of 200 valid surveys were collected and analyzed to fulfill the research objectives. The structural equation modeling was used to report the findings of this research. Empirical findings revealed that four dimensions of online advertising namely informativeness, credibility, creativity, and interaction had a significant positive impact on consumers buying behavior, while entertainment and integration had no significant impact. In addition, the moderating analysis indicated that brand image only strengthens the impact of three dimensions of online advertising: informativeness, credibility, and interaction on consumer buying behavior. The findings of this research validate the importance of online advertising in influencing consumers' buying behaviors and urge online stores or platforms to consider the informativeness, credibility, and interaction dimensions of their online advertising.

Conflicts of interest

The author declares there is no conflict of interest.

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