QUALITY FINANCIAL INCLUSION, FINANCIAL VULNERABILITY, AND SUBJECTIVE WELL-BEING: EVIDENCE FROM SOUTH AFRICA

by

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Dissertation presented for the degree of

Doctor of Philosophy (Ph.D.) in Development Finance

in the Faculty of Economics and Management Studies

at the University of Stellenbosch

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March 2023

DECLARATION: PLAGIARISM

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Date: September 2022

ABSTRACT

Financial inclusion has been at the forefront of the policy agenda in many developing countries due to its potential to improve consumers' welfare as indicated by, for example, subjective well-being, financial vulnerability, and financial resilience. Beyond the provision of basic financial products, the policy is shifting to improving the quality of financial inclusion which refers to the use of diversified financial products that are flexible, easy to understand, appropriate, and affordable. This is important considering that although 84% of adults in South Africa own bank accounts, consumers remain financially vulnerable, and the subjective well-being of consumers, measured by life satisfaction, remains lower relative to other emerging and developed economies. Moreover, only 18% of consumers in South Africa can raise emergency funds which might make it difficult for them to be financially resilient to adverse shocks. The need for financial resilience has been brought to the fore by the recent COVID-19 pandemic which rendered many consumers in South Africa unable to meet basic living costs.

To understand how quality financial inclusion could enhance subjective well-being, bolster financial resilience, and reduce the financial vulnerability of consumers, the thesis has been divided into four empirical chapters. The study is based on the FinScope 2015 consumer survey of South Africa except for chapter three where the FinScope 2021 consumer survey of South Africa was used.

The first empirical chapter computed a multi-dimensional demand-side measure of quality financial inclusion using polychoric principal component analysis. This composite index of quality financial inclusion was more comprehensive than previous measures since it captured indicators of affordability, flexibility, and appropriateness which had been excluded in previous composite indices. This is pertinent because an indicative measure of one's inclusion in the financial system should capture as many dimensions as possible. Moreover, the inclusion of these dimensions is consistent with the utility maximisation theory, bounded rationality theory, and preference for flexibility theory which suggest that consumers derive value from using financial products that are affordable, appropriate, and flexible. Employing an ordinary least squares regression, the results suggest that females had higher quality financial inclusion than males while bank distance was a statistically insignificant determinant. The proposed index of quality financial inclusion could be used by researchers in assessing how a broader focus on financial inclusion influences consumers' welfare.

The second empirical chapter examined the impact of quality financial inclusion on consumers at various levels of financial vulnerability. The link between the use of financial products and financial vulnerability is explained by the capital conduit theory, social insurance theory, and debt intermediation theory. These theories assert that insurance hedges the risk of unforeseen life events while saving platforms and credit can help consumers to invest in income-generating projects, which contribute to lower financial vulnerability. However, previous composite measures of financial vulnerability excluded dimensions of saving vulnerability and lifestyle vulnerability. Therefore, this study makes a methodological contribution by computing an index of financial vulnerability that captures dimensions of saving vulnerability, expenditure vulnerability, and lifestyle vulnerability. Moreover, unlike previous studies that relied on single indicators or narrower indices of financial inclusion, the study extends extant literature by examining the link between a broader measure of quality financial inclusion and consumer financial vulnerability. The results from the method of moments quantile regression analysis showed that consumers with the highest quality of financial inclusion (top 20%) were less financially vulnerable, but this was less pronounced among the more vulnerable consumers. Implicitly, policymakers and financial institutions need to improve the quality of financial inclusion as this contributes to the enhancement of consumers' welfare through the mitigation of financial vulnerability.

The third empirical chapter examined the role of various channels of financial inclusion in building financial resilience to the COVID-19-induced income shock. The link between financial product use and financial resilience is explained by social insurance theory, risk-sharing models, and precautionary saving theory. These theories suggest that consumers can become financially resilient to shocks by purchasing insurance, receiving remittances, and postponing current consumption. However, previous studies focused on the role of financial inclusion on financial resilience to agricultural sector-specific shocks and region-specific shocks. Therefore, the current study contributes to the literature by examining the various channels of financial inclusion through which consumers enhanced their financial resilience to the nationwide COVID-19 pandemic that reduced the income of most consumers. Results from propensity score matching suggested that consumers that employed formal channels to save, insure and borrow did not experience a statistically significant decline in consumption after the COVID-19-induced income shock. Also, a robustness check showed that indebted consumers employing both formal and informal channels were not financially resilient to the COVID-19-induced income shock. These results suggest that policymakers ought to increase access to

formal financial services and complement it with financial education programs targeting debt management to build financial resilience to adverse economic shocks in the future.

The fourth empirical chapter contributed to the empirical literature by examining whether an improvement in the quality of financial inclusion could indirectly enhance the subjective well-being of consumers via asset accumulation. The study was based on the theory of institutional saving, Quach's (2016) theoretical model, and social insurance theory which suggests that saving, credit, and insurance could improve asset ownership. In turn, an increase in asset endowment could enhance the subjective well-being of consumers according to the asset effects theory. To this end, the chapter extends previous literature that had only examined how various channels of financial inclusion had influenced asset accumulation by examining whether this, in turn, improves the subjective well-being of consumers. The results from the partial least squares path model suggested that an increase in the quality of financial inclusion had a positive indirect effect on the subjective well-being of consumers via asset accumulation. The implication to social policymakers is that an improvement in the quality of financial inclusion could indirectly enhance the subjective well-being of consumers via asset accumulation.

The overarching evidence presented in this thesis suggests that an improvement in the quality of financial inclusion can play a significant role in reducing financial vulnerability and indirectly improving the subjective well-being of consumers via asset accumulation. Moreover, the evidence emerging from the study suggests that increased access to formal financial services bolsters consumers' financial resilience and prepares them against future economic shocks. Noteworthy, the study relied on a cross-sectional dataset of South Africa hence future studies should employ panel data to assess the dynamic link between quality financial inclusion, financial vulnerability, and subjective well-being.

Keywords: quality financial inclusion, financial vulnerability, subjective well-being, financial resilience, shock, South Africa

OPSOMMING

In onlangse dekades was finansiële insluiting ’n prioriteit vir die sentrale banke van ontwikkelende lande en internasionale ontwikkeling-finansieringsinstellings. Boonop het die Suid-Afrikaanse regering finansiële insluiting bevorder, wat gelei het tot ’n sterk toename in die proporsie Suid-Afrikaners met toegang tot finansiële dienste. In Suid-Afrika het bankrekening-eienaarskap gestyg tot 85% in 2021 van 54% in 2011. Dit is egter nie geëwenaar deur verbetering in belangrike verbruikerswelstand-aanduiders, soos finansiële kwesbaarheid, finansiële veerkragtigheid, opbou van bates en subjektiewe welstand nie. Byvoorbeeld, slegs 18% van Suid-Afrikaners kan noodfondse vind na ’n negatiewe skok, terwyl die subjektiewe welstand van Suid-Afrikaners redelik laag is in die lig van ’n lewensbevrediging-koers van gemiddeld 4.7 in vergelyking met OESO se 6.5 op ’n skaal van 0-10. Gegewe dat blote bankrekening-eienaarskap dalk nie ’n aanwyser is van verbeterde welvaart nie, word ’n breër fokus op die kwaliteit van finansiële insluiting benodig deur beleidmakers en hoe dit verbruikerwelvaart-aanwysers raak uit ’n vraagkant-perspektief. Boonop moet beleid die kanale waardeur finansiële insluiting hierdie aanwysers positief kan beïnvloed, beklemtoon.

Om te verstaan hoe finansiële insluiting belangrike verbruikerwelvaart-aanwysers kan beïnvloed, is die empiriese studie in hierdie tesis in vier dele gestruktureer, elk waarvan uiteengesit is in ’n tesis-hoofstuk. Daarom verduidelik Hoofstuk 2 hoe die eerste deel van die studie die FinScope 2015 Suid-Afrikaanse verbruikersopname aangewend het om ’n omvattende indeks te bereken van kwaliteit finansiële insluiting uit ’n vraagkant-perspektief met die gebruik van ’n polichoriese hoofkomponent-analise. Met gebruik van hierdie indeks is ’n heteroskedasties-konsekwente gewone kleinste kwadrate regressie bereken om die demografiese bepalers van finansiële insluiting te ondersoek.

Die resultaat het getoon dat verdieners van hoër inkomste, vroue, mense wat in diens is, die finansieel geletterdes, en opgevoede verbruikers hoër finansiële insluiting ervaar. Bank-afstand en ouderdom was egter nie bepalers van verbruikers se finansiële insluiting nie. Hierdie resultate dui dus aan dat die finansiële insluiting van verbruikers in Suid-Afrika verhoog kan word deur ongelykheid van inkomste te verminder, toegang tot opvoeding te verhoog, finansiële infrastruktuur in landelike gebiede uit te brei, en finansiële geletterdheid-programme uit te brei.

Met die gebruik van die kwaliteit finansiële insluitingsindeks, die ontwikkeling waarvan in Hoofstuk 2 van die tesis uiteengesit word, het die tweede deel van die studie ondersoek hoe

kwaliteit finansiële insluiting verbruikers op verskeie vlakke van finansiële kwesbaarheid geraak het. Hierdie fokus op finansiële kwesbaarheid, wat uiteengesit is in Hoofstuk 3, was pertinent omdat die hedoniese siening van subjektiewe welstand aanneem dat laer finansiële kwesbaarheid bydra tot hoër subjektiewe welstand. Om die ondersoek uit te voer is ’n omvattende kwesbaarheid-indeks bereken met gebruik van ’n polichoriese hoofkomponent-analise. Daarna, met gebruik van die FinScope 2015 opname-data, is die impak van kwaliteit finansiële insluiting op verbruikers op verskillende vlakke van finansiële kwesbaarheid ondersoek deur die gebruik van kwantiele regressie-analise. Die resultate het aangedui dat slegs die top 20% van finansieel-ingeslote verbruikers ’n aansienlik laer kwesbaarheid gehad het en dat meer kwesbare verbruikers minder gebaat het uit finansiële insluiting as minder kwesbares. Die resultaat dui dus aan dat bestuurders van finansiële instellings ’n voetsoolvlak-benadering moet gebruik in die ontwerp van kwaliteit finansiële produkte wat die finansiële kwesbaarheid van alle verbruikers kan verminder. Die resultate het ook aangetoon dat vroue, meer opgevoede individue, ryker verbruikers, en die finansieel geletterdes minder kwesbaar was in vergelyking met ander demografiese kategorieë. Daarom kan beleide wat poog om inkomste-ongelykheid te verminder, om ongelykheid in toegang tot opvoeding te versag en finansiële opvoeding te verhoog, help om verbruikers se finansiële kwesbaarheid te verminder.

Die derde deel van die studie, wat uiteengesit is in Hoofstuk 4 van die tesis, het die FinScope opname van Suid-Afrika gebruik om die impak van finansiële insluiting op finansiële veerkragtigheid teen die COVID-19 skok te ondersoek deur gebruik te maak van buur-passing en kern-passing. Die resultate dui aan dat informele spaargeld, krediet en versekering gelei het tot laer verbruik ná die COVID-19-geïnduseerde inkomste-skok. Daar was egter geen statisties betekenisvolle afname in verbruik ná die COVID-19-geïnduseerde skok onder verbruikers wat formele spaargeld, krediet en versekering gebruik het nie. Verdere analise het aan die lig gebring dat verbruikers met skuld wat informele spaargeld, krediet en versekering gebruik het, nie basiese lewenskoste kon behartig ná die COVID-19-geïnduseerde inkomste-skok nie, anders as skuld-vrye verbruikers. Daarom moet beleidmakers in Suid-Afrika, afgesien van bevordering van die gebruik van formele finansiële produkte, ook finansiële insluiting-programme komplementeer met finansiële opvoeding wat fokus op skuld-bestuur, om finansiële veerkragtigheid teen toekomstige nasionale ekonomiese skokke te bou.

Met behulp van ’n gedeeltelike kleinste kwadrate model het die vierde deel van die studie, wat in Hoofstuk 5 van die tesis uiteengesit word, ondersoek of finansiële insluiting bate-houding verhoog het, en dus, op sy beurt, die subjektiewe welstand van verbruikers. Bate-versameling

is gemeet met ’n bate-indeks wat bestaan het uit materiële besittings en bereken met gebruik van meervoudige korrespondensie-analise, terwyl subjektiewe welstand verteenwoordig is deur lewensbevrediging. Die resultate het aan die lig gebring dat formele spaargeld, krediet en versekering ’n positiewe direkte en indirekte impak gehad het op subjektiewe welstand via bate-houding. Daar was egter ’n mededingende bemiddeling van bate-houding in die verhouding tussen informele versekering, spaargeld en subjektiewe welstand. Daarom moet beleidmakers batebou-programme ondersteun en inisieer wat die gebruik van formele krediet, spaargeld en versekering bevorder. Dit is belangrik omdat verbruikers se subjektiewe welstand, wat geassosieer word met hoër produktiwiteit en innovering, uiteindelik bydra tot die ekonomiese groei van ’n land.

Sleutelwoorde: finansiële insluiting, finansiële kwesbaarheid, finansiële veerkragtigheid, subjektiewe welstand, Suid-Afrika

ACKNOWLEDGEMENTS

Firstly, I would like to offer my utmost gratitude to the Almighty God for guiding me throughout this doctoral journey. Without His unmerited blessings, it would not have been possible to reach the final stage. Secondly, I am highly indebted to my supervisor, Professor Ashenafi B. Fanta, for his relentless support, guidance, and expert supervision throughout the doctoral journey. He assisted me in nursing the idea of this write-up from its infant stage. Beyond academic support, I benefitted from his moral support, which made it possible to overcome challenges that I encountered from the onset until the end.

Moreover, this thesis has benefitted from invaluable comments and contributions from academics at conferences, reviewers from journals where the two papers drawn from two chapters were published, and at the University of Stellenbosch Business School colloquia. I would like to acknowledge the financial support provided by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst) without which I would not have afforded to complete my study at the University of Stellenbosch.

I am grateful to Dr Jaco Franken for his untiring efforts and willingness to assist administratively from the beginning to the end of the journey. To my friends cum brothers, Dr Hilary T. Muguto, Mr. Joseph F. Munyoro, Dr Sizo Nkala, Dr Bonny Bagenda, and Dr Martin Mwale, I truly appreciate all the support you have rendered during the course of my studies. Moreover, I wish to express my gratitude to Professor Ailie Charteris, Professor Phocenah Nyatanga, and Professor Kerry McCullough for the unwavering support throughout my academic journey. Above all, I would like to extend my deepest appreciation to my family for the unceasing prayers and relentless support during this journey.

DEDICATION

This thesis is dedicated to my mother and late father for all the sacrifices they made through the various stages of my education.

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ABBREVIATIONS AND ACRONYMS

AFI	Alliance for Financial Inclusion
ANOVA	analysis of variance
ATM	automated teller machines
ATT	average treatment effect on the treated
COVID-19	Coronavirus-19
FSTC	Financial Sector Transformation Council
FVI	financial vulnerability index
FAOC	first axis ordering consistency
MMQR	methods of moments quantile regression
IDA	individual development accounts
IV	instrumental variable
IHS	inverse hyperbolic sine
KMO	Kaiser-Meyer-Olkin
MCA	multiple correspondence analysis
NDP	National Development Plan
NIDS	National Income Dynamics Study
OLS	ordinary least squares
OECD	Organisation for Economic Co-operation and Development
PLS-PM	partial least squares path modelling
PPCA	polychoric principal component analysis
PCA	principal component analysis
PSM	propensity score matching
ROSCA	rotating savings and credit associations
SASSA	South African Social Security Agency
SWB	subjective well-being
SSA	Sub-Saharan Africa
SDGs	Sustainable Development Goals
UNDP	United Nations Development Programme
VAF	variance accounted for
VIF	variance inflation factors
VSLA	village savings and loan associations
WBG	World Bank Group

CHAPTER ONE

INTRODUCTION

1.1 Background

Financial inclusion has become a policy priority in many developing countries owing to its potential in enhancing consumers' welfare through, for instance, lowering financial vulnerability and building financial resilience.[1] As such, several key international development finance institutions and policy bodies, such as the World Bank Group (WBG) and the Alliance for Financial Inclusion have been at the forefront of contributing towards universal financial access to enhance consumers' welfare (Gabor & Brooks, 2017). In South Africa, the reforms in the financial sector through the Financial Sector Charter and the Mzansi account initiative increased bank account ownership and access to the formal financial system, particularly for previously disadvantaged black consumers (Shipalana, 2019). Moreover, the South African government disburses social grants to improve the welfare of vulnerable groups through the formal financial system, thereby increasing the recipients' access to bank accounts. However, women are the main beneficiaries of these social grants since they constitute 80% of the social grant recipients (FinScope, 2021).

Due to global and national policies and commitments to enhance financial inclusion, there has been an increase in bank account ownership among consumers. Despite the increase in global account ownership in 2021 to 76% (Demirgüç-Kunt et al., 2022), this has not been matched with improvement in several welfare indicators. For example, Africa has the lowest ranking in terms of happiness relative to other regions (World Happiness Report, 2022), and 27 of the world's 28 poorest countries are found in Sub-Saharan Africa (World Bank, 2021). In South Africa, despite the increase in bank account ownership to 84% in 2021, consumers still face difficulty in making ends meet and only 18% can raise emergency funds without difficulty (Bureau of Market Research, 2021; Demirgüç-Kunt et al., 2022). Moreover, on a scale of 0-10, South Africans' average life satisfaction score of 4.7 suggests that consumers' subjective

[1] Welfare is indicated by protection against unforeseen economic risks or shocks, vulnerability, life evaluation, material possessions, and consumption possibilities *inter alia* (Skidelsky & Skidelsky, 2012).

well-being (SWB) is relatively low relative to the life satisfaction average score of 6.5 among the Organisation for Economic Cooperation and Development (OECD) member countries (OECD, 2020).

Financial inclusion, however, still lacks a universally accepted definition and measure. Sharma (2016) defined financial inclusion as a means to provide banking or financial services to society whereas Demirguc-Kunt et al. (2017) defined financial inclusion as ownership and use of a bank account. By contrast, some studies have defined financial inclusion as the state in which adults have access to formal services including insurance, credit, payment, and savings (Churchill & Marisetty, 2020; Fungáčová & Weill, 2016; Grohmann et al., 2018; Iddrisu & Danquah, 2021; Sakyi-Nyarko et al., 2022). On the other hand, financial inclusion has been conceptualised as a state in which adults have access to and can use a range of appropriate financial services (Demirgüç-Kunt et al., 2018; Ibrahim, 2020; Koomson et al., 2020).

While the focus of the financial inclusion policy initially was to improve access to basic financial services, several policy and research institutions, such as the WBG and Alliance for Financial Inclusion have been advocating the enhancement of quality financial inclusion (QFIN). This is premised on the notion that improvement in the quality of financial products will improve usage which will result in an improvement in consumers' welfare. The WBG's (2015) view on the quality of financial inclusion is that consumers will have a diversified range of financial products and services that are affordable, easy to understand, and appropriate. FinScope (2015) regards QFIN as a situation when consumers have access to diversified formal financial products while Milaou et al. (2017, p. 108) perceive it to be "the extent to which financial services address the needs of consumers". Another quality indicator of financial inclusion is flexibility which aims to provide more flexible payment terms for financial products (Coulibaly, 2017; Sherraden, 2013). The Alliance for Financial Inclusion (2016) considers QFIN from the regulator's perspective which included indicators such as consumers' indebtedness, financial education, transparency, and consumer protection *inter alia*. However, this study conceptualised QFIN from a demand-side perspective as it seeks to understand how this could benefit consumers. In the absence of a consensus on conceptualisation of QFIN from a demand-side perspective, the study defined it as the use of diverse financial products that are affordable, easy to understand, flexible, and appropriate.

It is worth noting that financial inclusion is not an end *per se*, but a means to an end that entails improvement in consumers' welfare such as mitigating financial vulnerability. Noteworthy,

despite being closely related concepts, financial vulnerability ought not to be confused with financial resilience. Financial resilience refers to the ability to recover from an adverse shock (McKinnon & Derickson, 2013; Southwick & Charney, 2012), whereby an adverse shock is an unforeseen negative event that can be idiosyncratic or covariate (Deaton, 1992).

In contrast, financial vulnerability is multifaceted and does not have a universally accepted definition which influences the variability in its measurement.[2] Some define financial vulnerability objectively as an individual exceeding a predetermined debt ratio threshold (Ampudia et al., 2016; Brunetti et al., 2016; Kim et al., 2016; Lee & Sabri, 2017) and not having savings because income is exceeded by basic living costs[3] (Ali et al., 2020; Ampudia et al., 2016). Others conceptualise financial vulnerability based on the subjective measurement of the likelihood of experiencing future hardships (O'Connor et al., 2019), facing difficulty in meeting basic living costs, and being unable to raise emergency funds (Daud et al., 2018; Singh & Malik, 2022). Moreover, financial vulnerability has been conceived as the failure to maintain a particular lifestyle, such as engagement in recreational activities (Chakrabarty & Mukherjee, 2021; Prina, 2015; Worthington, 2006).

In the absence of a universal definition, in this study, financial vulnerability encapsulated the inability to meet basic living costs (expenditure vulnerability), to engage in social activities (lifestyle vulnerability), and failure to accumulate savings after income has covered basic living costs (saving vulnerability). According to the hedonic view of SWB, these dimensions are pertinent to consumers because they contribute to higher SWB (Diener, 2000; Nanda & Banerjee, 2021). Therefore, the definition of financial vulnerability falls under the hedonic view of SWB since it captures affective evaluations of the ability to engage in lifestyle activities whilst having enough savings for the future and cognitive evaluations of the ability to meet basic expenditures. Following Kuroki (2019), Joshanloo and Jovanović (2020), and Brulé et al. (2020) among others, SWB contextually refers to an individual's evaluation of their overall life.

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[2] Financial fragility, financial distress, and financial vulnerability are terms used interchangeably in literature (Ali et al., 2020; Arestis et al., 2021; O'Connor et al., 2019).

[3] This is a negative financial margin which occurs when income is exceeded by basic living costs (Ali et al., 2020).

1.2 Theoretical perspectives

Considering the above, this study is based on several theoretical perspectives to explain how the use of financial products and services could mitigate financial vulnerability, build financial resilience and ameliorate SWB among consumers. On the one hand, the social insurance theory posits that consumers can purchase insurance to mitigate financial vulnerability as it hedges against risks of unforeseen life events (Chetty & Looney, 2006). Moreover, insurance prevents costly coping mechanisms such as selling assets or reducing food consumption after an adverse shock. On the other hand, the complementarity hypothesis suggests that consumers with platforms to accumulate savings can save until such a time they can invest in assets that generate income and improve their welfare (McKinnon, 1973). Further, the debt intermediation theory infers that high-interest rates in the financial markets could attract savings from consumers. This will facilitate the accumulation of funds that will be loaned to consumers to invest in income-generating projects, thereby enhancing their welfare (Shaw, 1973). As income increases, consumers are likely to afford basic living costs (Fayyaz & Khan, 2021; Geng et al., 2018; Lyons et al., 2020) and a better lifestyle as reflected by increased participation in recreational activities according to the opportunity theory (Lee et al., 2001).

Besides lowering financial vulnerability, financial inclusion helps consumers to build financial resilience to adverse shocks through several channels. The precautionary saving theory asserts that consumers can become financially resilient to adverse shocks by reducing their current consumption to hedge the risk of liquidity constraints in the future (Carroll & Kimball, 2001; Ersado et al., 2003). That is, consumers can build financial resilience to adverse shocks by accumulating precautionary savings in the presence of uncertainty and the likelihood of liquidity constraints in the future. Moreover, the risk-sharing theoretical models proposed by Townsend (1994) and Gertler and Gruber (1997) suggest that consumers can build financial resilience to adverse shocks by sharing resources from their communities. For example, consumers can borrow from pooled savings in a saving group or village saving and loan association within the community thereby building financial resilience to adverse shocks. Also, the risk-sharing model by Jack and Suri (2014) posits that a reduction in transaction costs in an environment with no asymmetric information will increase the number of active users of financial services in a consumer's network, thereby facilitating remittances that build financial resilience to adverse shocks.

Apart from bolstering financial resilience, various channels of financial inclusion could facilitate asset accumulation and, in turn, increase the SWB of consumers. Contextually, assets refer to physical material possessions held by a consumer such as a microwave, fridge, and washing machine (Ibrahim, 2020; Janzen & Carter, 2019; Latif & Magazi, 2021; Tita & Aziakpono, 2017). The institutional theory of saving, on the one hand, posits that saving could contribute to asset accumulation if there is institutional support (Sherraden, 1991). The institutional theory of saving assumes that institutions have structural mechanisms that include facilitation, restrictions, access, expectations, and security. These structural mechanisms will enable consumers to accumulate savings and channel them to welfare-enhancing investments such as household assets. Besides savings, Quach's (2016) theoretical model of credit and welfare suggests that credit enables consumers to invest in welfare-enhancing projects that provide capacity for asset accumulation. Also, the social insurance theory posits that insurance can avert costly coping mechanisms after adverse shocks such as selling assets, thereby facilitating asset accumulation (Chetty & Looney, 2006).

As consumers accumulate assets, their SWB could be ameliorated. This accords with the asset effects theory which posits that an increase in asset endowments will increase an individual's self-esteem, thereby enhancing his/her SWB (Sherraden, 1991). Similarly, the hierarchy of needs theory suggests that the accumulation of basic household assets could satiate physiological needs which increases one's SWB (Maslow, 1987). Based on the exposition above, the use of financial products and services could increase asset holding and, in turn, increase consumers' SWB.

1.3 Problem Statement

As mentioned above, there has been a commitment to increase financial inclusion which warrants a suitable metric to track the progress of financial inclusion and measure its impact on consumers' welfare (Beck, 2016; Klapper & Singer, 2017). Therefore, several empirical studies have developed measures of financial inclusion with a supply-side orientation (Khera et al., 2021; Park & Mercado, 2018; Sahay et al., 2020; Sha'ban et al., 2020). However, one cannot draw useful inferences from supply-side measures about how consumers benefit from mainstream financial products and services (Churchill & Marisetty, 2020). Thus, there have been several efforts to measure financial inclusion from a demand-side perspective (Churchill & Marisetty, 2020; Iddrisu & Danquah, 2021; Koomson et al., 2020; Luo & Li, 2022; Mahalika et al., 2021).

Previous composite measures from a demand-side perspective, however, have excluded the quality dimensions of affordability and appropriateness while a few studies have captured the use of flexible financial products. This is despite Mialou et al. (2017) contending that financial inclusion should be measured and analysed through multiple dimensions as this helps to assess the impact of financial inclusion and improve policy recommendations. Therefore, the study contributes to the literature by computing a demand-side metric of QFIN that captures the use of diverse financial products and quality indicators that include appropriateness, affordability, and flexibility of financial products. This is important because capturing multiple dimensions of financial inclusion would make impact analyses more robust and would fully capture the inclusion of a consumer in the formal financial system (Tram et al., 2021).

As highlighted above, the use of financial products and services could improve consumers' welfare by lowering their financial vulnerability. Several studies have confirmed that mobile money, formal and informal savings, and credit enable consumers to become less financially vulnerable. However, these studies measured financial vulnerability using single indicators of an individual's ability to cover basic living costs (expenditure vulnerability) and while a few studies in Asia used single indicators of inability to engage in social activities (lifestyle vulnerability) (Ahmed & Cowan, 2021; Chakrabarty & Mukherjee, 2021; Koomson et al., 2021; Prina, 2015; Sakyi-Nyarko et al., 2020).

Moreover, several studies have suggested composite measures of financial vulnerability due to a lack of consensus on financial vulnerability measurement. Current composite measures of financial vulnerability capture consumers' inability to meet basic living costs, indebtedness, a decline in household income, and difficulty in raising emergency funds[4] (see, for example, Arestis et al., 2021; Bruce et al., 2022; Nemeth et al., 2020; Singh & Malik, 2022; Xu et al., 2017). However, existing composite indices of financial vulnerability did not capture one's ability to engage in social activities (lifestyle vulnerability) and the inability of accumulating saving after covering basic living costs (savings vulnerability). On the other hand, the Bureau of Market Research in South Africa has an index of consumer financial vulnerability based on

[4] Consumers can raise emergency funds through selling property, avoiding payment, using cash reserves, borrowing from friends and family and credit (Bruce et al., 2020).

key informants' judgments, but this precludes a subjective financial vulnerability measurement from a consumer's perspective.

Therefore, the study makes a methodological contribution by computing a consumer financial vulnerability index that encapsulates expenditure vulnerability, saving vulnerability, and lifestyle vulnerability. Capturing various facets of financial vulnerability is important as they jointly contribute to greater life satisfaction according to the hedonic view of SWB (Diener, 2000; Nanda & Banerjee, 2021). Moreover, a multi-faceted measure provides a more indicative measure of consumer financial vulnerability (Fang et al., 2016; O'Connor et al., 2019; Salignac et al., 2019). Thereafter, the study contributes to the literature by examining the association between a broader index of QFIN and financial vulnerability measured along multiple dimensions. This will inform policymakers on how improvement in QFIN could influence consumer financial vulnerability.

Furthermore, other studies found that mobile money has enabled consumers to become financially resilient to adverse shocks related to health, agriculture, and weather in several developing countries (Afawubo et al., 2020; Naito et al., 2021; Sakyi-Nyarko et al., 2022; Suri et al., 2021; Tabetando & Matsumoto, 2020). On the other hand, Akampumuza and Matsuda (2017), Karlan et al. (2017), and Lensink et al. (2017) did not find evidence of the role of insurance and saving accounts in offsetting the negative impact of the adverse agricultural sector shocks and weather-specific shocks on consumption. However, these studies merely focused on how various channels of financial inclusion influenced consumers' financial resilience to covariate shocks that were mostly weather-specific and agricultural-sector specific. These studies did not consider how financial inclusion could build financial resilience in the context of a nationwide economic shock that induced a decline in income of many consumers.

It is worth noting that the COVID-19 pandemic triggered a global economic recession that was punctuated by rising unemployment and a reduction in consumers' income due to the introduction of restrictive measures to reduce the contagion. These COVID-19 protocols were imposed globally between 2020 and 2022 though the severity varied across countries. For example, South Africa's major trading partners including China, Germany, the United Kingdom (UK), Japan, and the United States (US) imposed economic lockdowns between 2020 and 2022 to suppress the contagion of COVID-19 (Oxford University, 2023). This contributed to a decline in exports by 12.295% in 2020 and 3.279% in 2021 relative to 2019 (pre-COVID-

19 pandemic) (South African Revenue Service, 2022). Moreover, South Africa's key tourism source markets such as Germany, the UK, the US, and Italy imposed strict travel restrictions to curb the contagion resulting in a slump in tourist arrivals in South Africa by 71% in 2020 relative to 2019 (Statistics South Africa, 2021).

Against this backdrop, export-oriented industries, tourism, and other non-essential industries experienced a surge in job losses due to the COVID-19 pandemic. As a result, about 50% of adults in South Africa reported a decline in income during the pandemic, and more than 2.2 million jobs were lost in the first quarter of 2020 despite regaining 40% of lost jobs by mid-2021 (FinScope 2021; Statistics South Africa, 2020; World Bank, 2021). Moreover, global unemployment increased by 207 million in 2022 relative to 186 million in 2019 (International Labour Organisation, 2020; World Bank, 2022). Therefore, assessing whether financial inclusion could build financial resilience to the nationwide COVID-19-induced income shock in South Africa's context presents a novel empirical contribution to the literature. This differentiates this study from previous ones that only focused on the role of financial inclusion in building financial resilience to region-specific weather shocks, health shocks, and agricultural sector-specific shocks.

The focus on South Africa becomes relevant for several reasons. South Africa was one of the highly affected countries by the COVID-19 pandemic in Africa, accounting for 40% of the deaths in Africa (World Health Organisation, 2021), and experienced the highest decline in the national income in Africa between 2020 and 2021 (Awoyemi et al., 2022). Moreover, while South Africa has one of the highest rates of inclusion in the formal financial system in Africa (Demirgüç-Kunt et al., 2022), little is known whether this could help consumers offset income shocks induced by global pandemics in the future. Thus, South Africa's case study is pertinent as it informs developing countries on how various channels of financial inclusion could build financial resilience among consumers in the event of a similar adverse economic shock in the future.

Not only does the use of various financial products improve consumer welfare by bolstering financial resilience, but it could also improve asset accumulation. Several studies have shown that insurance, savings, and credit contribute to higher asset accumulation (Doss et al., 2019; Ibrahim, 2020; Janzen & Carter, 2019; Kamal & Rana, 2019; Latif & Magazi, 2021), but no study has examined how this, in turn, enhances the SWB of consumers. Therefore, this study contributes to the literature by examining how the use of financial products influences asset

accumulation and, in turn, the SWB of consumers. Considering that previous studies used single indicators of credit, insurance, and savings, this study contributes to the literature by using a broader index to examine how QFIN could influence asset accumulation and, in turn, the SWB of consumers. Examining how QFIN could indirectly enhance SWB via asset accumulation is important because higher SWB has positive ramifications on productivity, health habits, and innovation of consumers, which are instrumental to economic growth (Neve et al., 2013; Oswald et al., 2015).

In summary, there has been no examination of how QFIN could affect consumer financial vulnerability of consumers, and indirectly influence the SWB of consumers via asset accumulation. Moreover, studies are yet to ascertain whether the use of various financial products and services could build financial resilience to nationwide adverse economic shocks. Based on the above gap, the current study seeks to examine how QFIN could influence financial vulnerability, bolster financial resilience, and indirectly influence SWB via asset accumulation in South Africa's context.

1.4 Research questions

In light of the problem statement, the overarching research question is: What is the impact of quality financial inclusion on financial vulnerability, financial resilience, and subjective well-being of consumers in South Africa? Specifically, the study sought to answer the following research questions:

i. How can quality financial inclusion be measured from a demand-side perspective?
ii. What is the impact of quality financial inclusion on consumers at different levels of financial vulnerability?
iii. What are the channels through which financial inclusion influenced consumers' financial resilience to the COVID-19-induced income shock?
iv. Does quality financial inclusion increase asset accumulation and, in turn, consumers' subjective well-being?

1.5 Research objectives

Considering the research question, the overarching research objective is to examine the impact of quality financial inclusion on financial vulnerability, financial resilience, and SWB in South

Africa. More specifically, the study sought to achieve the following objectives in the context of South Africa:

i. To construct a quality financial inclusion index from a demand-side perspective and identify its determinants.
ii. To examine the impact of quality financial inclusion on consumers at different levels of financial vulnerability.
iii. To investigate the channels through which financial inclusion could build the financial resilience of consumers to the COVID-19-induced income shock.
iv. To examine whether quality financial inclusion increases asset accumulation and, in turn, the subjective well-being of consumers.

1.6 Significance of the study

1.6.1 Theoretical significance

The study contributes to the theory related to financial inclusion and consumer welfare in several ways. The study provided a test on risk-sharing theory, social insurance theory, and precautionary saving theory under a global economic shock that rendered many consumers unemployed and experienced a decline in their incomes. This is a departure from previous studies which tested these theories under covariate shocks such as region-specific weather shocks and agricultural-sector-specific shocks. Testing the theories during the COVID-19 pandemic enhances the understanding of whether risk-sharing, purchasing insurance, and precautionary saving could build financial resilience to future global economic shocks.

Further, previous studies tested a direct hypothesis on the impact of financial product use on asset accumulation. However, no study has examined whether the use of financial products could increase asset accumulation and, in turn, increase the SWB of consumers. Therefore, the study contributes to the theory by deriving a testable hypothesis on how QFIN can indirectly increase consumers' SWB via asset accumulation. This was achieved by jointly testing the asset effects theory, hierarchy of needs theory, Quach's (2016) theoretical model on credit and welfare, social insurance theory, and institutionalised theory of saving.

1.6.2 Methodological significance

Also, the study made a methodological contribution to the literature. Despite the growing attention on financial inclusion, there is no consensus on how it is measured. Tram et al. (2021)

contend that the computation of financial inclusion with multiple indicators and dimensions will be helpful in the assessment of the impact of financial inclusion and enhance policy recommendations. Moreover, Mialou et al. (2017) and Camara and Tuesta (2018) argued that an attempt to measure financial inclusion should include multiple dimensions, yet dimensions of affordability, flexibility, and appropriateness had been excluded from previous demand-side composite measures. Hence this study contributes to the literature by proposing a multi-dimensional index of QFIN that captures the diversity, affordability, flexibility, and appropriateness of financial products.

Also, existing financial vulnerability composite indices have excluded facets of the inability to accumulate savings after meeting basic living costs (saving vulnerability) and the inability to engage in social activities (lifestyle vulnerability). Instead, the existing composite measures of financial vulnerability studies have focused on indebtedness, the ability to meet basic living costs, and the ability to raise emergency funds (see, for example, Arestis et al., 2021; Bruce et al., 2022; Nemeth et al., 2020; Singh & Malik, 2022; Xu et al., 2017). Therefore, the study makes a methodological contribution by computing a multidimensional consumer financial vulnerability index that captures lifestyle vulnerability, saving vulnerability, and expenditure vulnerability. These facets of financial vulnerability are important as they contribute to an individual's evaluation of life, according to the hedonic view of SWB (Nanda & Banerjee, 2021).

1.6.3 Policy significance

The study's findings have several policy implications. Firstly, researchers can inform policy by using the proposed index to examine how an improvement in QFIN could influence consumers' welfare. Secondly, the study's results could guide policymakers in developing countries on the extent to which different channels of financial inclusion could strengthen consumers' financial resilience to future economic shocks. The evidence will complement policy guidance from the World Bank's COVID-19 Crisis Response to Resilient Recovery, which is a forward-looking crisis response that seeks to build financial resilience to future economic shocks. Thirdly, social policymakers will be guided on how improvement in QFIN could indirectly influence the SWB of consumers via asset accumulation. This is important in shaping asset-building social welfare programs as a conduit through which consumers' SWB is enhanced. Such strategies to improve the SWB of consumers are relevant considering that

consumers with higher SWB are likely to be innovative and productive, which is pertinent for economic growth (Neve et al., 2013).

1.7 Data and sample

This section outlines the data and sample used in the study. Chapters 2, 3, and 5 are based on the FinScope 2015 consumer survey from South Africa because the question on life satisfaction (a proxy for SWB) and indicators constituting the QFIN index were only available in this survey. The FinScope 2015 consumer survey was administered to a sample of 5 000 consumers by FinMark Trust in South Africa over the period spanning 14 July 2015 to 2 September 2015.[5] The survey is a nationally representative cross-sectional survey that collects data from adults aged 16 or above and provides information on their use of financial services and several welfare indicators. To identify the households that would participate in the survey, the households were initially randomly selected within an enumeration area. Thereafter, a Kish grid was used whereby a pre-assigned table of random numbers helped to identify an individual eligible to be interviewed face-to-face for at least 60 minutes. Using this technique, a selection bias in the selection of respondents was averted as it assigned an equal probability of selection for each possible survey participant (Lewis-Beck et al., 2003). Thereafter, there was a need to ensure that the survey was nationally representative to circumvent any potential sample bias. Therefore, probability proportional to size sampling was used before the sample was weighted and benchmarked against Statistics South Africa's mid-year population estimates in 650 enumeration areas, which ultimately yielded a nationally representative sample covering South Africa's nine provinces.

Several measures were put in place to improve the quality of the data collected. The FinScope 2015 consumer survey was monitored by a steering committee to ensure that the questions were relevant to the stakeholders' requirements and to contextualise the questions in terms of South Africa's socio-economic situation. Given that the steering committee comprised experts from the Ministry of Finance, the National Treasury, the National Statistical Agency, and the FinScope team, it can be reasoned that their participation in the formulation of the survey instrument ensured its content validity.

[5] FinMark Trust is an autonomous non-profit organisation that collects demand-side survey data of consumers who are served and unserved by financial service providers in both formal and informal markets.

The interviews were conducted using the computer-assisted personal interviewing technique to check for consistency and data validation. To ease readability and comprehension for the respondents, the survey instrument was translated into the vernacular languages of South Africa. The rigour in implementing the survey and the quality control in the data collection led to the FinScope consumer surveys being used in several studies focusing on South Africa only (Latif & Magazi, 2021; Mutsonziwa & Fanta, 2019; Nanziri, 2018) and other cross-country studies that included South Africa (Aterido et al., 2013; Ndlovu & Toerien, 2020).

Although the current study relied on the FinScope 2015 consumer survey, the data remains relevant in South Africa's current context. This is because financial product use amongst adults has not significantly changed despite the growth in bank account ownership to 84.3% in 2021 from 69.07% in 2015. For instance, adults with formal insurance increased by 1.79% in 2021 from 41.67% in 2015, bank loan use increased to 3.74% in 2021 up from 2.58% in 2015, and saving through formal channels slightly increased to 19.12% in 2021 from 17.60% in 2015 (FinScope, 2015, 2021).

Furthermore, the macroeconomic conditions have marginally changed between 2015 and 2021 such that the data remains relevant in South Africa's present-day context. Firstly, the consumer financial vulnerability index computed by the Bureau of Market Research was 50.95 in 2015 (4^{th} quarter) and declined slightly to 50.30 in 2021 (3^{rd} quarter). This indicates that, despite minor fluctuations between 2015 and 2021, South Africans have remained mildly exposed to problems with servicing their debt, low savings accumulation, and the deterioration of expenditure rates (Bureau of Market Research, 2021). Secondly, the macroeconomic variables associated with consumer financial vulnerability have not significantly changed in South Africa between 2015 and 2021. For instance, the unemployment rate was 25.15% in 2015 and increased to 29.22% in 2021, the prime lending rate increased from 10.25% in 2015 to 10.50% in 2021, whereas the savings to gross domestic product ratio slightly increased from 17.33% in 2015 to 17.57% in 2021 (World Bank, 2021). Considering the marginal changes in macroeconomic conditions and financial product use in the country highlighted above, it can be argued that analysis using data from FinScope 2015 consumer survey is still relevant in present-day South Africa.

In Chapter 4, the study used data collected in September 2021 from a nationally representative FinScope 2021 consumer survey from South Africa. The reason was that the questions related to the COVID-19 pandemic, the use of financial products, and consumer welfare during the

COVID-19 pandemic were available exclusively in this survey. Similar to the previous FinScope consumer surveys from South Africa, a Kish grid was used for random sampling before weighting and benchmarking against Statistics South Africa's mid-year population estimates. This was done to identify a representative sample of respondents at both national and provincial levels. Consequently, face-to-face interviews were conducted with a sample of 5 664 respondents who were at least 16 years old. The other quality checks on data collection are the same as those in the FinScope 2015 consumer survey explained above.

1.8 Organisation of the thesis

The rest of this thesis is structured around four related studies: Chapter Two presents the measurement of quality financial inclusion and an examination of its determinants. Chapter Three presents the investigation of the impact of quality financial inclusion on consumer financial vulnerability. Chapter Four presents an analysis of the role of various channels of financial inclusion in building financial resilience to the COVID-19-induced income shock. Chapter Five presents an exploration of the interrelationship between quality financial inclusion, asset accumulation, and the SWB of consumers. Chapter Six concludes the study by summarising the key results, providing recommendations, and suggesting avenues for future research. Figure 1 below presents the study's framework in terms of the research objectives.

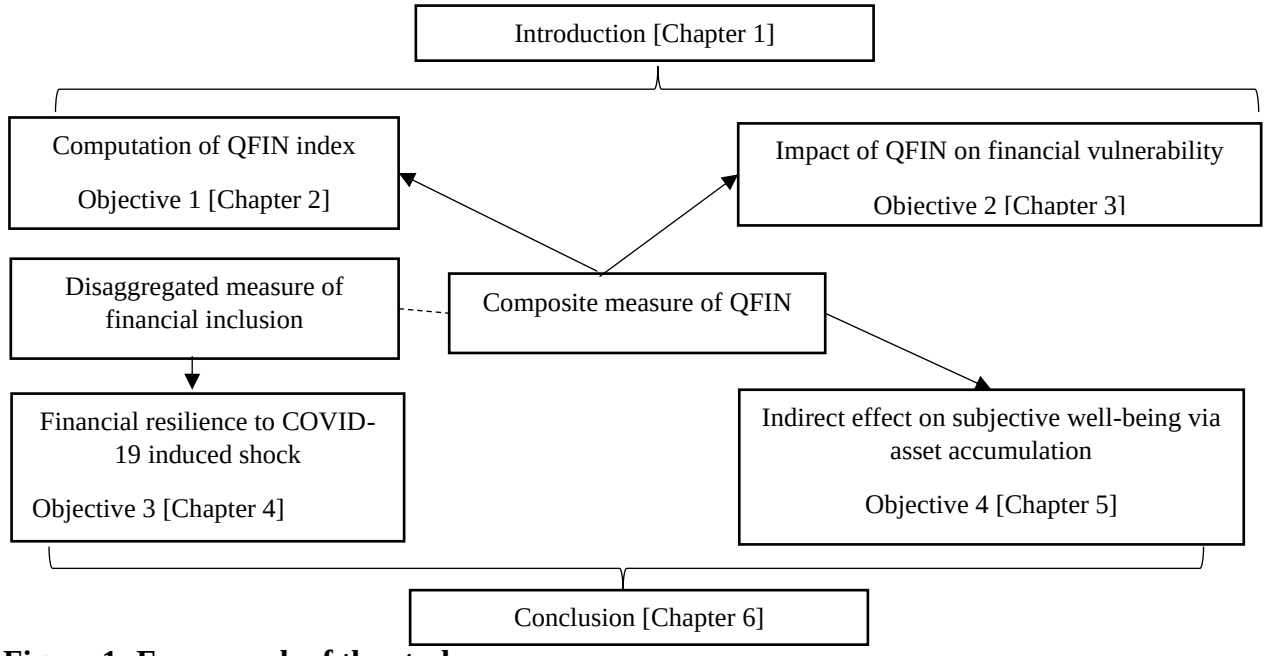


Figure 1: Framework of the study

CHAPTER TWO

QUALITY FINANCIAL INCLUSION AND ITS DETERMINANTS IN SOUTH AFRICA[6]

2.1 Introduction

Financial inclusion has become an important policy goal owing to its role in bolstering financial resilience and facilitating day-to-day life (Lyons et al., 2020). Therefore, financial inclusion is a cross-cutting theme across eight Sustainable Development Goals (SDGs) such that several developing countries, through the Maya Declaration of 2011, committed to increasing access to bank account ownership to increase inclusion in the formal financial system (Beck, 2016; Gabor & Brooks, 2017). In South Africa's context, the Financial Sector Charter of 2004 and the Financial Sector Code of 2012 reformed the banking sector to increase access to banking products and services, particularly among previously disadvantaged groups. This was complemented by the Mzansi Bank Account Initiative which increased access to low-fee bank accounts for the low-income segments of the adult population in South Africa (Shipalana, 2019).

As such, bank account ownership has increased globally among adults from 51% to 76% on average between 2011 and 2021(Demirgüç-Kunt et al., 2022). In South Africa's context, bank account ownership has increased to 84% among adults and this could be partially attributed to the social grants which are disbursed through the formal financial system (FinScope, 2021). In 2015, 24.28% of bank account owners were social grant recipients of which 80.45% of social grant recipients were females (FinScope, 2015). Recent data shows that 35% of bank account owners are social grant recipients, particularly among women who constitute 80.59% of the social grant recipients (FinScope, 2021).

[6] A paper drawn from this chapter has been published in a journal with the following reference: Chipunza, K. J., & Fanta, A. (2021). Quality financial inclusion and its determinants in South Africa: evidence from survey data. *African Journal of Economic and Management Studies*,13(2),177-189. A declaration with signature in possession of candidate and supervisor.

The increased focus on financial inclusion is premised on the complementarity hypothesis and debt intermediation theory which explain how increased access to financial services could ameliorate consumers' welfare. On the one hand, the complementarity hypothesis by McKinnon (1973) suggests that financial institutions could facilitate savings by consumers which they can invest in income-generating projects, thereby enhancing their welfare. On the other hand, Shaw's (1973) debt intermediation theory posits that increased savings through financial institutions will result in the accumulation of loanable funds. In turn, financial institutions can provide credit to consumers who can channel these funds to projects that generate income, thereby improving their livelihoods. Notwithstanding, the credit rationing theory suggests that information asymmetry between lenders and borrowers could result in credit demand exceeding the supply of credit (Stiglitz, 1975).

Financial inclusion, however, is variously conceived and there has been no consensus on its conceptualisation. Demirguc-Kunt et al. (2017) conceived financial inclusion as ownership and use of a bank account whereas Sharma (Sharma, 2016) simply defined financial inclusion as a means to provide banking or financial services to society. By contrast, financial inclusion has been defined as the state in which adults have access to formal services including insurance, credit, payment, and savings (Churchill & Marisetty, 2020; Fungáčová & Weill, 2016; Grohmann et al., 2018; Iddrisu & Danquah, 2021; Sakyi-Nyarko et al., 2022). Other studies have conceived financial inclusion as a state in which adults have access to and can use a range of appropriate financial services (Demirgüç-Kunt et al., 2018; Ibrahim, 2020; Koomson et al., 2020).

On the other hand, there have been efforts to go beyond basic financial inclusion which most studies refer to as access to a broader suite of financial products. That is, the focus has turned to improve the quality of financial inclusion (QFIN), but there has been no consensus on its conceptualisation from a demand-side perspective. According to the World Bank Group (WBG), an increase in the quality of financial inclusion implies that consumers will have diversity in the financial products perceived to be affordable, appropriate, and easy to understand (WBG, 2015). Milaou et al. (2017, p. 108) perceive QFIN to be "the extent to which financial services address the needs of consumers", whereas FinScope (2015) considers QFIN as a situation when consumers have access to diversified formal financial products. Moreover, given that consumers' income streams are usually unpredictable, a pertinent quality aspect of financial inclusion is the provision of financial products with more flexible payment terms (Coulibaly, 2017; Krishna & Phillip, 2014; Sherraden, 2013). Against this backdrop, this study

defined QFIN from a demand-side perspective as the use of financial products that are affordable, diverse, easy to understand, flexible, and appropriate (Mialou et al., 2017; Sherraden, 2013; WBG, 2022).

Considering that several governments have committed to increasing the financial inclusion of consumers, it warrants the measurement of financial inclusion to track their progress, benchmark them, and measure the impact of financial inclusion policy interventions at both the macro-and micro-level. Therefore, several empirical studies have computed composite supply-side financial inclusion measures (Khera et al., 2021; Mialou et al., 2017; Park & Mercado Jr., 2018; Sahay et al., 2020). However, supply-side measures might not reflect the use and welfare impact of financial services at the micro-level (Churchill & Marisetty, 2020) and might preclude the differentiation of financial inclusion across demographic groups (Beck, 2016).

Given the limitations of supply-side metrics, demand-side financial inclusion measures have been developed, albeit without consensus. Some cross-country and country-level studies measured financial inclusion using single indicators of account ownership and formal savings (Akileng et al., 2018; Asuming et al., 2019; Lotto, 2018; Matsebula & Yu, 2020; Ndlovu & Toerien, 2020). Considering that a single indicator might not fully capture the inclusivity of an individual or country, other studies have computed indices constituting bank account ownership, insurance, credit, and savings (Churchill & Marisetty, 2020; Iddrisu & Danquah, 2021; Koomson et al., 2020; Luo & Li, 2022; Sakyi-Nyarko et al., 2022). In South Africa, Mahalika, Matsebula, and Yu (2021) computed an index that captured the use and access of financial services including the dimension of welfare.

However, previous financial inclusion measures from a demand-side perspective did not capture the quality dimension of affordability and appropriateness and indicators of flexible financial products. Therefore, this study proposed an index of QFIN from a demand-side perspective by adding dimensions of affordability, flexibility, and appropriateness which were not included in previous studies. This is important because aggregating several indicators into a composite index of financial inclusion would help in improving the information content of the measure (Mialou et al., 2017). Moreover, Tram et al. (2021) contend that financial inclusion ought to be measured along multiple dimensions as this improves policy recommendations.

Several theoretical perspectives motivate the inclusion of these dimensions in the measurement of QFIN from a demand-side perspective. The appropriateness dimension is motivated by the bounded rationality theory which posits that consumers have satisficing tendencies such that

they consider goods that meet their acceptability and appropriateness threshold (Giacalone & Jaeger, 2019; Rim, 2012; Simon, 1990). Also, the flexibility dimension is premised on the preference for flexibility theory which suggests that a decision maker who might have uncertainties regarding the future consumption utilities prefers avoiding a commitment to a course of future action presently resulting in a preference for flexibility (Kreps, 1979; Krishna & Phillip, 2014). Further, the affordability dimension is based on the utility maximisation theory which asserts that consumers will purchase an item that yields the highest marginal utility with the lowest amount of spending (Kahneman & Thaler, 2006; Wonder et al., 2008).

This study is important in South Africa's context where there has been an increase in bank account ownership, which is consistent with the National Development Plan, but this has not been reflected in the improvement of key welfare indicators. For example, despite approaching universal financial access measured by 84% ownership of bank accounts among adults (FinScope, 2021), South Africans remain mildly financially vulnerable suggesting they still face problems meeting basic living costs and have difficulty in settling debts (Bureau of Market Research, 2021). Intuitively, a narrow focus on bank account ownership might not be adequate to enhance the consumers' welfare. To this end, institutions such as the World Bank Group, and the Financial Sector Transformation Council in South Africa aim to enhance the quality of financial inclusion by increasing the accessibility to a wide range of financial products and services which are affordable, appropriate, and structured in a way that is easily understood by users (Shipalana, 2019). In other words, a holistic approach aimed at the provision of quality financial products might stimulate the use of financial products and lead to greater consumer welfare. Therefore, the proposed measure will be useful to researchers in assessing whether improvement in QFIN could enhance welfare outcomes such as mitigating financial vulnerability.

The remainder of this chapter proceeds as follows: Section 2.2 outlines the financial inclusion landscape in South Africa. Section 2.3 discusses the theoretical literature of QFIN. Section 2.4 reviews empirical studies. Section 2.5 outlines the methodology followed by Section 2.6 which presents the results. Section 2.7 discusses empirical results and Section 2.8 concludes the chapter with some remarks for policymakers and outlines avenues for future research.

2.2 Overview of financial inclusion in South Africa

2.2.1 Financial inclusion policies in South Africa

The South African government has implemented policies that enable previously excluded consumers to participate in the formal financial sector. This is against the background of the systematic exclusion of non-white people from the mainstream financial sector to the extent that about 60% of the adult population, mostly blacks, were excluded from the formal financial sector in South Africa's pre-democracy period (Kirsten, 2006). Therefore, to improve access to bank accounts for previously marginalised consumers, the Financial Sector Charter of 2004 and the Financial Sector Code of 2012 were promulgated (Shipalana, 2019).

The Financial Sector Charter of 2004 and Financial Sector of 2012 gave birth to the Mzansi Account Initiative, which provided low-fee transactional accounts termed "Mzansi accounts" to previously unbanked low-income consumers according to a predetermined criterion (FinMark Trust, 2009). Consequently, about six million new transactional bank accounts were opened between 2004 and 2008 although only about 2 173 930 accounts were active by 2008 (Kostov et al., 2015). This implied that 42% of Mzansi accounts were dormant or inactive because they had limited services which prompted consumers to use different bank accounts with more transactional options (Shipalana, 2019).

Apart from the Financial Sector Charter of 2004 and the Financial Sector Code of 2012, the National Development Plan (NDP) Vision 2030 of South Africa, which was adopted in 2012, also recognises financial inclusion as one of the pillars of development. Therefore, the NDP Vision 2030 formulated a target of 90% bank account ownership by 2030, as the use of banking services is considered as playing a complementary role in the government's efforts to mitigate poverty, unemployment, and income inequality (Louis & Chartier, 2017). Although the NDP Vision 2030 seeks to increase bank account ownership, the Financial Sector Transformation Council of South Africa has been promoting the improvement in the quality of financial inclusion by ensuring that consumers have affordable financial products, which are non-discriminatory and meet consumers' needs (Financial Sector Transformation Council, 2016).

2.2.2 Digitisation of social grants in South Africa

To complement the NDP Vision 2030 and other national financial inclusion policies, the South African government has digitised the disbursements of social grants. The digitisation of social grants was done through a partnership between Mastercard and the South African Social

Security Agency (SASSA) in 2012 and between SASSA and the South African Post Office in 2018 (Department of Planning, Monitoring & Evaluation, 2018). As a result, consumers that were previously reliant on the informal financial market became incorporated into the mainstream sector. Consequently, recent data indicates that the banked population in South Africa now constitutes 35% of social grant recipients and women constitute about 80% of the social grant recipients (FinScope, 2021). That is, social grant disbursements have increased the inclusion of women in the formal financial system enabling them to make payments, withdraw cash, and store money outside the informal financial markets.

2.2.3 Informal financial services in South Africa

While the South African government has made efforts to attract consumers to the mainstream financial market, consumers still manage their financial lives by complementing formal financial products with informal ones. For example, the National Stokvel Association of South Africa observes that two-fifths of low-income earners in South Africa are more inclined to use trust-based models, such as savings groups and stokvels, to circumvent defaulting on bank installments and avoid high banking fees (Chitimira & Ncube, 2020; Kessler et al., 2017). Verhoef (2001: 263) defines a stokvel as "a type of credit union in which a group of people, by voluntary mutual agreement, regularly contribute to a common and circulate the pool amongst the group". This collectivism amongst community members permits consumers to create a pool of savings whereby members agree to contribute a certain amount of money, which is distributed amongst members after a predetermined period (Verhoef, 2001).

2.3 Review of theoretical literature on financial inclusion

Given the brief synopsis above of financial inclusion policies in South Africa, it would be worthwhile drawing attention to the theories that justify financial inclusion by recognising the role that is played by financial institutions in improving the welfare of consumers. As such, the discussion in the following section points to the complementarity hypothesis and debt intermediation theory which motivate the need for increasing consumers' access to financial markets.

2.3.1 The complementarity hypothesis

McKinnon (1973) postulated the complementarity hypothesis which suggests that physical and financial assets complement each other. This theory rests on two assumptions. Firstly,

economic agents are assumed to be restricted to self-financing, and secondly, productive investments are assumed to be indivisible. Due to the indivisibilities in investments, the potential investor must accumulate funds until a time the funds are adequate to undertake the investment. Therefore, financial institutions can provide a profitable platform for consumers to accumulate savings before they can invest in income-generating projects. By so doing, services and products provided by financial institutions can improve the welfare of consumers through the saving channel. For this to occur, however, interest rates should be liberalised and permitted to be determined by the market such that savers are attracted to save due to the prospect of accruing income from interest.

2.3.2 Debt intermediation theory

In comparison to McKinnon's (1973) complementarity hypothesis, Shaw's (1973) debt intermediation theoretical argument is not based on self-financing. Instead, investors and savers are linked by a financial market which serves as an intermediary thereby making it an inside money theoretical model. The argument is that financial intermediaries enhance the financial system's efficiency and minimise the cost of borrowing thereby providing access to savings facilities and credit to the poor. Thus, Shaw's (1973) debt intermediation theory argues in favour of the liberalisation of financial markets by suggesting that higher interest rates will augment the savers' income and increase the opportunities for diversifying the portfolio of assets. In other words, financial markets will attract savings, which increase the supply of loanable funds to consumers thereby introducing the credit channels of finance to mitigate poverty and enhance consumers' welfare.

2.3.3 Credit rationing theory

The debt intermediation theory, however, did not consider the presence of market constraints which preclude poor consumers to use credit. Stiglitz and Weiss' (1981) theory of credit rationing posits that in the presence of information asymmetry, which refers to a situation where one party possesses more information than the other, credit rationing might characterise a competitive loan market. The key reason for credit rationing is the adverse selection and moral hazard. Adverse selection occurs because high-risk borrowers are more likely to increase loan demand than low-risk borrowers as the rate of interest increases. On the other hand, moral hazard occurs because once the borrowers have received loans, the higher rates of interest can prompt borrowers to make more risky investments that might yield higher returns. Therefore, in the presence of information asymmetry, lenders are unable to distinguish between high-risk

and low-risk borrowers. As such, among borrowers with similar identities, some receive loans while others do not regardless of the rejected borrower's ability to pay higher than the prevailing market rate. Consequently, the lenders are unlikely to lend if they suspect that the borrower will take a riskier project to offset the cost of the higher interest rate which might lower the bank's expected return (Stiglitz & Weiss, 1981). Moreover, due to the high monitoring costs, lenders will increase control mechanisms within the lending contracts such as raising the interest rates as a hedge against the risk of a payment default. In essence, the theory of credit rationing argues that information asymmetries might ration some consumers out of credit markets.

2.3.4 Quality of financial products

The above theories suggest that financial institutions are important because they provide a conduit through which consumers can enhance their welfare. It is not only financial inclusion through the provision of basic financial products that is necessary but the quality of the financial inclusion should be considered too. Considering the working definition of QFIN, the study leveraged the utility maximisation theory, bounded rationality theory, and preference for flexibility theory to justify the relevance of including the various dimensions of QFIN from a demand-side perspective.

2.3.4.1 Utility maximisation theory

The utility maximisation theory suggests that a rational consumer will purchase an item that produces the greatest marginal utility with the lowest amount of spending. The assumption is that a rational consumer will know his/her alternatives, preference ordering of the alternatives, and will select the best from the available alternatives (Kahneman & Thaler, 2006; Wonder et al., 2008). In the context of financial markets, a utility-maximising consumer will likely demand satisfying financial products at the lowest price. For example, a utility-maximising consumer will likely demand insurance, transaction accounts, or credit products that are affordable relative to others offered in the financial market. Therefore, the affordability dimension in the provision of financial products becomes imperative to ensure consumers employ diverse financial products.

2.3.4.2 Bounded rationality theory

The bounded rationality theory challenged the notion that consumers are rational decision-makers who can manage complete information about the alternatives that face them as assumed

in the traditional economic theory (Simon, 1990). It is assumed that humans have internal mental mechanisms which exploit the external information available in the environment. The bounded rationality theory defines these mental mechanisms used by consumers as heuristics, which are cognitive shortcuts that enable individuals to evaluate alternatives based on structures or several basic rules, thereby circumventing the cost incurred in exploring other alternatives. Due to the complexity of the environment and the limited capacity of humans to process complex information, Simon (1990) contends that decision-makers are satisficers who seek satisfactory solutions instead of optimal ones. Thus, consumers are more comfortable in making a choice when they are confident that they have found an option that meets their needs such that they will not consider other unseen options. Implicitly, in making a decision, consumers might be limited in their rationality and bounded by the specific attributes of a particular product such as its appropriateness for that particular context. From this viewpoint, consumers described by the bounded rationality theory have satisficing tendencies such that they consider goods that meet their needs and acceptability threshold (Giacalone & Jaeger, 2019; Rim, 2012; Simon, 1990). In this context, consumers are more likely to employ financial products if they are appropriate to meet their needs in the given context.

2.3.4.3 Preference for flexibility theory

Apart from appropriateness, consumers require flexible financial products. This accords with the preference for flexibility theory which asserts that decisions by economic agents are influenced by their uncertainties regarding future consumption utilities (Kreps, 1979; Krishna & Phillip, 2014). Thus, a decision-maker who might have uncertainties regarding the future consumption utilities prefers avoiding a commitment to a course of future action presently and, thus, has a preference for flexibility. Flexibility, in this context, is a feature in financial products that would enhance the consumer's ability to manage daily financial costs and risk-coping such as overdraft and revolving credit loans (Sherraden, 2013; Sherraden & McBride, 2010). As such, a decision maker who is uncertain about his/her future preferences may want to have various options to choose from in the event of uncertainty (Krishna & Phillip, 2014). This would be useful considering that consumers' incomes tend to be unpredictable and irregular, particularly for those in the lower-income category.

2.4 Review of the empirical literature

As explained in Section 2.1, a suitable metric for measuring financial inclusion is needed to track its progress and assess the impact of financial inclusion programs. However, there is yet

to be a universally accepted metric to gauge financial inclusion partly owing to the lack of a clear-cut conceptualisation of it. For this reason, as reviewed in this section, empirical studies have endeavoured to find a suitable metric from both the supply-side and demand-side perspectives.

2.4.1 Measuring financial inclusion from a supply-side perspective

Several studies have computed indices of financial inclusion because a single indicator fails to capture the multi-faceted nature of financial inclusion. Tram et al. (2021) contend that any attempt to measure financial inclusion ought to include as many dimensions and indicators as possible. Apart from providing a comprehensive picture of financial inclusion, multidimensional financial inclusion indices potentially have more indicative policy implications (Camara & Tuesta, 2018; Mialou et al., 2017).

Mialou et al. (2017) constructed a financial inclusion index using commercial bank data for 28 countries for the period between 2009 and 2012. They contended that the inclusion of indicators from the quality dimension would make the financial inclusion index more representative. However, owing to data constraints, this index included only four indicators from the use and outreach dimensions and failed to capture the quality dimension. In India, Goel and Sharma (2017) computed an index of financial inclusion between 2004 and 2014, which consisted of six indicators from the dimensions of access and penetration.

Several studies have criticised composite financial inclusion indices that were constructed using the UNDP's equal weighting method on account of their methodological weaknesses. Firstly, the UNDP technique employs equal weighting and does not permit sub-indices to be weighted according to their theoretical importance (Sarma & Pais, 2011). Secondly, as Chakravarty and Pal (2013) contend, the UNDP method does not permit disaggregated dimension-wise components for computing individual-level percentage contributions. Thirdly, as argued by Yorulmaz (2016), the UNDP method disregards the relative importance of constituent indicators in index construction by assigning equal weights to the index. Lastly, the UNDP's equal weighting method assumes perfect substitutability within and across dimensions, although this assumption might be misleading and biased (Mialou et al., 2017).

Considering the demerits of the UNDP technique, several studies constructed financial inclusion indices using alternative dimension reduction techniques. Camara and Tuesta (2018) used a two-stage PCA and differentiated themselves from previous studies by constructing a financial inclusion index with 11 indicators combining both demand-side and supply-side data

from 82 countries across the use, barrier, and access dimensions. Similarly, using two-stage PCA, Ahmed and Malick (2019) and Kebede, Naranpanawa, and Selvanathan (2021) computed an index for financial inclusion that captured availability, use, and access dimensions. To have a more technically efficient technique for computing a composite financial inclusion index, Park and Mercado Jr (2018) combined Camara and Tuesta's (2018) and Sarma's (2008) approaches. In the end, their financial inclusion index consisted of nine indicators from the access and use dimensions for 151 countries in 2011 and 2014. Similarly, Sha'ban et al. (2020) adopted Park and Mercado Jr's (2018) approach to compute an index from the access, use, and depth of financial service dimensions between 2004 and 2015 for 95 countries.

Moreover, Yorulmaz (2016) computed a financial inclusion index by assigning different dimension weights according to their relative importance, which was unlike the UNDP equal weighting method. The resultant index encapsulated indicators from both commercial banks and microfinance institutions across outreach, use, eligibility, and cost dimensions from 58 countries covering the period between 2004 and 2005. Despite Yorulmaz's (2016) attempt to address the shortcomings of the UNDP technique, the index still had not addressed the pitfall of perfect substitutability within and across dimensions. As a remedy, Mialou et al. (2017) used a weighted geometric mean methodology to derive the weighted geometric mean across the dimensions in the computation of a financial inclusion index for 31 countries between 2009 and 2012. Moreover, Mialou et al. (2017) contended that the quality dimension could make the index more indicative. However, the lack of data that were comparable across countries inhibited the inclusion of this dimension and the index was restricted to the use, penetration, and outreach dimensions.

Although the above-mentioned studies made improvements in computing the financial inclusion index based on conventional finance, little attention was paid to digital financial inclusion at a macro level due to a lack of data. Therefore, using a three-stage principal component analysis, Sahay et al. (2020) and Khera et al. (2021) computed an index of financial inclusion that combined the access and use of both financial technology (fintech), which integrates technology into the offerings of financial services, and conventional financial products for 52 countries in 2014 and 2017. In addition, Tram et al. (2021) computed an index of financial inclusion encapsulating both digital and conventional financial inclusion using a sample of 41 developing economies spanning a period from 2012 to 2018.

While measures of financial inclusion built from supply-side data might help in financial inclusion impact analysis, they are devoid of granularity, which precludes insightful policy direction from a consumer's perspective (Churchill & Marisetty, 2020). Moreover, supply-side measures preclude the differentiation of financial inclusion across demographic groups (Beck, 2016). This warrants the employment of demand-side survey data to gauge financial inclusion from a consumer's perspective.

2.4.2 Measuring financial inclusion from a demand-side perspective

This section reviews the literature on empirical studies that measured financial inclusion using data from demand-side surveys. These studies, which were mostly conducted in developing countries, have suggested various proxies for financial inclusion, albeit without consensus. In India (Nandru et al., 2016), Indonesia (Wardhono et al., 2016), South Africa (Wenztel et al., 2016; Omran, 2016), Bangladesh (Hussain et al., 2019), Tanzania (Lotto, 2018) Sub-Saharan Africa (Ndlovu & Toerien, 2020), and Uganda (Akileng et al., 2018), financial inclusion from a demand-side perspective was measured by bank account ownership. However, the contention is that account ownership is narrow and does not capture the use of other financial products. Therefore, other studies have gauged financial inclusion using single indicators of bank account ownership, savings, and credit use in 37 African countries (Zins & Weill, 2016), 123 countries (Allen et al., 2016), Sub-Saharan African countries (Asuming et al., 2019), South Africa (Matsebula & Yu, 2020), and Zimbabwe (Abel et al., 2018).

Despite using an array of single indicators to measure financial inclusion, Camara and Tuesta (2018), and Mialou et al. (2017) put forward the claim that single indicators preclude a comprehensive gauge of financial inclusiveness. Therefore, Peña et al. (2014) used multiple correspondence analysis (MCA) to compute a composite financial inclusion index constituting nine indicators including formal saving and credit products used by Mexican consumers. Unlike Peña et al. (2014) who used single-country data, Aslan et al. (2017) used MCA to construct an index that comprised 12 indicators across 140 countries using data from 2011 and 2014. Zhang and Posso (2019) constructed a financial exclusion index that measured the deprivation of financial services for Chinese consumers using data collected in 2015. The index measured a consumer's deprivation of remittances, savings, credit, and insurance based on an equally weighted index technique. Following Zhang and Posso (2019), Churchill and Marisetty (2020) applied an equal weighting technique to construct a financial inclusion index constituting credit use, saving, and insurance for Indians between 2016 and 2017.

Furthermore, in Ghana, Gyasi, Adam, and Phillips (2019) constructed financial inclusion index using MCA to capture the following indicators: ownership of a savings bank account, recent withdrawal from an account, credit union membership, ownership of a Susu account, opportunities of obtaining a loan from financial institutions, and ownership of mobile money account. Similarly, Koomson et al. (2020) used MCA to compute an index of financial inclusion at the individual level in Ghana between 2016 and 2017 using 15 indicators from the access and usage dimensions. Moreover, Ibrahim, Ozdeser, and Cavusoglu (2019) computed an equally weighted financial inclusion index of Nigerian consumers constituting the use of microcredit, ownership of a savings account, ownership of a transaction account, microinsurance, and ownership of a fixed account. Similarly, in Ghana, Iddrisu and Danquh (2021) constructed an equally weighted financial inclusion index constituting indicators of saving, insurance, bank account ownership, and formal credit. In South Africa, Mahalika, Matsebula, and Yu (2021) used principal component analysis to compute an index of financial inclusion for consumers based on access, quality, and welfare. The quality dimension only considered reasons for not using bank accounts and did not capture the dimensions of affordability and appropriateness of various financial products. Besides, the welfare dimension included a list of indicators that could not be attributed to using financial products or services. In Ghana, Sarkyi-Nyarko, Ahmad, and Green (2022) computed an index of financial inclusion from a demand-side perspective that constituted variables of bank account ownership, savings at a formal institution, and mobile money use.

Apart from conventional financial products, other studies computed indices capturing the use of digital financial services. For example, in China, Song et al. (2020) computed a digital financial inclusion index comprising indicators of online banking, phone banking, online investment, and online shopping. Wang and Fu (2022) and Luo and Li (2022) computed a digital financial inclusion index constituting indicators of online shopping, digital payment, online credit, and online financial purchase. By contrast, in Sub-Saharan Africa, mobile money has been used as a proxy for digital financial services (see, for example, N'dri & Kakinaka, 2020; Suri et al., 2021). Table 2.1 provides a summary of measures of financial inclusion from a demand-side perspective, which have been discussed in this section.

Table 2.1 Summary of studies measuring financial inclusion from a demand-side perspective

Year	Author(s)	Country/Countries	Measurement of financial inclusion
2016	Nandru et al.	India	Bank account ownership
2016	Allen et al.	123 countries	Single indicators of bank account, savings, and credit
2016	Zins and Weill	37 African countries	Single indicators of bank account, savings, and credit
2018	Lotto	Tanzania	Bank account ownership
2018	Akileng et al.	Uganda	Bank account ownership
2019	Hussain et al.	Bangladesh	Bank account ownership
2020	Ndlovu and Torrien	Sub-Saharan Africa	Bank account ownership
2020	Matsebula and Yu	South Africa	Single indicators of bank loans, credit cards, mortgages, unit trusts, vehicle finance
2014	Pena et al.	Mexico	Index constituting indicators of saving and credit
2017	Aslan et al.	140 countries	Index constituting bank account, debit card use, use of bank account, saving, borrowing, and the possibility of raising emergency funds
2019	Gyasi et al.	Ghana	Index capturing the following indicators: ownership of savings bank account, recent withdrawal from an account, membership of credit union, ownership of Susu account, opportunities of obtaining a loan from financial institutions, ownership of mobile money account.
2019	Ibrahim et al.	Nigeria	Index constituting the use of microcredit, ownership of a savings account, ownership of transaction account, micro insurance, and ownership of a fixed account
2019	Zhang and Posso	China	Index constituting indicators of saving, insurance, and credit

Table 2.1: Summary of studies measuring financial inclusion from a demand-side perspective (continued)

Year	Author(s)	Country	Measurement of financial inclusion
2020	Song et al.	China	Digital financial inclusion index comprising indicators of digital financial services including online banking, phone banking, online investment, online shopping
2020	Churchill and Marisetty	India	Index constituting indicators of saving, insurance, and credit
2021	Mahalika et al.	South Africa	An index comprising indicators of welfare (ownership of a cell phone, ownership of a computer, ownership of internet facility at home), and use of financial products (insurance, bank loan, bank account, borrowed in the past 12 months, saving book)
2021	Iddrisu and Danquh	Ghana	Index constituting indicators of saving, insurance, bank account ownership, and formal credit
2021	Koomson et al.	Ghana	An index constituting indicators of ownership of savings account, susu account, E-zwich account, insurance policy, investment account, mobile money account, ownership of current or cheque account, access to credit, receipt of remittance, transactions using an ATM card, transactions using E-zwich card,
2022	Luo and Li	China	An index of digital financial inclusion comprising indicators of online shopping, digital payment, online credit, and online financial purchase
2022	Sarkyi-Nyarko et al.	Ghana	An index constituting indicators of mobile money usage, bank account ownership, and savings in a formal institution

2.4.3. Determinants of financial inclusion

Although computing financial inclusion indices might contribute to the assessment of the impact of financial inclusion programs at both macro-and micro-level, it would be more useful to understand the determinants of financial inclusion, as this could also direct policy. Thus, several studies have investigated the determinants of financial inclusion in several countries at both the micro- and macro-level, although the review below is restricted to the micro-level.

Although Wenztel et al. (2016) failed to find a gender difference in bank account ownership in South Africa, several other country-specific studies in developing countries found evidence suggesting that males had more bank account ownership, saving account ownership, and frequency of account use compared with females (Abel et al., 2018; Akileng et al., 2018; Dar & Ahmed, 2021; Lotto, 2018; Wardhono et al., 2016). Similarly, cross-country evidence from Sub-Saharan Africa (Soumaré et al., 2016; Zins & Weill, 2016) and globally (Allen et al., 2016) suggested that being female lowered the probability of bank account ownership, saving account ownership, and frequency of bank account use. This result could be explained by the exclusion of females from economic activities, which is inherent in most societies and contributes to their exclusion from mainstream financial markets (Gonçalves et al., 2021). Therefore, unlike females, males are more likely to be involved in the formal labour market which increases their inclusion in the formal financial market system since they are paid through bank accounts (Wardhono et al., 2016).

It has been reported that income has a positive impact on bank account ownership, saving account ownership, and frequency of bank account use (Allen et al., 2016; Asuming et al., 2019; Lotto, 2018; Nandru et al., 2016; Soumaré et al., 2016; Wentzel et al., 2016). The supposition is that higher income-earning consumers are more likely to afford banking fees and meet the costs associated with several financial products, such as payments of interest for credit and insurance premiums. Moreover, Akudugu (2013) contends that financial institutions are more likely to target consumers in the higher income bracket resulting in lower-income groups having difficulty finding financial products appropriate for them. To explain this, Bester et al. (2016) argue that it is more expensive to serve the lower-income bracket since they might not be able to afford formal financial services consistently.

Several studies have reported a non-linear age effect on financial inclusion at the country level in developing economies (Abel et al., 2018; Akileng et al., 2018; Dar & Ahmed, 2021; Lotto, 2018; Pena et al., 2014). Similarly, cross-country evidence has revealed a non-linear age effect

on bank account ownership, saving account, and frequency of bank account use (Allen et al., 2016; Soumaré et al., 2016; Zins & Weill, 2016). This perceived non-linear pattern in financial inclusion has suggested that 16-29-year-olds, who are in the early stages of their working life, and those who are 60 years old and above tend to engage less in mainstream financial markets as they have less economic activity. However, consumers between 30 years and 59 years, who are in the middle and late stages of their working life, tend to be more economically active and use more formal financial products.

Another determinant of bank account ownership and use of formal financial services is proximity to bank branches as evidenced in studies of developing economies (Abel et al., 2018; Akudugu, 2013; Wardhono et al., 2016). A possible explanation is that a long distance from a financial institution might preclude bank ownership and the use of financial services owing to in-kind costs, which include transportation costs or the cost of economic opportunities forgone such as time spent doing productive work (Bester et al., 2016; Koomson et al., 2020).

Not only will distance affect the access and use of financial services but also geographic location could have a bearing on them. Previous studies have shown that consumers in rural have less bank account ownership and saving account ownership which could be attributed to poor investment in financial infrastructure compared with urban areas (Allen et al., 2016; Soumaré et al., 2016). However, Wenztel et al. (2016) reported that there was no statistically significant difference in bank account ownership across geographical locations in South Africa. This suggests that the South African government has made great strides in lowering the rural-urban divide in accessing bank accounts perhaps due to the provision of social grants, which has provided a gateway for vulnerable consumers' inclusion into the mainstream financial system.

Apart from location, education is one of the determinants of bank account ownership, savings, and credit use as reported in country-specific studies based on developing economies (Abel et al., 2018; Akileng et al., 2018; Dar & Ahmed, 2021; Lotto, 2018; Nandru et al., 2016; Wardhono et al., 2016) and cross-country studies (Allen et al., 2016; Soumaré et al., 2016; Zins & Weill, 2016). The higher financial inclusion amongst more educated consumers could be explained by their capacity and skillset to make decisions in the formal financial markets (Demirgüç-Kunt & Klapper, 2012; Soumaré et al., 2016).

Not only is higher education qualification positively related to financial inclusion but also financial literacy too. In Zimbabwe (Abel et al., 2018) and Uganda (Akileng et al., 2018), it

was found that financial literacy was positively related to the use of formal financial products and bank account ownership, respectively. Contextually, financial literacy was conceptualised as "a combination of awareness, knowledge, skill, attitude, and behaviour necessary to make sound financial decisions and ultimately achieve individual financial well-being" (Organisation for Economic Co-operation and Development, 2011, p. 3). The probable reason is that financially literate consumers are more likely to be future-orientated, which increases their propensity to use saving products (Henager & Mauldin, 2015). Moreover, financially literate consumers are more likely to employ formal financial products due to their relatively higher trust and confidence in the mainstream financial market compared with financially illiterate consumers (De Beckker et al., 2019; Lusardi et al., 2009). Also, financially literate consumers plan for the future and have requisite budgeting skills and computational ability that enable them to accumulate precautionary savings for rainy days, which increases the likelihood of using saving products (Henager & Mauldin, 2015). In addition, the use of insurance products is likely to be high amongst financially literate consumers since they have a future orientation that prompts them to insure themselves against unforeseen events (Stolper & Walter, 2017). Moreover, consumers who are more financially capable are likely to have a positive perception of the appropriateness of financial products (Lusardi et al., 2009).

Further, various studies have reported that employed consumers were more financially included, as measured by bank account ownership, frequency of bank account use, and saving account (Abel et al., 2018; Allen et al., 2016; Lanie, 2017; Soumaré et al., 2016; Zins & Weill, 2016). The reasoning behind this result is that employees may be required to have accounts for salary disbursements and have a regular income, which would provide security in the event of a rejection of a loan application, for example (Allen et al., 2016). In addition, employed consumers earn an income that enables them to afford diversified financial products, such as credit cards, loans, insurance, and special savings accounts owing to a regular income.

Based on available evidence, some studies have measured financial inclusion based on single indicators whereas some have used composite indices which captured the use of saving, credit, and insurance products. However, these composite indices have excluded the use of flexible financial products and quality indicators of affordability and appropriateness. To fill this gap, this study proposed a measure of QFIN from a demand-side perspective encapsulating indicators of diversity, appropriateness, flexibility, and affordability of financial products. This is important because an attempt to measure financial inclusion ought to capture its multiple dimensions (Mialou et al., 2017; Tram et al., 2021). Moreover, a more comprehensive measure

helps the researcher in assessing how a broader focus on improving the quality of financial inclusion could impact consumers' welfare. The following section details the methodology that was used to compute the index of QFIN and examine its determinants.

2.5 Methodology

2.5.1 Reliability and sample adequacy tests

To compute the index of QFIN, the study used the FinScope 2015 consumer survey of South Africa as explained in Chapter 1 in Section 1.7. As a preliminary step, the reliability and sample adequacy tests were conducted on the items constituting the latent variables of QFIN before the dimension reduction technique. To achieve this, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, Cronbach's alpha, and Bartlett's (1950) sphericity test were used.

Cronbach's alpha provides a measure of internal consistency, which refers to the extent to which items measure the same concept or construct (Tavakol & Dennick, 2011). The Cronbach's alpha score ranges from 0 to 1 whereby a low score suggests poor inter-correlation between items. Whilst some studies employ a Cronbach's alpha score of 0.7 as a cut-off point, scores of $\geq 0.6 < 0.7$ are considered mildly acceptable (George & Mallery, 2003). Besides, Cortina (1993), Lance *et al*. (2006), and Schrepp (2020) contend that there is no clear methodological rationale that lends support to the 0.7 yardsticks.

The Cronbach's alpha might be inadequate if used in isolation which warrants Bartlett's sphericity test and the KMO sample adequacy measure (Cortina, 1993; Schmidt, 1996; Taber, 2018). Bartlett's (1950) test of sphericity tests the null hypothesis that the items are intercorrelated whereby a rejection of the null hypothesis at the 5% level implies that the items measuring a particular construct are indeed intercorrelated. Moreover, the KMO measure of sample adequacy ranges from 0 to 1 whereby a score of 0.6 or greater suggests that the sample is adequate (Williams et al., 2010; Yong & Pearce, 2013). In the study, these tests indicated that items measuring QFIN had a Cronbach's alpha of 0.701, a KMO value of 0.710, and Bartlett's test was statistically significant at the 1% level. This suggests that the items satisfied the minimum thresholds, which warranted the application of dimension-reduction techniques to measure QFIN as explained in the following section.

2.5.2 Polychoric principal component analysis

QFIN can be considered an unobserved multi-dimensional phenomenon that is estimated based on a set of observed proxies. Although the 14 indicators in Table 2.2 below describe different dimensions of QFIN in terms of a holistic interpretation of the phenomenon, it was convenient to combine the information into a composite indicator. The objective of this was to aggregate various dimensions of QFIN to depict a yet-unobserved indicator of QFIN.

To combine different dimensions into a composite indicator and facilitate interpretation, dimension reduction techniques can be used. While standard PCA can be applied, it works best only with continuous data since it is predicated upon the assumption that variables are normally distributed and a linear relationship exists between them (Kolenikov & Angeles, 2009; Krishnakumar & Nagar, 2008). To circumvent standard PCA's shortcomings, Filmer and Pritchett (2001) suggest a method of dimension reduction by incorporating discrete data into standard PCA, which involves segmenting the categorical variables into a set of dummy variables.

Notwithstanding the efficacy of Filmer and Pritchett's (2001) approach, some shortcomings are associated with it. Firstly, the segmentation of categorical variables into a set of dummy variables in PCA might result in spurious correlations, leading to a loss of ordinal information, and yielding biases toward the covariance structure. Secondly, ordinal variables do not possess an origin or measurement unit (Kolenikov & Angeles, 2009). Thus, covariance and variances of such variables will not have any meaningful inference if Filmer and Pritchett's (2001) approach is applied

In light of the pitfalls of standard PCA and Filmer and Pritchett's (2001) technique in the presence of categorical data, other dimension reduction techniques have been developed, such as MCA and polychoric principal component analysis (PPCA). However, one of the conditions of MCA is that of the monotonicity axiom, which means that the composite indicator must be monotonically increasing in each of the primary indicators (Asselin & Anh, 2008). In other words, if an individual improves in his or her inclusion in terms of one of the primary indicators, then the composite index should improve. Moreover, there must be f ordering consistency (FAOC)for the indicator *i*, which suggests ordinal consistency between the ordering of categories and weight across the categories either in an increasing or declining manner (Asselin & Anh, 2008; Moser & Felton, 2007). However, as opposed to binary

variables, the FAOC condition might not always be met if ordinal or categorical variables are included in the MCA (Ezzrari & Verme, 2013).

Considering the shortcomings of Filmer and Pritchett's (2001) technique and the inapplicability of MCA with ordinal or categorical variables, the study used PPCA. The PPCA is a technique that incorporates categorical variables into PCA by employing polychoric correlations (Kolenikov & Angeles, 2009). PPCA has the advantage over conventional PCA since it assigns each indicator the value of a discrete variable and ensures that the coefficients of a categorical variable will follow the order of its values (Moser & Felton, 2007). In the current study's context, for example, PPCA assigned a positive sign to the coefficient of owning an ATM card/debit card and a negative sign to the coefficient of not owning an ATM card/debit card. Given that PPCA coefficients are assigned different signs, the positive coefficients suggest that there is increasing QFIN in this context and *vice versa* (Moser & Felton, 2007).

Turning to the mechanics of PPCA, assuming that x is a random variable of dimension p with finite p×p variance-covariance matrix V [x]=Σ, PCA will solve the problem by result directions of the highest variance of linear combinations of *x's* (Njong & Ningaye, 2010). Put differently, the principal components (y_j) of variables $x_1,\ldots,x_p$ are linear combinations $\dot{a}_1x,\ldots, \dot{a}_px$ whereby

$$y_j=\dot{a}_jx \quad j=1, \ldots, k \tag{2.1}$$

The rationale behind PPCA is that directions with the greatest variability give the most information about the data's configuration in a multi-dimensional space. Therefore, the first principal component will have the greatest variance and extract the most information from the data, whereas the second component will be orthogonal to the first one and tend to extract the highest amount of information in the given sub-space (Njong & Ningaye, 2010). To solve Equation 2.1, the following eigenproblem for the correlation matrix Σ must be solved by finding λ and a such that:

$$\Sigma a=\lambda a \tag{2.2}$$

The solution to the eigenproblem in Equation 2.2 for the correlation matrix provides the set of principal components weights a (also called factor loadings), the linear combinations $a'x$ which can be referred to as factor scores and eigenvalues expressed as $\lambda_1\geq\lambda_2\geq\ldots, \geq\lambda_p$. The total variance is, therefore, equal to $\lambda_1+\lambda_2+\ldots, +\lambda_p$ and, consequently, the proportion of total

variance can be explained by the kth principal component which is equal to $\frac{\lambda_k}{\lambda_1+\lambda_2+\ldots,+\lambda_p}$ (Njong & Ningaye, 2010).

Generally, the first principal component from the PPCA explains variance in the original data set and is often considered to have a representation of the composite index (Kolenikov & Angeles, 2009). In the study, the index was computed as the weighted average of the variable scores with weights that were equal to the loadings of the first principal component. Moreover, considering that the proposed index constituted both binary and categorical variables, the PCA was based on the polychoric correlation matrix instead of the conventional Pearson correlation matrix (Kolenikov & Angeles, 2009). Therefore, the composite index of QFIN took the following form:

$$QFIN_i = \sum_{i=1}^{n} w_i x_i \qquad (2.3)$$

where $QFIN_i$ denotes the composite QFIN index, n refers to the number of variables, w_i signifies the weight obtained via PPCA that is attached to variable i and x_i represents the score on variable i.

Several adjustments were made to ease the interpretation of the index of QFIN. Beforehand, to obtain a logical flow of responses, some questions were reverse coded by designating a higher point for each affirmative response and lower scores for negative responses as shown in Table 2.2 below. Since PPCA estimations could yield negative index scores, the indicator was rescaled to obtain 0 as the starting value for the sake of convenience in the interpretation (minimal QFIN).[7] Consequently, a higher index score suggested that the individual has a higher QFIN and *vice versa.*

[7] Re-scaling was done by adding the minimum score to each variable in the indicator, as done in the computation of indices such as the asset index (Tita & Aziakpono, 2017) and the financial vulnerability index (Anderloni et al., 2012).

Table 2.2: Quality financial inclusion indicators

Dimension	**Indicators**
Diversity	Savings account: (1 - have now and 0 - otherwise) ATM card or debit card: (1 - if have now and 0 - otherwise) A personal loan from the bank: (1 - have now and 0 - otherwise) Credit card: (1 - if have now and 0 - otherwise) Use of at least one formal insurance product or funeral cover (1 - have now and 0 - otherwise) Fixed deposit account: (1 - have now and 0 - otherwise)
Affordability	Bank fees are too expensive (1- No; 0 - Yes) Insurance is not available for people with your income (2 - if strongly disagree and disagree; 1 - neutral; 0-otherwise) There are many reasons why people do not have a loan or do not borrow. What are your reasons for this?: Can't afford it (0-Yes; 1-No)
Flexibility	In the past 12 months, did you make use of revolving credit or a revolving loan facility? (1-Yes, 0-No) Overdraft facility: (1 - have now and 0 - otherwise)
Appropriateness	Banks provide solutions for your everyday problems (2 - if strongly agree/agree; 1 - neutral; 0-strongly disagree/disagree) Since you started using financial services, you feel very much in control of your financial situation (2- if strongly agree/agree; 1 - neutral and 0- strongly disagree/disagree) In your household, you are satisfied with the financial products and services that you use (2 - if strongly agree/agree; 1 - neutral; 0-strongly/disagree/disagree)

2.5.3 Ordinary least squares

To examine the association between socio-demographic factors and QFIN, heteroscedasticity-consistent ordinary least squares (OLS) regression analysis was conducted. Despite its limitations, the OLS regression was appropriate because it estimated the coefficients that represented the magnitude and direction of the association between QFIN and the covariates.[8] In addition, the OLS regression was chosen because the study sought to establish only an association between QFIN and the socio-demographic variables instead of a causal relationship. Considering this, the OLS regression was expressed as follows:

$$QFIN_i=\alpha_i+\beta_i X_i+\varepsilon_i \tag{2.4}$$

where $QFIN_i$ is the QFIN index for individual *i*; X_i denotes the socio-demographic factors that could influence QFIN (see Table 2.3), and ε_i signifies the error term. The OLS regression shown in Equation 2.4 was estimated after converting the QFIN index using inverse hyperbolic sine (IHS) transformation to account for extreme variables using the following formula (see, for further discussion, Burbidge et al., 1988):

$$\log\left(QFIN_i+\sqrt{(QFIN_i^2+1)}\right) \tag{2.5}$$

However, the QFIN index had some values that were equal to zero after rescaling, which made the conversion into the natural logarithm impracticable. To ensure that the assumptions of classical linear regressions were not violated, post-estimation diagnostic tests were carried out. Accordingly, variance inflation factors (VIF) were used to test for the presence of multicollinearity whereby values less than the cut-off of four in the study suggested the absence of multicollinearity (Aiken & West, 1991). Moreover, the robust command in Stata 16 was used and the OLS estimations were performed using standard errors robust to heteroscedasticity to ensure that the assumption of homoscedasticity was not violated.

[8] Nanziri (2016) and Anderloni et al. (2012) used an OLS regression to examine the determinants of financial literacy and financial vulnerability, respectively.

Table 2.3: Determinants of quality financial inclusion

Variable	Coding[9]
Gender	Female=0, male=1
Income	Income quintiles = poorest 20%, second 20%, middle 20%, fourth 20%, and richest 20%
Age	16-29=0, 30-44=1, 45-59=2, 60 and above =3
Bank distance	Minutes to the nearest bank branch
Location	Urban=0, small urban=1 and rural=2
Education	Upper secondary = 0, no formal education = 1, primary education = 2, lower secondary = 3, post-secondary = 4
Employment	Own business=0, formal employment=1, economically inactive=2, 3, Unemployed=3, Other=4
Financial literacy	Financial literacy index (computed using PPCA)

2.6 Results

This section presents and interprets the results of the QFIN index estimation using PPCA.[10] To gain an intuitive interpretation of QFIN, an analysis of indicators per each quintile of the QFIN index was done. Thereafter, the section concludes by presenting the results of QFIN determinants based on the heteroscedasticity-consistent OLS estimation.

2.6.1 Descriptive statistics

Table 2.4 below shows the descriptive statistics of the variables included in the estimations. The males constituted about 49.70% of the sample while about four-fifths of consumers resided in the urban areas and small urban areas combined. Also, consumers were on average between the second poorest and median income quintile as indicated by the mean income quintile of 2.578. However, the standard deviation of the income quintile was 1.527 suggesting that there was high variability in the income of consumers, which indicates the income inequality in

[9] To mitigate multicollinearity concerns, the base category was designated to the category with the highest frequency in some categorical variables (Wissmann et al., 2009).

[10] The estimation results of the proportion of each indicator in the QFIN index are summarised in Appendix 2B.

South Africa. Moreover, about 67.60% of consumers took 30 minutes or less to the nearest bank branch implying that few consumers did not have proximity to a bank branch. Further, sampled consumers on average were almost 40 years of age and the standard deviation of 15.215 suggested that there was a high variation in the age among consumers. The financial literacy index on average was 3.136 yet the standard deviation was 1.559 which suggested high variability in financial literacy among consumers. In addition, the standard deviation of the QFIN index was 1.003 which can be interpreted as a relatively high dispersion in the quality of financial inclusion from the average index score of 2.224.

Table 2.4: Descriptive statistics of variables

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
gender	5000	0.446	0.497	0	1
age	5000	39.859	15.215	16	99
income quintiles	3436	2.578	1.527	1	5
education	4989	1.897	1.607	0	4
employment	5000	2.285	1.235	1	5
bank distance	4155	0.676	0.468	0	1
location	5000	0.807	0.395	0	1
QFIN index	2234	2.224	1.003	0	5.536
financial literacy index	2579	3.136	1.559	0	6.113

Notes: Std. dev denotes standard deviation. Income quintiles were computed based on individuals' monthly income. FinScope 2015 survey data were drawn from a nationally representative sample of 5000 respondents based on weights benchmarked to StatsSA.

Table 2.5 below summarises the QFIN index coefficients from PPCA estimations. The results suggest that the FAOC assumption was satisfied since all variables with positive signs increased QFIN while negative signs lowered the index value, which was consistent with expectations (Asselin & Anh, 2008; Moser & Felton, 2007). For instance, the index had a positive value on "perceive banks provide solutions for everyday problems" and "perceives bank costs to be affordable" suggesting that these indicators improved the individual's QFIN. This was consistent across all constituent variables in the index; hence, not all indicators were interpreted for brevity's sake. Furthermore, Figure 2.1 below shows that the distribution of the QFIN index is asymmetrical, with a progressively declining frequency for higher QFIN levels while more consumers appear to have medium QFIN.

Table 2.5: Polychoric principal component analysis scoring coefficients of the quality financial inclusion index

Variable	Coding	Coeff. 1	Variable	Coding	Coeff. 1
No fixed notice deposit account	0	-0.290	Cannot afford credit	0	-0.353
Have fixed notice deposit account	1	0.202	Affords credit	1	0.059
No ATM or debit card	0	-0.451	No insurance or funeral cover	0	-0.573
Have an ATM or debit card	1	0.070	Have at least insurance or funeral cover	1	0.151
No savings account	0	-0.171	Perceives bank costs to be expensive	0	0.095
Have savings account	1	0.043	Perceives bank costs to be affordable	1	-0.038
No personal loan from a bank	0	-0.284	No credit card	0	-0.368
Have a personal loan from a bank	1	0.226	Have credit card	1	0.240
Perceives insurance to be unaffordable	0	-0.194	Do not feel in control of your financial situation after using financial products	0	-0.398
Neutral	1	-0.106	Neutral	1	-0.216
Perceives insurance to be affordable	2	0.051	Feel much more in control of the financial situation after using a financial product	2	0.094
No revolving loan or credit	0	-0.242	No overdraft facility	0	-0.339
Have a revolving loan or credit	1	0.190	Have overdraft facility	1	0.252
Does not perceive banks provide solutions for everyday problems	0	-0.212	Not satisfied with financial products used	0	-0.395
Neutral	1	-0.112	Neutral	1	-0.221
Perceive banks provide solutions for everyday problems	2	0.054	Satisfied with financial products used	2	0.090

Notes: The table shows the scoring coefficients of the QFIN indicators based on PPCA. Coeff denotes the scoring coefficient for each indicator.

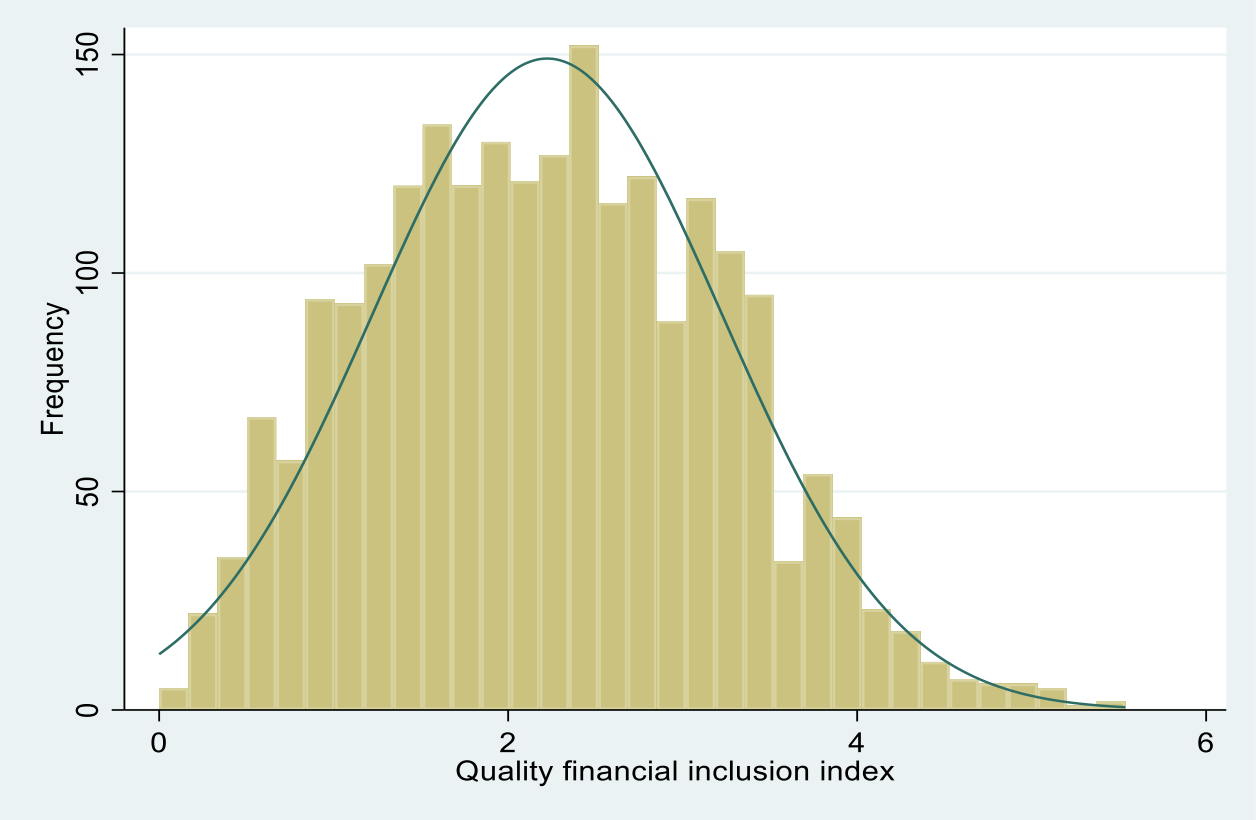


Figure 2.1: The frequency distribution of the quality financial inclusion index

Notes: The figure shows the frequency distribution of the QFIN index. The index was computed using PPCA based on FinScope 2015 consumer survey data of South Africa that is weighted to be nationally representative. The weights of the data are benchmarked to Statistics South Africa.

2.6.2 Analysis of quality financial inclusion quintiles

Table 2.6 below shows the distribution of constituent indicators across QFIN index quintiles. In this context, the quintiles were interpreted as follows: 1st quintile - low QFIN, 2nd quintile - upper-lower QFIN, 3rd - medium QFIN, 4th quintile - lower upper QFIN, and 5th quintile - high QFIN. Generally, the use of bank loans by consumers was very low since only 2.47% of consumers in the 5th QFIN quintile had bank loans. In addition, credit card ownership by consumers was less than 2% ranging from the least QFIN to medium QFIN, whereas approximately 47% of consumers with the highest QFIN owned credit cards.

Table 2.6: Components of quality financial inclusion per quintile

Dimension	Indicator		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
		Coding	Percentage per quintile (%)				
Diversity	No fixed notice deposit account	0	100.00	98.43	97.10	93.92	69.73
	Have fixed notice deposit account	1	0.00	1.57	2.90	6.08	30.27
	No personal loan from a bank	0	100.00	100.00	99.78	99.32	97.53
	Have a personal loan from a bank	1	0.00	0.00	0.22	0.68	2.47
	No ATM or debit card	0	79.02	42.51	16.48	9.23	3.81
	Have an ATM or debit card	1	20.98	57.49	83.52	90.77	96.19
	No savings account	0	79.46	49.22	35.86	31.08	29.15
	Have savings account	1	20.54	50.78	64.14	68.92	70.85
	No insurance or funeral cover	0	95.54	76.96	47.22	11.04	1.79
	Have at least insurance or funeral cover	1	4.46	23.04	52.78	88.96	98.21
	No credit card	0	99.55	98.88	98.22	91.44	52.91
	Have credit card	1	0.45	1.12	1.78	8.56	47.09
Affordability	Cannot afford credit	0	60.71	45.19	32.07	16.44	5.38
	Affords credit	1	39.29	54.81	67.93	83.56	94.62
	Perceives bank costs to be expensive	0	54.24	63.98	61.69	67.79	71.30
	Perceives bank costs to be affordable	1	45.76	36.02	38.31	32.21	28.70
	Perceives insurance to be unaffordable	0	35.71	39.15	31.85	24.77	15.25
	Neutral	1	33.93	30.65	29.84	26.35	13.23
	Perceives insurance to be affordable	2	30.36	30.20	38.31	48.87	71.52

Table 2.6: Components of quality financial inclusion per quintile (continued)

Dimension	Indicator		Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
		Coding	Percentage per quintile (%)				
Flexibility	No revolving loan or credit	0	99.78	99.55	99.55	99.32	93.95
	Have a revolving loan or credit	1	0.22	0.45	0.45	0.68	6.05
	No overdraft facility	0	100.00	100.00	99.55	97.75	80.04
	Have overdraft facility	1	0.00	0.00	0.45	2.25	19.96
Appropriateness	Not satisfied with financial products used	0	52.23	25.95	15.81	10.59	1.79
	Neutral	1	37.72	41.16	39.42	32.88	17.71
	Satisfied with financial products used	2	10.04	32.89	44.77	56.53	80.49
	Does not perceive banks provide solutions for everyday problems	0	40.85	24.83	20.49	16.44	13.23
	Neutral	1	40.40	36.69	38.31	31.98	29.60
	Perceive banks provide solutions for everyday problems	2	18.75	38.48	41.20	51.58	57.17
	Not satisfied with financial products used	0	50.67	31.77	16.70	11.04	2.69
	Neutral	1	35.49	32.66	35.19	29.28	14.35
	Satisfied with financial products used	2	13.84	35.57	48.11	59.68	82.96

A similar pattern can be seen in the other formal financial products considering that there was a progressively higher percentage of consumers in higher quintiles that had fixed deposit accounts, ATM cards, and transaction accounts compared with those in lower quintiles. For example, consumers in the 4th and 5th quintiles who had formal insurance were above 88% but the percentage declined to below 24% for those between the 1st and 2nd quintiles. While consumers between the 1st and 2nd QFIN quintiles did not use the overdraft facility, about a fifth (19.96%) of consumers in the 5th QFIN quintile used it. Furthermore, the use of flexible credit products was low considering that only 6% of consumers in the 5th QFIN quintile used a revolving loan credit, and this declined to less than 1% in the lower quintiles.

The pattern above could be explained by consumers in higher quintiles of QFIN being progressively satisfied with financial products, afforded insurance, and perceiving that a bank provides solutions for everyday problems. For instance, 57.17% of consumers in the 5th QFIN quintile perceived that a bank provides solutions for everyday problems compared with 18.75% in the 1st QFIN quintile. In addition, about four-fifths (82.96%) of consumers in the 5th QFIN quintile expressed satisfaction with financial services, while the percentage declined progressively to 13.84% in the 1st quintile.

2.6.3 Ordinary least squares

Previous studies from a demand-side perspective had mostly focused on the association between socio-demographic indicators and single indicators of bank account ownership, savings, and credit. Thus, the study proceeded to employ OLS regression analysis to examine the determinants of a broader measure of QFIN. The results tabulated in Table 2.7 below were obtained after estimating the regression model in Equation 2.4 where the dependent variable was a QFIN index converted using IHS transformation.

Contrary to *á priori* expectations, the results suggest that males have relatively lower QFIN as compared with females given a negative slope coefficient of -0.031 that was statistically significant at the 5% level. Relative to the poorest 20%, the richest 20% had the highest QFIN, as shown by the slope coefficient's magnitude of 0.153, which exceeded the coefficient of the fourth highest 20% (0.062), and median income earners (0.056). However, since the coefficient of the second poorest 20% was statistically insignificant at all conventional levels, there was no statistically significant difference in the QFIN of the poorest 20%.

Distance from the bank branch did not influence the variation in the QFIN of consumers, as indicated by a negative slope coefficient of -0.010 that was statistically insignificant at all conventional levels. In other words, proximity to bank branches did not result in significantly higher QFIN compared with residing far from bank branches. However, older consumers experienced more inclusion compared with younger ones, as indicated by larger significant slope coefficients, although there was no statistically significant difference in the 30-44 and 16-29 age categories. As expected, the rural slope coefficient was negative (-0.057) and statistically significant at the 5% level suggesting that urbanites experienced more inclusion compared with rural consumers. However, there was no statistically significant difference in the inclusion of small urbanites and urbanites, as shown by a statistically insignificant small urban slope coefficient. Consistent with expectations, more financially literate consumers had higher QFIN given that the financial literacy slope coefficient was positive (0.082) and statistically significant at the 1% level.

The *á priori* expectations of the positive influence of employment status on QFIN were met. As compared with consumers who own businesses, those who were formally employed (-0.094), economically inactive (-0.111), and unemployed (-0.172) had lower QFIN given that the slope coefficients entered with negative signs and were statistically significant at the 1% level. Moreover, the unemployed consumers had the lowest inclusion since the slope coefficient was the smallest compared with the other employment categories. However, the QFIN of consumers in other forms of employment was not different from the QFIN among entrepreneurs since the slope coefficient of -0.078 was statistically insignificant at all conventional levels. Education levels also explained the variation in the financial inclusion of consumers. In other words, compared with consumers with an upper-secondary qualification (Matric), consumers with no formal education (-0.241), with primary education (-0.186), and with lower secondary education (-0.050) had lower QFIN, as indicated by negative slope coefficients that entered significantly at the 1% level. In contrast, consumers with post-secondary education (0.055) had higher QFIN since the slope coefficient was positive and statistically significant at the 1% level.

Subsequently, diagnostic tests were conducted to ascertain whether the estimations might have been biased owing to a violation of classical linear regression model assumptions. The adjusted r-squared value of 0.529 suggested that approximately 52.91% of the variance in the QFIN index was explained by the independent variables. Moreover, the post-estimation analysis

suggested that the model did not suffer from multicollinearity given a mean VIF of 1.660, which was less than the threshold of four.

Table 2.7: Ordinary least squares results

Variable		Coefficient	t-statistic
Gender (Ref: female)	male	-0.031**	-2.100
		(0.015)	
Income (Ref: 1st quintile)	second 20%	-0.002	-0.050
		(0.030)	
	middle	0.054*	1.650
		(0.033)	
	fourth 20%	0.062**	2.210
		(0.028)	
	richest 20%	0.154***	4.860
		(0.032)	
Age (Ref: 16-29)	30-44	0.025	1.410
		(0.018)	
	45-59	0.044**	2.070
		(0.021)	
	60+	0.102***	3.220
		(0.032)	
Bank distance (Ref: >30 minutes)	<30 minutes	0.008	0.480
		(0.017)	
Location (Ref: urban areas)	small urban	-0.025	-1.590
		(0.016)	
	rural	-0.062**	-2.300
		(0.027)	
Financial literacy	financial literacy index	0.082***	14.810
		(0.006)	
Employment (Ref: own business)	formal employment	-0.094***	-3.820
		(0.025)	
	economically inactive	-0.112***	-3.830
		(0.029)	
	unemployed	-0.173***	-5.800
		(0.030)	
	other	-0.082	-0.670
		(0.123)	
Education (Ref: upper-secondary)	no formal education	-0.246***	-3.460
		(0.071)	
	primary education	-0.187***	-3.550
		(0.053)	
	lower secondary	-0.051***	-2.730
		(0.019)	

	post-secondary	0.056***	2.830
		(0.020)	
	Observations	1030	
	Adjusted R-Squared	0.529	
	Mean VIF	1.660	

Notes: The table reports an OLS estimation on the correlates of QFIN. Income quintiles were calculated based on individuals' monthly income. Ref. denotes reference or base category. ***p<0.01, **p<0.05, *p<0.10. () robust standard errors. Estimations are based on FinScope 2015 nationally representative consumer survey data using weights benchmarked against those of Statistics South Africa.

For robustness, the study assessed whether the results using a multi-dimensional measurement of QFIN would differ from single indicators of bank account ownership and saving account ownership that was mostly used in previous studies. To achieve this, a probit regression was estimated because the dependent variable was binary given that 1 was assigned if an individual owned a bank account and saving account ownership and 0 otherwise. The following probit regression in Equation 2.6 was estimated to assess the determinants of bank account ownership and saving account ownership:

$$P(FI=1/X)=\beta_0+\beta_i X_i+\mu_i \quad (2.6)$$

where FI denotes financial inclusion measured by bank account ownership and saving account ownership; X_i denotes the socio-demographic variables outlined in Table 2.3. As shown in Appendix 2H, financial literacy, income, employment, and education were statistically significant determinants of bank account ownership and saving account ownership. However, age, location, and bank distance did not influence ownership of a bank account and a saving account. Interestingly, ownership of bank accounts and saving accounts was higher among women than males. Despite a few variables being statistically insignificant, these results suggest that most factors that influence the quality of financial inclusion among consumers are similar to those that influence bank account ownership and saving account ownership.

2.7 Discussion

This section aims to draw a comparison between the findings in this study and those in the previous studies. Noteworthy, previous studies examined the association between socio-demographic variables and narrower indicators of financial inclusion. Therefore, a comparison is necessary to assess whether the results are sensitive to a multi-dimensional measure of QFIN.

To begin with, the result suggesting that males had lower QFIN were inconsistent with the *á priori* expectations. The result contrasts with previous studies conducted by Abel et al. (2018), Lotto (2018), and Lanie (2017) which revealed that males had higher financial inclusion, albeit measured by single indicators of bank account ownership, bank account use, and formal savings. However, the result of the current study could be partly attributed to the social grant program in South Africa which disburses social grants through the formal financial system as highlighted in Section 2.1. The FinScope 2015 data shows 24.28% of bank account owners were social grant recipients of which females constituted 80.45% of the social grant recipients shown in Appendix 2G. By so doing, this social welfare might have narrowed exclusion in the financial system in favour of women in South Africa's context. The intuition is that increased ownership of bank accounts among women through such initiatives could have increased access to other banking products including credit and insurance which are captured in the QFIN index.

Further, the result indicating that consumers in higher-income categories had significantly higher QFIN compared with the poorest 20% was consistent with the study's expectations. This is because consumers in higher-income categories might have higher QFIN since they are more likely to perceive formal financial products as affordable compared with consumers in the lower-income categories (Bester et al., 2016). The results are, however, similar to studies that reported that single indicators of bank account ownership, formal saving, and account use were associated with higher income (Abel et al., 2018; Allen et al., 2016; Asuming et al., 2019; Lanie, 2017; Lotto, 2018).

While bank branch proximity might not have influenced the variation in QFIN, consumers in rural areas had lower QFIN. This is similar to the results of the studies conducted by Allen et al. (2016) and Soumaré et al. (2016), although they used single indicators of bank account ownership and formal saving. This result could be attributed to the financial infrastructure gap between the rural and urban areas, which could make formal financial products in rural areas less accessible (Shipalana, 2019). Although financial technology through mobile money mainly has helped to reduce the urban-rural financial inclusion gap in other Sub-Saharan African countries through the reduction of transaction costs (Nzie et al., 2018; Ouma et al., 2017), South Africa's reliance on conventional financial institutions, which mostly requires physical financial infrastructure might explain why this gap still exists.

Also, the current study found that higher financial literacy increased QFIN which is similar to previous studies by Abel et al. (2018) and Akileng et al. (2018) who found a positive association between bank account ownership, frequency of bank account use, and financial literacy. A possible explanation is that financially literate consumers have trust and confidence in formal financial markets, which is highly correlated with financial market participation (De Beckker et al., 2019; Stolper & Walter, 2017). In addition, Lusardi et al. (2009) contend that consumers who are more financially capable tend to have a positive perception of financial products which increases their likelihood of selecting and using appropriate financial products. Moreover, apart from selecting appropriate financial products, financially literate consumers are likely to be more inclined to prepare for future adversities, which augments the use of saving, investment, and insurance products (Henager & Mauldin, 2015).

Similar to results in previous studies which found that bank account ownership, formal saving, and frequency of account use were positively associated with education qualification (Abel et al., 2018; Akileng et al., 2018; Allen et al., 2016; Lotto, 2018), the current study found that educational qualification was positively associated with higher QFIN. This was consistent with expectations since more educated consumers have the capacity and skill set to participate in formal financial markets (Allen et al., 2016). Besides, Demirgüç-Kunt and Klapper (2012) contend that more educated consumers are more likely to earn higher incomes, which increases their propensity to own bank accounts and the likelihood of having the collateral required in loan applications.

In summary, income, location, education, gender, financial literacy, and employment had a significant impact on QFIN among consumers. However, except for gender, the signs were like those of previous studies that used narrower metrics to gauge a consumer's inclusion in the financial system. Implicitly, most factors associated with the quality of financial inclusion are similar to narrower metrics of financial inclusion such as bank account ownership and saving account ownership. The following section concludes this chapter by recapping the key results and suggesting a further extension of the study covered in the chapter.

2.8 Conclusion

Financial inclusion has been regarded as a pathway for building financially resilient communities and providing a buffer against unforeseen financial adversities affecting households. Thus, owing to the welfare-enhancing potential of financial inclusion, a suitable measure that can be used to provide a benchmark and track changes in financial inclusion is

needed. Although the use of diverse financial products has been a measure of financial inclusion, the discourse has broadened to QFIN which refers to access to diverse, affordable, flexible, and appropriate formal financial products.

Several studies have suggested measures that can capture the inclusiveness of a consumer in the formal financial system. Given that a single indicator of financial product use might not capture fully the different facets of financial inclusion, other studies have computed multi-dimensional indices. However, to the best of the author's knowledge, the current measures from a demand-side perspective have not captured the use of flexible financial products and quality dimensions of appropriateness and affordability. From a consumer's perspective, the need for financial products that are flexible, affordable, and appropriate is drawn from the utility maximisation theory, preference for flexibility theory, and bounded rationality theory. To this end, using the FinScope 2015 consumer survey data from South Africa, the study contributed to the literature by computing an index of QFIN that captures the quality of financial inclusion from a demand-side perspective.

The results from the OLS regression suggested that gender, income, financial literacy, education level, employment status, and geographical location were significant determinants of QFIN in South Africa. Moreover, except for gender and bank distance, the signs of the coefficients of these socio-demographic determinants were similar to studies that used narrower metrics such as bank account ownership, frequency of account use, and formal saving.

Considering the findings, several recommendations could be drawn from the study. Firstly, researchers could employ the QFIN index developed in the study to assess how an improvement in the quality of financial inclusion could influence consumers' welfare. Secondly, the finding that the financial literacy index was positively associated with QFIN implies that financial education programs could contribute to increasing the use of diverse financial products. Moreover, financial service providers need to consider a bottom-up approach to understanding how they can improve the QFIN of consumers in the various socio-demographic groups, particularly low-income consumers and non-urban consumers.

Insofar as the current study's results are insightful, several avenues exist for future research. Owing to data limitations, the study relied on a cross-sectional dataset that eclipsed time-varying changes in QFIN, which suggests that a time series analysis of QFIN as more data becomes available could be conducted. Moreover, notwithstanding the efficacy of PPCA,

future studies could make index computation robust to other data reduction techniques such as non-linear PCA.

It is worth noting that the computation of a QFIN index ought not to be an end in itself because this might not be beneficial. In other words, it is not the measurement of QFIN that is pertinent *per se* but rather how it impacts consumers' welfare given it is the *raison d'être* of financial inclusion policy. For this reason, the subsequent chapter seeks to specifically focus on QFIN's association with consumers at different levels of financial vulnerability in the South African context. Before proceeding to Chapter 3, the appendices of Chapter 2 are provided below.

APPENDICES

Appendix 2A: Proportion explained per indicator of quality financial inclusion index

k	Eigenvalues	Proportion explained	Cumulative proportion
1	4.369	0.312	0.312
2	1.732	0.124	0.436
3	1.425	0.102	0.538
4	1.226	0.088	0.625
5	1.034	0.074	0.699
6	0.884	0.063	0.762
7	0.733	0.052	0.814
8	0.701	0.050	0.864
9	0.600	0.043	0.907
10	0.519	0.037	0.944
11	0.407	0.029	0.973
12	0.345	0.025	0.998
13	0.130	0.009	1.007
14	-0.103	-0.007	1.000

Appendix 2B: Polychoric correlation matrix of financial literacy index

	L8_7	L8_8	L8_9	L3_3	L3_4	L7_6	L4_1	L4_2	L3_1	L3_2	L11_1
L8_7	1.000										
L8_8	0.857	1.000									
L8_9	0.655	0.675	1.000								
L3_3	0.212	0.239	0.138	1.000							
L3_4	0.519	0.455	0.361	0.511	1.000						
L7_6	0.243	0.262	0.206	0.085	0.099	1.000					
L4_1	0.438	0.359	0.414	0.249	0.507	0.268	1.000				
L4_2	0.443	0.399	0.364	0.306	0.514	0.272	0.755	1.000			
L3_1	0.391	0.373	0.319	0.408	0.523	0.215	0.454	0.455	1.000		
L3_2	0.443	0.440	0.405	0.329	0.482	0.257	0.472	0.478	0.628	1.000	
L11_1	0.388	0.327	0.358	0.090	0.299	0.400	0.429	0.368	0.234	0.258	1.000

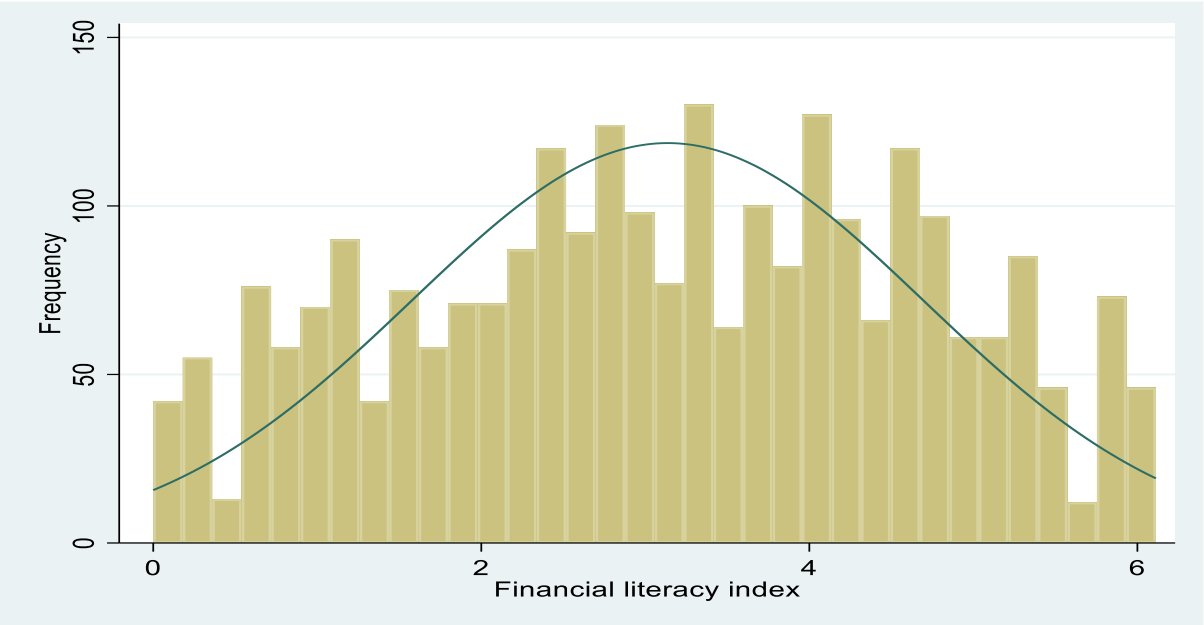
Appendix 2C: Indicators of financial literacy index

Dimension	Question	Description	Coding
Financial awareness	L8_7	You understand the difference between banking products offered	1-Yes; 0-No
	L8_8	You understand the difference between banks	1-Yes; 0-No
	L8_9	You are sure which bank account is the best one for you	1=Yes; 0-No
	L3_3	You have heard of a village or cooperative bank	2-Yes; 1-Sometimes; 0-No
	L3_4	You have heard of the ombudsman	2-Yes; 1-Sometimes; 0-No
Financial capability	L7_6	You always keep an eye out for better products and services than you currently have	2-Completely disagree/agree; 1-Neutral; 0-Completely agree/agree
	L4_1	When buying a product or service you ensure that the features of the product are explained to you	2-Yes; 1-Sometimes; 0-No
	L4_2	Before buying a product or service, you get alternative quotes from other providers	2-Yes; 1-Sometimes; 0-No
	L3_1	You have written up a plan or budget for your spending and earnings to make sure they balance	2-Yes; 1-Sometimes; 0-No
	L3_2	You keep track of the money that you get and spend	2-Yes; 1-Sometimes; 0-No
Financial attitude	L11_1	Financial security is important to you	2-Completely disagree/agree; 1-Neutral; 0-Completely agree/agree

Appendix 2D: Proportion explained per indicator of the financial literacy index

k	Eigenvalues	Proportion explained	Cumulative proportion
1	4.963	0.451	0.451
2	1.347	0.122	0.574
3	1.134	0.103	0.677
4	0.814	0.074	0.751
5	0.712	0.065	0.815
6	0.554	0.050	0.866
7	0.425	0.039	0.904
8	0.356	0.032	0.937
9	0.336	0.031	0.967
10	0.230	0.021	0.988
11	0.129	0.012	1.000

Appendix 2E: Frequency distribution of financial literacy index



Notes: The figure shows the frequency distribution of the financial literacy index. The index was computed using PPCA based on FinScope 2015 consumer survey data that is weighted to be nationally representative. The weights are benchmarked to Statistics South Africa.

Appendix 2F: Scoring coefficients of financial literacy index

Variable	Coding	Coefficient	Variable	Coding	Coefficient
L8_7	0	-0.468	L8_8	0	-0.452
	1	0.139		1	0.132
L3_3	0	-0.185	L3_4	0	-0.342
	1	-0.024		1	-0.111
	2	0.154		2	0.200
L7_6	0	-0.316		0	-0.473
	1	-0.170	L4_1	1	-0.243
	2	0.077		2	0.153
L4_2	0	-0.452	L3_1	0	-0.362
	1	-0.198		1	-0.124
	2	0.185		2	0.196
L3_2	0	-0.496	L11_1	0	-0.543
	1	-0.241		1	-0.356
	2	0.163		2	0.055
L8_9	0	-0.488			
	1	0.080			

Note: The table shows scoring coefficients of the financial literacy indicators based on the PPCA estimation.

Appendix 2G: Social grants recipients disaggregated by gender and location

Variable	Category	Coding	Frequency	Percent	Proportion of non-recipients (%)	Proportion of recipients (%)
location	urban	non-recipient	1653	81.830	44.174	
		recipient	367	18.170		29.173
	small urban	non-recipient	1516	75.270	40.513	
		recipient	498	24.730		39.587
	rural	non-recipient	573	59.320	15.313	
		recipient	393	40.680		31.240
gender	female	non-recipient	1759	63.480	47.007	
		recipient	1012	36.520		80.445
	male	non-recipient	1983	88.960	52.993	
		recipient	246	11.040		19.555

Notes: The table shows the proportion of social grant recipients across gender and location. The computation is based on the FinScope 2015 consumer survey data that is weighted to be nationally representative. The weights are benchmarked to Statistics South Africa.

Appendix 2H: Correlates of bank account and saving account ownership

		Bank account ownership			Saving account ownership		
Variable		**Coefficient**	**SE**	**t-stat**	**Coefficient**	**SE**	**t-stat**
Gender (Ref: female)	male	-0.201**	0.103	-1.960	-0.117*	0.068	-1.720
Income (Ref: 1st quintile)	2nd quintile	0.350**	0.145	2.420	0.389***	0.128	3.040
	3rd quintile	0.922***	0.205	4.500	0.535***	0.150	3.560
	4th quintile	1.096***	0.191	5.740	0.605***	0.130	4.640
	5th quintile	1.057***	0.255	4.150	0.146	0.144	1.020
Age (Ref: 16-29)	30-44	0.224*	0.128	1.760	0.027	0.086	0.310
	45-59	-0.097	0.141	-0.690	-0.015	0.099	-0.150
	60+	0.166	0.203	0.820	-0.192	0.146	-1.320
Bank distance (>30 minutes)	<30 minutes	-0.147	0.109	-1.350	-0.112	0.077	-1.440
Location (Ref: urban)	small urban	-0.113	0.115	-0.980	-0.060	0.073	-0.820
	rural	-0.226	0.144	-1.560	-0.012	0.041	-0.300
Financial literacy	financial literacy index	0.340***	0.040	8.560	0.150***	0.025	5.960
Employment (Ref: own business)	formal employment	-0.496***	0.176	-2.810	0.009	0.120	0.070
	economically inactive	-0.501***	0.191	-2.630	-0.012	0.134	-0.090
	unemployed	-0.649***	0.178	-3.640	-0.110	0.132	-0.830
	other categories	-0.138	0.668	-0.210	-0.343	0.468	-0.730
Education (Ref: upper secondary)	no formal education	-0.106	0.350	-0.300	-0.250	0.337	-0.740
	primary education	-0.073	0.198	-0.370	-0.173	0.171	-1.010
	lower secondary	-0.188	0.115	-1.630	-0.089	0.087	-1.020
	post-secondary	0.380*	0.209	1.820	0.168*	0.096	1.760

Notes: The table shows correlates of bank account ownership and saving account ownership estimated using probit regression analysis. Income quintiles are calculated based on an individual's monthly income. SE denotes a standard error. ***p<0.01, **p<0.05, *p<0.10. Estimations are based on FinScope 2015 consumer survey data using weights benchmarked to Statistics South Africa. Ref denotes reference category.

CHAPTER THREE

THE IMPACT OF QUALITY FINANCIAL INCLUSION ON FINANCIAL VULNERABILITY IN SOUTH ARICA[11]

3.1 Introduction

Financial inclusion has been considered one of the pathways to improving consumers' welfare because it may lead to less financial vulnerability and financial resilience (Lyons et al., 2020). Therefore, several policy initiatives have targeted an increase in bank account ownership among consumers, particularly in developing countries that still have the highest number of unbanked consumers. For example, the Mzansi Account Initiative in South Africa and the World Bank's Universal Finance Access 2020 were designed to provide low-fee transaction accounts to consumers. Consequently, there has been growth in bank account ownership to 84% among South African adults which is above the global average of 76% (Demirgüç-Kunt et al., 2022).

However, the policy focus has shifted from providing access to formal financial products to quality financial inclusion (QFIN). In the study's context, QFIN is defined as a state in which consumers use diverse financial products that are affordable, easy to understand, flexible, and appropriate. This is consistent with the utility maximisation theory (Schlesinger, 2012; Wonder et al., 2008), preference for flexibility theory (Krepps, 1979; Krishna & Phillip, 2014), and bounded rationality theory (Simon, 1990; Rim, 2012) which suggest that consumers will likely use financial products that are affordable, flexible and appropriate. This broader focus on financial inclusion might be more successful in lessening financial vulnerability compared with the earlier narrow focus on bank account ownership.

[11] A paper based on this chapter titled "Quality Financial Inclusion and Financial Vulnerability" was accepted for publication by the International Journal of Consumer Studies. The same paper was presented at the African Economics Conference, Santa Maria, Cape Verde, 2-4 December 2021. A declaration with signature in possession of candidate and supervisor.

Financial vulnerability and financial resilience are closely related concepts that are distinguishable.[12] While financial resilience is the ability to recover from an adverse shock (McKinnon & Derickson, 2013; Southwick & Charney, 2012), financial vulnerability is a multi-faceted and elusive concept that has been either objectively or subjectively defined. Objective definitions of financial vulnerability are based on an individual exceeding a predetermined debt ratio threshold (Brunetti et al., 2016; Lee & Sabri, 2017) and not having savings after accounting for all spending needs (Ali et al., 2020; Ampudia et al., 2016). However, this definition is not comprehensive and accurate enough since consumers might not want to divulge the monetary value of their debt, income, or expenditure to those assessing their financial vulnerability (Bialowolski & Weziak-Bialowolska, 2014). Therefore, subjective indicators are used since they provide a more comprehensive picture of consumers' financial vulnerability based on their perceptions of the difficulty they might be experiencing. This could include the likelihood of experiencing future hardships (O'Connor et al., 2019), facing difficulty in meeting basic living costs, and being unable to raise emergency funds (Daud et al., 2018; Singh & Malik, 2022). Moreover, financial vulnerability has been conceived as the failure to maintain a particular lifestyle, such as engagement in recreational activities (Chakrabarty & Mukherjee, 2021; Prina, 2015; Worthington, 2006).

In this study, financial vulnerability has three dimensions that encapsulate the inability to accumulate savings after meeting basic living costs (saving vulnerability), the inability to attend recreational activities (lifestyle vulnerability), and the inability to meet rudimentary living costs (expenditure vulnerability). Lowering vulnerability across these dimensions is important since it could contribute to the enhancement of an individual's SWB. The concept of SWB is a hedonic view of increasing pleasure and mitigating suffering and is both a cognitive and affective assessment of life (Diener, 2000). Therefore, a consumer's cognitive and affective evaluation of their ability to meet basic living costs, accumulate savings, and participate in recreational activities will influence their SWB (Diener, 2000; Nanda & Banerjee, 2021).

Several theories explain how consumers can reduce their financial vulnerability by using various financial products and services. Chetty and Looney's (2006) model of social insurance

[12] Financial fragility, financial distress, and financial vulnerability are terms used interchangeably in literature (Ali et al., 2020; Arestis et al., 2021; O'Connor et al., 2019).

posits that risk-averse consumers could have higher welfare gains by purchasing insurance, as this circumvents costly coping mechanisms after adverse life events. In addition, McKinnon's (1973) complementarity hypothesis asserts that saving platforms enable consumers to accumulate funds that can be channeled to income-generating activities, thereby improving their welfare. Furthermore, Shaw's (1973) debt intermediation theory introduces a credit channel through which consumers can access loans from financial institutions and invest in welfare-enhancing income-generating projects. Moreover, the income generated might not only permit individuals to meet their basic needs but also their lifestyle needs such as participation in recreational activities. This is consistent with the opportunity theory which posits that the consumption of recreational activities is positively correlated with income levels (Lee et al., 2001).

Previous studies have shown that the use of mobile money could mitigate financial vulnerability among consumers by allowing them to meet basic living costs and, in some cases, bounce back from shocks (Ahmed & Cowan, 2021; Koomson et al., 2021; N'dri & Kakinaka, 2020; Sakyi-Nyarko et al., 2020). Similarly, bank account ownership, non-formal and formal means of saving and borrowing have been shown to help households to meet basic living costs such as food and health expenses (Ibrahim et al., 2019; Iddrisu & Danquah, 2021; Wiersma et al., 2020). Moreover, in India and Nepal, it was reported that bank account ownership reduced households' financial vulnerability based on single indicators of basic living costs and attendance of religious festivals and ceremonies (Chakrabarty & Mukherjee, 2021; Prina, 2015).

As mentioned above, there has been no consensus on conceptualisation and the measurement of financial vulnerability from a consumer's perspective. Some studies measured financial vulnerability using single indicators of predetermined debt-to-income ratios (Cavalletti et al., 2020; Parise & Peijnenburg, 2019; Subova et al., 2021), inability to engage in social activities (Chakrabarty & Mukherjee, 2021; Prina, 2015; Worthington, 2006), and lack of liquidity because income is exceeded basic living expenses (Ali et al., 2020; Ampudia et al., 2016; Bettocchi et al., 2018; Brunetti et al., 2016). Other studies, however, computed indices to capture the multi-dimensionality of financial vulnerability. These indices of consumer financial vulnerability mostly captured the inability to raise funds to meet unexpected expenses, indebtedness, a decline in household income, and failure to meet basic living costs (Arestis et al., 2021; Bruce et al., 2022; Nemeth et al., 2020; Singh & Malik, 2022; Xu et al., 2017).

Considering the existing literature, there are two gaps in the existing literature this study seeks to fill. Financial vulnerability is multi-dimensional yet previous composite indices have only captured the ability to raise emergency funds, meet basic living costs, and indebtedness. To the best of the author's knowledge, these composite measures have excluded one's inability to have savings after meeting basic living costs (saving vulnerability) and inability to engage in social activities (lifestyle vulnerability). Moreover, previous studies relied on narrow financial inclusion measures that excluded the quality indicators of affordability, flexibility, and appropriateness of formal financial products.

Therefore, the study addressed these gaps identified above, thereby making two methodological contributions. Firstly, the study proposed an indicator of consumer financial vulnerability that captures its multi-dimensionality in terms of expenditure vulnerability, saving vulnerability, and lifestyle vulnerability. The various dimensions captured by the financial vulnerability index are important as they contribute to the enhancement of SWB (Nanda & Banerjee, 2021). Moreover, O'Connor et al. (2019) and Salignac et al. (2019) contend that single indicators do not capture other facets resulting in an underestimation of consumer financial vulnerability. Secondly, previous studies examining how financial inclusion influenced financial vulnerability employed narrow measures that excluded indicators of appropriateness, flexibility, and affordability of financial products. As such, this study departs from the previous ones by using a broader QFIN measure from a demand-side perspective which captures the aforesaid indicators. That said, using the methods of moments quantile regressions, this study answered the following question: what is the impact of QFIN on consumers at different levels of financial vulnerability in South Africa? The study's findings will inform policymakers in developing African countries on the extent to which a broader focus on the quality of financial inclusion could reduce the financial vulnerability of consumers.

The rest of this chapter is structured as follows: Section 3.2 explains the theoretical link between quality financial inclusion and financial vulnerability. Section 3.3 reviews empirical studies on financial vulnerability and financial inclusion. Sample 3.4 explains the methodology. Section 3.5 details the results. Section 3.6 discusses the results. Section 3.7 concludes the chapter with recommendations for future research.

3.2 Theoretical framework

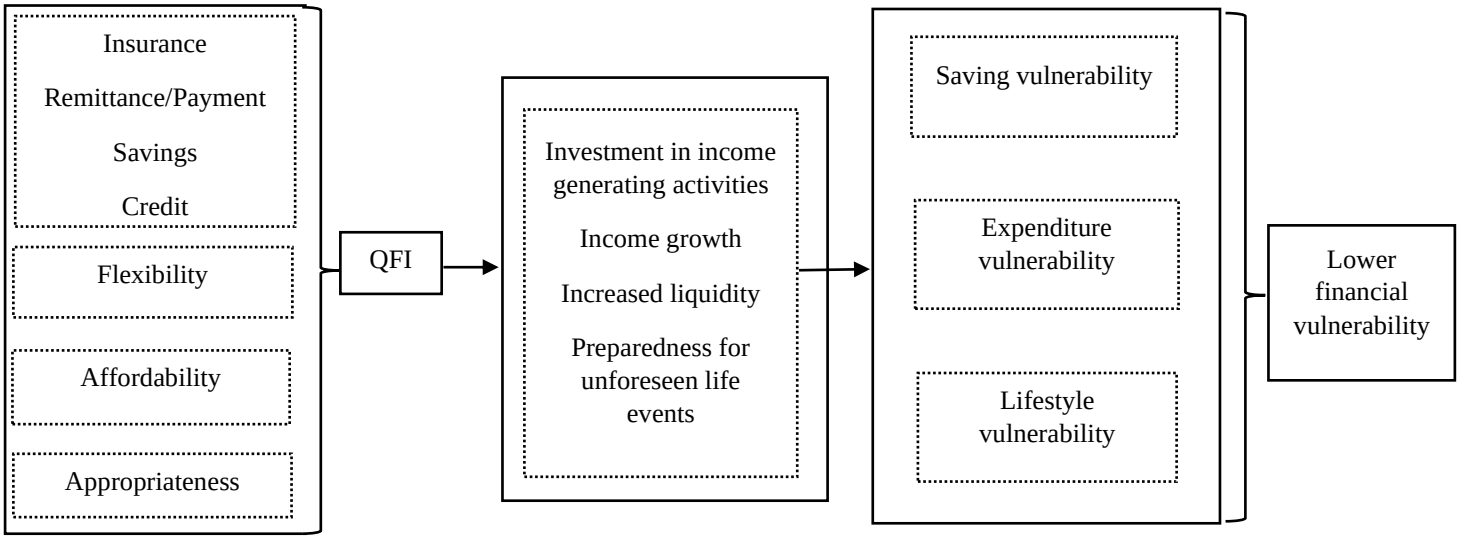


Figure 3.1: The link between quality financial inclusion and financial vulnerability

3.2.1 Quality financial inclusion framework

As explained in Section 2.3.2 of Chapter 2, to justify the inclusion of various dimensions of QFIN, the study drew insights from utility maximisation theory, bounded rationality theory, and preference for flexibility theory. According to the utility maximisation theory, rational consumers are more likely to purchase an item that produces the greatest marginal utility with the lowest amount of spending (Kahneman & Thaler, 2006; Wonder et al., 2008). The implication in the financial market is that consumers are more likely to use affordable financial products. Moreover, the bounded rationality theory asserts that consumers are satisficers who seek goods that are appropriate to meet their needs (Simon, 1990). Therefore, consumers will likely demand financial products that meet their contextual needs. Furthermore, the preference for flexibility theory suggests that a decision maker who might have uncertainties about his/her future consumption utilities will seek to avoid a current commitment to a course of future action and, thus, prefers flexibility (Kreps, 1979; Krishna & Phillip, 2014). To this end, consumers prefer financial products that provide some flexibility such as flexible debt repayment. Given the recap of the various theoretical perspectives justifying the inclusion of various dimensions in conceptualising QFIN, the following section explains how it could contribute to lower financial vulnerability.

3.2.2 Impact of quality financial inclusion on financial vulnerability

Theoretically, there are several channels through which consumers might lower their financial vulnerability when participating in mainstream financial markets. The complementarity hypothesis suggests that the poor can deposit their savings in financial intermediaries and earn interest until such time that they have enough resources to invest in physical assets that could earn higher yields. Therefore, deposits with positive real rates of return facilitated by financial intermediaries could encourage savings and serve as a conduit to accumulate capital channeled towards income-generating projects which enhance consumers' welfare (McKinnon, 1973).

Apart from saving, credit access could stimulate talented consumers to invest in high-risk and high-return income-generating activities, which would increase their income and wealth. Shaw's (1973) debt intermediation theory argues in favour of the liberalisation of financial markets by suggesting that higher interest rates will augment the savers' income and increase the opportunities for diversifying the portfolio of assets. The theory suggests that investors and savers are linked by a financial market that serves as an intermediary to facilitate financial transactions. Consequently, financial markets will attract savings which increases the supply of loanable funds to consumers, thereby introducing the credit channel of finance to welfare enhancement. Similarly, Quach's (2016) theoretical model linking credit and welfare suggests that consumers can invest borrowed funds into income-generating activities. The assumption is that talented consumers will take on credit and channel it toward income-generating projects. This generated income can lower consumers' financial vulnerability by allowing them to afford to pay for rudimentary household needs, such as food, energy, and medicine *inter alia*. Not only will higher income cater to basic living costs but it can also be allocated to spending on social activities, which would contribute to improving an individual's SWB. This is consistent with the opportunity theory which asserts that participation in outdoor recreational activities varies with the cost of the outdoor activities (Lindsay & Ogle, 1972).

In addition, consumers can avert the negative effects of adverse events by purchasing insurance. Chetty and Looney's (2006) social insurance theory posits that risk-averse consumers who experience large fluctuations in consumption after a shock might have greater welfare gains from purchasing insurance. This is because insurance helps consumers to circumvent costly-coping mechanisms after unforeseen events such as the illness or death of a family member. Insurance also facilitates risk management thereby helping talented consumers to invest in high-risk and high-return projects which generate income and reduce exposure to fluctuations in income and unforeseen life events (Brown et al., 2014; Elbers et al., 2007).

Based on the exposition above, the relationship between QFIN and financial vulnerability is simplified in Figure 3.1.

3.3 Review of the empirical literature

This section reviews two strands of literature. Firstly, the section reviews studies that have examined the link between financial vulnerability and financial inclusion. Secondly, the section reviews studies that have developed various measures of financial vulnerability.

3.3.1 The link between financial inclusion and financial vulnerability

This section discusses empirical studies that have examined the impact of various channels of financial inclusion on consumer financial vulnerability in several developing countries. Following the introduction of mobile money, researchers have attempted to examine its impact on welfare-related outcomes. This is attributed to lower transaction costs and increased convenience in payment associated with mobile finance which enables consumers to meet basic living costs (Koomson et al., 2021). In Uganda, Burkina Faso, and Kenya, mobile money account owners reported a higher monthly per capita consumption of food, health, education, and semi-durable goods compared with non-mobile money account owners (Munyegera & Matsumoto, 2016; N'dri & Kakinaka, 2020; Peprah et al., 2020). Furthermore, Meneses et al. (2019) conducted a field experiment in Niger to assess how mobile finance through Zap money transfer influenced expenditure vulnerability. They reported that Zap money transfer users increased expenditure on food, food diversity, and non-food items.

Obadha et al. (2020) reported that mobile money account holders in Kenya were more likely to become enrolled in the national health insurance fund compared with non-mobile money account holders. This increased health-seeking behaviour was attributed to lower transportation costs and a decline in travel time associated with mobile money accounts. Apart from health expenditure, Ahmed and Cowan (2021) reported that mobile money account ownership in Kenya increased expenditure on food, health, education, and clothing compared with non-users of mobile money. Moreover, Sakyi-Nyarko et al. (2021) showed that frequent use of mobile money accounts enabled Ghanaian consumers to increase their expenditure on education, food, shelter, medicine, and energy for cooking. This contrasts with Obadha et al. (2020), Meneses et al. (2019), and Munyegera and Matsumoto (2016) who focused on the impact of mobile money account ownership instead of the use of mobile money accounts.

Recent studies in China show that mobile finance could lower the vulnerability of households and consumers. Song et al. (2020), relative to conventional formal finance, reported that digital inclusion had a pronounced effect on household consumption of food, education, and medical expenses, but did not have a significant impact on the consumption of luxury goods by Chinese consumers. In addition, Luo and Li (2022) constructed an index of mobile finance for Chinese households and investigated how mobile finance influences household consumption. Findings suggested that mobile finance resulted in lower consumption inequality in China, while formal insurance had a statistically insignificant impact on household consumption.

Although mobile money has contributed to a reduction in financial vulnerability across several developing countries, non-formal financial arrangements have helped low-income consumers to manage their financial lives where formal financial institutions have failed. In Malawi and Kenya, it was reported that saving groups enabled consumers to invest in income-generating activities, which translated to higher meals consumed per day and the ability to cope with school expenses. By contrast, non-savings group members did not increase their income and failed to meet basic needs (Habyarimana & Jack, 2018; Ksoll et al., 2016).

Localised forms of risk pooling might be limited by their relatively small scale which permits only a small portion of risk to be offset. However, eligible consumers could employ products and services from formal financial institutions because these products have a greater capacity to help consumers manage their financial lives (Besley, 1995). In Nigeria, Dimova and Adebowale (2018) reported that bank accounts and formal credit enabled households to increase per capita expenditure, albeit widening inter-household inequalities. Moreover, credit use had a greater effect on household per capita expenditure amongst those in the urban areas *vis-a-vis* rural areas. Gyasi et al. (2019) constructed a composite financial inclusion index consisting of indicators of bank account ownership, mobile money account, Susu account, and credit use. Employing this index, they reported that financial inclusion contributed positively to health-seeking behaviour and improved health outcomes amongst adults in Ghana.

Ibrahim et al. (2019), employing a financial inclusion index similar to that formulated by Gyasi et al. (2019), reported that per capita expenditure on health and food increased amongst financially included consumers in Nigeria, but the effect was higher among the higher-income households. This evidence suggested that financial inclusion might worsen the disparity in the livelihoods among consumers, as found by Dimova and Adebowale (2018). Furthermore, Iddrisu and Danquah (2021) constructed a financial inclusion index consisting of indicators of

saving, insurance, and credit before examining how it was associated with food consumption. They reported that the food consumption expenditure of Ghanaian households that were financially excluded was lower than financially included consumers. Besides meeting basic food expenditure, financial inclusion increased out-of-pocket health expenditure amongst female-headed and urban-located households in Ghana (Koomson et al., 2021).

Other studies investigated how formal financial inclusion impacted the vulnerability of consumers located in developing non-African countries. Prina (2015) investigated the impact of bank account access on the consumption expenditure of Nepalese households. The results showed that bank account access enabled consumers to accumulate precautionary savings and was associated with increased consumption in social activities such as festivals and ceremonies. Arellano et al. (2019), employing data from Bolivia, Chile, Colombia, Ecuador, and Peru, investigated the impact of financial inclusion on consumers' ability to cover their costs of living even in the absence of their main source of income. Their results suggested that saving, insurance, and credit enabled consumers to meet basic living costs, albeit less pronounced amongst the more financially vulnerable ones. Recently, Chakrabarty and Mukherjee (2021) investigated the diversification in consumption expenditure amongst financially included consumers in India. Noteworthy, financial inclusion was measured by single indicators of life insurance, mutual funds, post office, fixed deposit, bonds, and transaction accounts. Their results suggested that financially included consumers experienced an increase in diversity in food items and a shift in consumption to non-food items comprising expenditure on clothing, energy, and cosmetics.

However, formal channels of financial inclusion might not always improve consumers' livelihoods as shown in India where the consumption of health and education did not significantly change amongst members of a microcredit program despite increased expenditure on durable goods (Banerjee et al., 2015). Similarly, Augsburg et al. (2015) found that microcredit program participants in Bosnia had lower savings and consumption which was attributed to the repayment of loans to micro creditors.

Apart from the developing countries, a few studies in developed economies have examined how the use of financial services and products could influence the financial vulnerability of consumers. Lusardi, Mitchell, and Oggero (2018) examined the factors that influenced financial vulnerability in the United States (US) and reported that the overuse of credit has resulted in financial vulnerability as consumers exceeded a predetermined debt-income ratio,

particularly among older consumers. In the Netherlands, Wiersma et al. (2020) reported that consumers who had bank accounts and bank loans were less likely to be financially vulnerable, as indicated by one's ability to meet unexpected needs. Demertzis, Dominguez-Jimenez, and Lusardi (2020) reported that one-third of households in Europe who had no access to short-term savings and credit faced difficulty in raising emergency funds within a month. In Italy, Cavalletti et al. (2020) examined the impact of credit on financial vulnerability, as measured by exceeding the predetermined debt-to-income threshold. They reported that highly indebted households were at high risk of incurring more debt which worsened their financial vulnerability. This implied that there was a need to curb borrowing particularly amongst the already fragile consumers otherwise this could negatively impact the economy if they default on their loans. Noteworthy, few studies in developed countries focus on the link between financial inclusion and financial vulnerability but tend to be oriented more toward examining the determinants and measurement of consumer financial vulnerability (Ampudia et al., 2016; Arestis et al., 2021; Brunetti et al., 2016; Chhatwani & Mishra, 2021; Hasler et al., 2018).

3.3.2 Measurement of financial vulnerability

Another strand of literature has suggested measures of consumer financial vulnerability, albeit without consensus. Several studies have measured financial vulnerability based on single indicators. For example, Arellano, Camara, and Mejia (2019) measured the financial vulnerability of consumers in five Latin American countries based on the length of time one can cover the costs of living without his/her main source of income and a loan. In Italy, Cavaeletti et al. (2020) considered households to be financially vulnerable if their income could not cover their basic expenses. Chhatwani and Mishra (2021) measured the financial vulnerability of US consumers based on a single indicator of one's ability to raise $2000 should an unexpected expense come up within a month. Demertzis et al. (2020) and Clark, Lusardi, and Mitchell (2020), using data from 30 European countries and the US, measured financial vulnerability based on the inability to raise 2 000 euros should an unexpected expense arise within a month. Similarly, Bialowolski, Weziak-Bialowolska, and McNeely (2021) measured the financial vulnerability of consumers in the US as the inability to pay for an unforeseen expense. In Spain, Fernandez-Lopez et al. (2022) measured financial vulnerability based on single indicators of inability to meet unexpected expenses, inability to meet basic living expenses, and being overindebted.

Furthermore, some studies measured financial vulnerability based on a negative financial margin which is an indication of a lack of liquidity because income is exceeded by basic living costs. In other words, this measure of financial vulnerability considers one's inability to accumulate savings after covering basic living costs. For example, consumers in several Euro-area countries were regarded as financially vulnerable when there are no savings because basic living costs exceed the individual's income (Ampudia et al., 2016; Brunetti et al., 2016). Ali et al. (2020) and Bettocchi et al. (2018) extended this indicator by considering a consumer to be financially vulnerable if he/she is unable to accumulate savings because income is exceeded by the sum of basic living costs and debt.

Other studies have measured financial vulnerability based on single indicators of indebtedness. Terraneo (2018) considered consumers in Greece, Spain, Italy, and Portugal to be financially vulnerable when their debt-to-asset ratio, debt-to-income ratio, and mortgage debt service-to-income ratio exceeded a predetermined threshold. Similarly, Michelangeli and Rampazzi (2016) and Vandone and Ottaviani (2018) measured consumer financial vulnerability in Italy based on the debt-to-income ratio exceeding a predetermined. In comparison, Parise and Peijnenburg (2019) merely measured the financial vulnerability of Dutch consumers based on their inability to repay debt. In addition, Subova, Mura, and Buleca (2021) measured the financial vulnerability of 23 Europeans using a ratio of total monthly debt payments to total monthly income.

A few studies, however, have employed composite indices because single indicators do not capture the multi-dimensionality of financial vulnerability. In Italy, Anderloni, Vandone, and Bacchiochi (2012) computed a financial vulnerability index based on the individual's ability to raise funds to meet unexpected expenses, indebtedness, and failure to meet basic living costs (expenditure vulnerability). Relatively, Xu et al. (2017) narrowly measured the financial vulnerability of British consumers based on an index capturing their ability to cover basic living costs. Nemeth, Zsoter, and Beres (2020) measured the financial vulnerability of Hungarians using an index capturing consumers' inability to meet basic living costs (expenditure vulnerability), indebtedness, and difficulty in raising emergency funds. Using data from 18 Eastern European countries, Arestis, Corrado, and Corrado (2021) computed a financial vulnerability index capturing indicators of being in arrears, unsuccessful application for a bank loan, defaulting in debt payments, and having no assets such as a primary residence. Recently, in the US, Bruce (2022) measured the financial vulnerability of households using an index that consisted of indicators of inability to meet basic expenses, a decline in household income, and

inability to access credit in an emergency. Singh and Malik (2022) computed a financial vulnerability index for Indian households constituting three indicators of inability to meet basic living costs, inability to raise funds in the event of unforeseen expenses, and time taken to cover expenses after loss of income. Table 3.1 below provides a summary of the measurement of financial vulnerability in the various studies reviewed.

In the studies reviewed above, there are some gaps that the current study intended to fill. Firstly, existing studies have relied on narrow measures of financial inclusion that do not capture indicators of flexibility, affordability, and appropriateness. This makes the measurements less indicative as they lack other dimensions of financial inclusion (Mialou et al., 2017; Tram et al., 2021). Secondly, the existing financial vulnerability indices have captured an individual's ability to raise emergency funds, indebtedness, a decline in household income, and the ability to meet basic living costs. However, the existing consumer financial vulnerability indices have not captured one's inability to engage in social activities (lifestyle vulnerability) and inability to accumulate savings after covering all expenses (saving vulnerability). Hence, the study contributed to the literature by computing a financial vulnerability index encapsulating lifestyle vulnerability, expenditure vulnerability, and saving vulnerability. This is important because lowering financial vulnerability from various facets is critical in improving consumers' life satisfaction based on the hedonic view of SWB (Diener, 2000; Nanda & Banerjee, 2021). Moreover, single indicators do not fully capture the extent to which an individual is financially vulnerable, which warrants a multi-dimensional measure (O'Connor et al., 2019; Salignac et al., 2019). What tied together the methodological contributions was to employ these multi-dimensional indices to examine the impact of QFIN on consumers at different levels of financial vulnerability in the context of South Africa.

In light of the above, the study hypothesised that an increase in the QFIN will reduce financial vulnerability among consumers. This is because consumers with a broader suite of quality financial products are more likely to have liquid savings, credit, and insurance which enhances their welfare. For instance, savings could enable consumers to meet basic living costs when the need arises whereas insurance products can help consumers to hedge the risk of unforeseen life events, such as death, illness, or property damage. Moreover, consumers can borrow to invest in projects that generate income, thereby increasing the likelihood of meeting basic living costs and affording other lifestyle needs such as engaging in social activities. Against this backdrop, the following section details the methodological approach that was used to address the study's objective.

Table 3.1: Summary of studies measuring financial vulnerability

Year	Author(s)	Sample	The measure of financial vulnerability
2012	Anderloni et al.	Italy	Index capturing indebtedness, inability to meet basic monthly expenses, and inability to raise emergency funds
2016	Michelangeli and Rampazzi	Italy	Debt service-to-income ratios that are greater than its income and below the median of the population
2016	Brunetti et al.	Italy	Lack of liquidity because expenses exceed income and have insufficient liquid assets to cope with potential expenses
2017	Terraneo	Greece, Spain, and Italy	Debt-to-income ratio exceeding a predetermined threshold
2017	Bettocchi et al.	Italy	Single indicators measure the ability to cover unexpected expenses and the inability to accumulate savings because income is less than the sum of basic living costs and debt.
2017	Xu et al.	Britain	An index measuring the ability to meet basic living costs.
2018	Vandone and Ottaviani	Italy	Debt-to-income ratio exceeding a predetermined threshold
2019	Arellano et al.	Bolivia, Chile, Colombia, Ecuador, and Peru	Length of time individuals can cover their costs of living after they find themselves without their main source of income and a loan
2019	Parise and Peijnenburg	Netherlands	Single indicators of being in arrears, mortgage debt-to-income ratio, if unable to accumulate savings because income is exceeded by expenses
2020	Ali et al.	Pakistan	If unable to accumulate savings because income is exceeded by the sum of basic living costs and debt

Year	Author(s)	Sample	The measure of financial vulnerability
2020	Lusardi et al.	United States	Debt-to-income and debt-to-assets ratios exceeding a predetermined threshold
2020	Nemeth et al.	Hungary	Index constituting indicators of ability to meet basic living costs, indebtedness, and difficulty in meeting future financial costs.
2020	Demertzis et al.	Europe	Ability to raise $2000 should an unexpected expense come up within a month.
2020	Clark et al.	United States	The ability to come up with $2000 to cover unexpected expenses in the next month.
2020	Cavaeletti et al.	Italy	Adequacy of the household income to cover basic monthly expenses
2021	Arestis et al.	18 Eastern European countries	Index capturing indicators of being in arrears, bank loan has been refused, defaulting in debt payments, and no assets such as primary residence
2021	Chhatwani and Mishra	United States	Ability to raise $2000 should an unexpected expense come up within a month.
2021	Bialowolski et al.	United States	The ability to pay for an unforeseen expense after an emergency
2021	Subova et al.	Europe	The ratio of total monthly debt payments to total monthly income
2022	Bruce et al.	United States	Index capturing ability to meet household expenses, the decline in household income, and access to credit in an emergency.
2022	Singh and Malik	India	Index capturing a household's ability to meet basic living costs, paying for an unforeseen expense, and the time one takes to cover expenses after loss of income.
2022	Fernandez-Lopez et al.	Spain	Single indicators based on inability to meet unexpected expenses, inability to meet basic living expenses, and being overindebted

3.4. Methodology

To begin, the section explains the preliminary tests preceding the computation of the financial vulnerability index. Thereafter, the discussion points to the quantile regression that was used to examine the impact of QFIN on consumers at various levels of financial vulnerability. As mentioned in Section 1.7 of Chapter 1, the study used cross-sectional data from the FinScope 2015 consumer survey of South Africa.

3.4.1 Reliability and sample adequacy tests

Preliminarily, Cronbach's alpha, Bartlett's test of sphericity, and KMO measure of sample adequacy tests were conducted on the items constituting the latent variables of financial vulnerability before applying the dimension reduction technique. In the interest of brevity, reference can be made to Section 2.5 of Chapter 2 for a more detailed explanation of these tests. Based on Cronbach's alpha of 0.728, the items measuring financial vulnerability were reliable since the score exceeded the minimum threshold of 0.6. Furthermore, the rejection of the null hypothesis of Bartlett's test of sphericity at the 1% level indicated that the constituent items measuring financial vulnerability were intercorrelated as expected. In addition, the items constituting financial vulnerability satisfied the sample adequacy condition since the KMO score of 0.788 surpassed the minimum threshold of 0.6.

3.4.2 Financial vulnerability index computation

Considering the above, a measure of financial vulnerability was computed since the constituent indicators satisfied the sample adequacy and reliability tests. To achieve this, the study used survey questions that solicit subjective assessments of an individual's feelings about financial vulnerability. Given that the amount of information obtained from survey questions describes various aspects of financial vulnerability, it was convenient to summarise the information in a composite index constituting nine indicators to ease the interpretation of the phenomenon. This index provides a ranking of vulnerable consumers and identifies factors that are responsible for vulnerability (see, for example, Ali et al., 2020; Fang et al., 2016). The constituent indicators of the financial vulnerability index are shown in Table 3.1 and Appendix 3A below.

As discussed in Section 2.7 of Chapter 2, the standard PCA is unsuitable for categorical data. Moreover, although Filmer and Pritchett (2001) suggest a dimension reduction technique of incorporating discrete data into standard PCA, this technique might result in spurious correlations, and yield biases towards the covariance structure, which warrants the use of PPCA

to address this shortcoming (Kolenikov & Angeles, 2009). Therefore, the study used PPCA to compute the FVI following the steps explained in Section 2.6 of Chapter 2. Furthermore, the weighted average of variable scores with weights equal to loadings of the first principal component was used to compute the FVI as follows:

$$FVI_i = \sum_{i=1}^{n} w_i x_i \quad (3.1)$$

where FVI_i denotes the composite FVI for consumer *i*, *n* refers to the number of variables, w_i signifies the weight attached to the variable *i*, and x_i represents the score on variable *i*. By construction, declining financial vulnerability index scores were associated with lower financial vulnerability. Thereafter, the association between QFIN and financial vulnerability was investigated by estimating OLS, as a baseline model, and methods of moments quantile regression (MMQR) controlling for socio-demographic covariates as explained below.

3.4.3 Empirical strategy

3.4.3.1 Ordinary least squares

To estimate the association between QFIN and financial vulnerability, linear, logistic, or Poisson regression models could have been used but the dependent variable and the study's objective determined the model. While logistic regressions are used when the dependent variable is binary, ordinal, or categorical, Poisson regression is appropriate for rate or count outcome variables, and linear regression models are applicable for continuous dependent variables (Staffa et al., 2019). Therefore, the average distribution of the association between QFIN and financial vulnerability was estimated using OLS as follows:

$$FVI_i = \alpha_o + \beta_i QFIN_i + \gamma_i X_i + \varepsilon_i \quad (3.2)$$

where $QFIN_i$ represents the quintile of the QFIN index for individual *i*; X_i signifies socio-demographics that could explain the variation in the financial vulnerability of individual *i* as guided by previous empirical studies, and ε_i is the error term. The coefficient of interest in Equation 3.2 is β_i, which was expected to enter with a negative sign suggesting that higher QFIN lowers consumers' vulnerability.

To account for outliers and non-normality in the dependent variable, IHS transformation was used on the FVI in Equation 3.2. Furthermore, the VIF was used to test for the presence of multicollinearity whereby values less than the cut-off of four suggested the absence of

multicollinearity (Aiken & West, 1991). Also, the robust command in Stata 16 was used to ensure that the OLS estimations did not suffer from a violation of homoscedasticity.

3.4.3.2 Methods of moments quantile regression

It should be noted that OLS might have some limitations which warranted the estimation of MMQR. Koenker and Bassett (1978) suggested a quantile method that produced estimates for specific quantiles, unlike the OLS regressions which yield estimates for the mean. In other words, OLS regressions potentially obscure the impact of QFIN at the upper and lower levels of the financial vulnerability distribution owing to unobserved heterogeneity. Moreover, unlike OLS, quantile regressions are robust to outliers especially if the data exhibit non-linear distributions (Draper & Smith, 1998; Koenker & Hallock, 2001).

However, the general quantile regression technique suggested by Koenker and Bassett (1978) ignores the possibility of endogeneity in the treatment variable, which could result in biased results. In the current study, Equation 3.2 might suffer from an endogeneity problem emanating from reverse causality between QFIN and financial vulnerability. This is because higher QFIN could reduce the financial vulnerability of consumers, but financially vulnerable consumers might not afford to use a broader set of financial services. To mitigate the potential endogeneity problem, Chernozhukov and Hansen's (2008) instrumental variable quantile regression approach could have been employed. However, it was infeasible to find a suitable instrumental variable because the QFIN index was composed of various financial products which required different instruments.

Considering the above, the study employed the MMQR estimator by Machado and Silva (2019) which is applicable in situations where there are endogenous explanatory variables. To solve endogeneity, the MMQR system generates instrumental variables such that the explanatory variables will no longer be correlated with the error term. The exogeneity of the instruments will imply that orthogonality conditions will be satisfied such that the difference between the estimated parameter and the true value of the parameter draw close to zero. The MMQR estimator assumes that the covariates only influence the distribution of interest via known scale and location functions. The reason is that the MMQR estimator was adapted to estimate cross-sectional models with endogenous variables by ensuring that the estimated structural quantile functions do not cross in the presence of endogenous explanatory variables (Machado & Silva, 2019).

Apart from solving endogeneity, the model also increases efficiency by permitting the number of moment conditions to be greater than the number of parameters. Moreover, the MMQR estimator has good large sample properties since it yields strongly consistent and asymptotically normal coefficients in the presence of a large dataset as the one used in the study (Machado & Silva, 2019). Unlike the quantile regression by Koenker and Basset (1978), which is based on the estimation of conditional means, Machado and Silva's (2019) MMQR estimator is based on moment conditions that identify conditional means under exogeneity. Assuming that the distribution of the coefficients differs only in their location and scale, the MMQR model was estimated as follows:

$$Q_{\gamma}(\tau|X_i) = \alpha_i + \delta_i q(\tau)) + X_i\beta + U_i \quad (3.3)$$

where α_i, δ_i β, and γ denote the parameters for estimation; X_i denotes the vector of independent variables that influence financial vulnerability as shown in Table 3.2. $Q_{\gamma}(\tau|X_i)$ is the conditional distribution for financial vulnerability (dependent variable) and its association with X_i variables at the 25th quantile, 50th quantile, 75th quantile, and 95th quantile. $\delta_i q(\tau)$ signifies the scalar coefficient which indicates the symptomatic feature of quantile-τ for each cross-section i. U_i is the error term that is identically and independently distributed over individuals and orthogonal to X_i to satisfy the moment conditions, thereby indicating strict endogeneity. By construction, a higher financial vulnerability index implied higher vulnerability implying that consumers in the higher quantiles were more financially vulnerable and *vice versa*.

3.4.4 Control variables

Following previous studies, the OLS and MMQR estimations controlled for several covariates that could influence the variation of financial vulnerability. Therefore, this section details the *á priori* relationship between financial vulnerability and socio-demographic covariates.

3.4.4.1 Gender

The gender differences in financial vulnerability could be explained by the social capital theory. The social capital theory posits that disadvantages experienced by women result in lower-quality jobs, lower income due to irregular work trajectories, and lower financial knowledge due to less economic participation (Fan & Babiarz, 2019; Gonçalves et al., 2021). Moreover, the theory asserts that the gendering of family roles and work could restrict women from improving their livelihoods *vis-a-vis* men, who are regarded as breadwinners and have higher-quality jobs. From this viewpoint, women are more likely to become more financially

vulnerable than men as found by Koomson et al. (2021), Ibrahim et al. (2019), and Song et al. (2020). To this end, females were expected to be more financially vulnerable than males.

3.4.4.2 Income

Apart from gender, income could influence the financial vulnerability of consumers. Luo and Li (2022), Charkrabaty and Makhurjee (2021), and Song et al. (2020) reported that consumers in higher-income quintiles were less financially vulnerable despite Sakyi-Nyarko et al. (2020) and Gyasi et al. (2019) failing to find an income effect on financial vulnerability. Intuitively, consumers in higher-income categories are likely to have more financial resources to afford unforeseen expenditures, engage in social activities, and meet basic living costs. Thus, *á priori*, a negative income slope coefficient was expected.

3.4.4.3 Education

Although Koomson et al. (2021) and Gyasi et al. (2019) failed to find an impact of education qualification on consumers' financial vulnerability, the majority of the empirical studies have reported that more educated consumers were more capable of meeting basic living costs (Ahmed & Cowan, 2021; Chakrabarty & Mukherjee, 2021; Luo & Li, 2022). This is because the labour market tends to reward more educated consumers with more income, which could lower their vulnerability (Allonso-Villar et al., 2012; Blaug, 1972). Therefore, in the study, consumers with higher education qualifications were likely to exhibit lower financial vulnerability compared with less educated consumers.

3.4.4.4 Geographical location

Apart from education, geographical location could play a role in the financial vulnerability of consumers. Most studies have reported that rural residents are associated with higher financial vulnerability compared with urbanites (Koomson et al., 2021; Luo & Li, 2022; Song et al., 2020). This could be attributed to fewer career opportunities, fewer social facilities, and relatively poor financial infrastructure in rural areas, which increase financial vulnerability in this demographic category. Hence, in the current study, a positive rural slope coefficient was expected compared to an urban base category.

3.4.4.5 Age

There seems to be no consensus on the relationship between age and financial vulnerability. On the one hand, younger consumers were found to be more financially vulnerable than older

ones (Daud et al., 2018; Dimova & Adebowale, 2018; Song et al., 2020). On the other hand, some studies have reported that older consumers are less financially vulnerable (Ibrahim et al., 2019; Luo & Li, 2022; N'dri & Kakinaka, 2020). However, Iddrisu and Danquah (2021) and Gyasi et al. (2019) showed that age did not influence financial vulnerability. Considering that older consumers (60 and above) have fewer income streams owing to economic inactivity and a decline in financial literacy due to cognitive changes in that phase of their life cycle (Mitchell & Lusardi, 2021), it was expected that older consumers were more financially vulnerable compared with consumers in younger age categories.

3.4.4.6 Employment

As reported in previous studies, employed consumers are more likely to afford expenditures on health, food, and other non-food expenditures (Ahmed & Cowan, 2021; Koomson et al., 2021; Obadha et al., 2020). This is because employed consumers can borrow from financial institutions and earn income that could help them meet immediate basic living costs. Therefore, compared with unemployed and economically inactive consumers, employed consumers were more likely to be less financially vulnerable in the study.

3.4.4.7 Marital status

Song et al. (2020) and Koomson et al. (2021) reported that married individuals were likely to meet basic living costs and were prepared for unforeseen events compared with single consumers. A possible explanation is that married consumers can pool funds which enables them to make ends meet and reduce solvency problems, unlike unmarried individuals who typically have a single income (Reyers, 2019; Wiersma et al., 2020). Therefore, in the current study, married consumers were expected to be less financially vulnerable than consumers in other relationships.

3.4.4.8 Financial literacy

Cognitive abilities such as financial literacy could influence the financial vulnerability of consumers. Financially literate consumers are likely to participate in formal financial markets through saving, investing, buying insurance, and borrowing responsibly, which could reduce their likelihood of becoming financially vulnerable (Mitchell & Lusardi, 2021; Stolper & Walter, 2017). Moreover, financial literacy increases positive financial behaviour, such as planning and budgeting, which contributes to lower financial vulnerability (De Beckker et al., 2019; Goyal & Kumar, 2021). Correspondingly, a negative financial literacy slope coefficient

was expected suggesting that consumers with higher levels of financial literacy were less financially vulnerable.

To measure financial literacy, PPCA was used to capture indicators of financial awareness, financial capability, and financial attitude. The expectation was that a combination of financial awareness, financial capability, and financial attitudes that support financial decision-making could ultimately lower financial vulnerability (Atkinson & Messy, 2011; Cucinelli et al., 2021; Klapper et al., 2013).[13] For brevity's sake, Appendices 2D-2H provides a list of indicators and estimation results of the financial literacy index computation using PPCA.

3.4.4.9 Income transfer

In South Africa, the government provides social grants through the SASSA to improve the welfare of needy consumers. Notwithstanding its limitations, social grants digitisation has increased formal inclusion, which could facilitate savings and remittances amongst low-income South African consumers. However, in 2015, although the upper-bound poverty line was R992, the social grants ranged between R329.28 and R1386.21 (SASSA, 2019). Currently, the social grants range between R450 and R1890 whereas the upper-bound poverty line is R1335 (SASSA, 2019; Statistics South Africa, 2021). Given that the upper-bound poverty line exceeds social grants, for the most part, it was expected that social grants would not significantly reduce the financial vulnerability of most recipients.

3.4.4.10 Informal savings

Where formal financial institutions cannot meet the needs of consumers, informal financial arrangements provide consumers with a platform to alleviate financial vulnerability. In other words, informal financial arrangements such as savings groups enable consumers to accumulate savings and employ the lump sum to invest in income-generating activities that could improve their livelihoods (Ksoll et al., 2016; Lensink et al., 2017). While savings groups have lower economies of scale and capacity to cope with consumers' needs, they can be a source of the liquidity required to meet basic living costs as members can borrow from the pooled funds at a predetermined interest fee (Besley, 1995). Considering this, a negative

[13] The FinScope 2015 consumer survey of South Africa did not ask the questions suggested by Lusardi and Mitchell (2014), which solicit responses indicating an understanding of inflation, compound interest, and risk diversification.

informal savings slope coefficient was expected, but the magnitude was likely to be less pronounced than QFIN. Hence, in the current study, a negative social grants slope coefficient was expected.

Table 3.2: Description of variables and coding

Variable	**Coding**[14]
Gender	Female=0, male=1
Income	Income quintiles - poorest 20%, second 20%, middle 20%, fourth 20%, and richest 20%
Age	16-29=0, 30-44=1, 45-59=2, 60 and above =3
Location	Urban=0, small urban=1 and rural=2
Education	Upper secondary = 0, no formal education = 1, primary education = 2, lower secondary = 3, post-secondary = 4
Employment	Own business=0, formal employment=1, economically inactive=2, unemployed=3, other=4
Financial literacy	Financial literacy index (computed using PPCA)
QFIN	QFIN index quintiles
Marital status	Married = 0, single=1, widower=2, divorced=3
Social grants	Non-recipient=0, recipient=1
Informal savings	No informal savings=0, informal savings=1

3.5. Results

The results that emerged from the study are presented in this section. To begin, there is a presentation of summary statistics and analysis of the QFIN and FVI computation. Subsequently, the results of the impact of QFIN on financial vulnerability using OLS and MMQR are explained.

[14] To mitigate multicollinearity concerns, the base category was designated to the category with the highest frequency in some categorical variables (Wissmann et al., 2009).

Table 3.3: Scoring coefficients of financial vulnerability index

Saving	-0.467	You have enough money left for savings after covering all your spending needs
	-0.212	Sometimes
	0.168	Does not have enough money left for savings after covering all your spending needs
Expenditure	-0.306	Does not usually have problems making ends meet
	-0.067	Neutral
	0.211	Usually have problems making ends meet
	-0.321	Has never gone without enough food to eat because you did not have enough money to buy food
	-0.001	Rarely go without enough food to eat because you did not have enough money to buy food
	0.124	Sometimes has never gone without enough food to eat because you did not have enough money to buy food
	0.420	Often gone without enough food to eat because you did not have enough money to buy food
	-0.294	Has not gone without medicine or medical treatment that was needed
	-0.025	Rarely gone without medicine or medical treatment that was needed
	0.094	Sometimes gone without medicine or medical treatment that was needed
	0.347	Often gone without medicine or medical treatment that was needed
	-0.294	Often gone without energy to heat your home or cook food except for blackouts or load shedding
	-0.068	Rarely gone without energy to heat your home or cook food except for blackouts or load shedding
	0.052	Sometimes gone without energy to heat your home or cook food except for blackouts or load shedding
	0.305	Often gone without energy to heat your home or cook food except for blackouts or load shedding
Lifestyle	-0.461	Eaten out at a branded family restaurant such as Spur, Saddles, and Panarotti's.
	0.222	Has not eaten out at a branded family restaurant such as Spur, Saddles, and Panarotti's.
	-0.715	Attended a live performance at the theatre
	0.039	Has not attended a live performance at the theatre
	-0.752	Has visited a private game or safari lodge
	0.033	Has not visited a private game or safari lodge
	-0.584	Eaten out at an exclusive restaurant
	0.090	Has not eaten out at an exclusive restaurant

3.5.1 Descriptive statistics

The frequency distribution and proportion of each constituent indicator in the FVI are summarised in Appendices 3B-3D but the focus is on Table 3.3 which summarises indicator scoring coefficients from the FVI. As expected, the results revealed that the FAOC was satisfied implying that all variables with negative signs were associated with lower financial vulnerability and *vice versa* (Moser & Felton, 2007). For example, a negative value on the variable "has eaten out an exclusive restaurant" or the variable "does not have enough money left for savings after covering all your spending needs" implies that this indicator reduced the consumer's financial vulnerability. To conserve space, other indicators were not interpreted since this pattern was consistent across all constituent variables in the indices.

Table 3.4 below provides the descriptive statistics of the sample. It shows that males constituted 44.58% of the sample, while 64.70% of the adult population was between 16 and 44 years of age. In addition, almost two-fifths (41.66%) of adult consumers had self-owned enterprises, while 23.72% of the adult population was economically inactive (students, housewives, and pensioners). As for access to formal accounts, approximately seven in every ten adults had a bank account (69.05%). Although 38.69% of adults had matriculated (upper secondary level education), less than one-fifth had attained a post-secondary qualification. In addition, about 65% of adult consumers lay between the bottom 20% and the median 20% of the income distribution, while approximately 80.68% of the adult population resided in both urban and peri-urban areas.

Table 3.4: Descriptive statistics

Age	**Frequency**	**Percent**	**Marital status**	**Frequency**	**Percent**
16-29	1454	29.080	married	1 717	34.420
30-44	1781	35.620	single	2 722	54.560
45-59	1152	23.040	widower	450	9.020
60+	613	12.260	divorced	100	2.000
Employment	**Frequency**	**Percent**	**Income**	**Frequency**	**Percent**
own business	2 083	41.660	1st quintile	1 263	36.760
formal employment	588	11.760	2nd quintile	685	19.940
economically inactive	1 186	23.720	3rd quintile	287	8.350
unemployed	1 106	22.120	4th quintile	640	18.630
other	37	0.740	5th quintile	561	16.320

Location	Frequency	Percent	Gender	Frequency	Percent
urban	2 020	40.400	female	2 771	55.420
small urban	2 014	40.280	male	2 229	44.580
rural	966	19.320			
Social grants	**Frequency**	**Percent**	**Informal savings**	**Frequency**	**Percent**
recipient	3 742	74.840	not informally saved	3 975	79.500
non-recipient	1 258	25.160	informally saved	1 025	20.500
Education	**Frequency**	**Percent**	**Bank account**	**Frequency**	**Percent**
upper secondary	1 930	38.680	unbanked	1 546	30.930
no formal education	88	1.760	banked	3 452	69.070
primary education	387	7.760			
lower secondary	1 736	34.800			
post-secondary	848	17.000			

Notes: The table shows the descriptive statistics of the socio-demographic variables and financial inclusion variables. Income quintiles are computed from the individual's monthly income. The results based on the FinScope 2015 survey are nationally representative because the data is benchmarked to weights from Statistics South Africa.

3.5.2 OLS and quantile regression results

This section reports the results from both the OLS and MMQR, as summarised in Table 3.5 below. The OLS estimations yielded negative QFIN quintile coefficients, although only consumers with the highest QFIN (5^{th} quintile) had a statistically significant lower financial vulnerability on average. On the other hand, the MMQR shows that consumers with the highest QFIN (5^{th} quintile) had a lower financial vulnerability as indicated by negative coefficients that were statistically significant at the 1% level across the financial vulnerability conditional distribution. Nonetheless, the effect was less pronounced amongst the more financially vulnerable as indicated by a smaller magnitude of the 5^{th} quintile QFIN coefficient in the upper quantiles of financial vulnerability. These varying coefficient sizes across the quantiles confirmed that QFIN influenced consumers' financial vulnerability in a heterogeneous manner, albeit only for those with the highest QFIN.

Several demographic variables influenced the variation in the financial vulnerability of consumers. The positive male coefficient indicated that males were more financially vulnerable compared with females on average. In contrast, quantile regressions showed a statistically significant positive male slope coefficient suggesting that males were more financially vulnerable than females and this became worse at higher quantiles of financial vulnerability.

Further, the OLS estimations suggested that consumers in the higher-income categories exhibited lower financial vulnerability on average, as shown by the magnitude of the slope coefficients that progressively became more negative in the higher-income categories. As expected, the MMQR estimations showed that the top 40% of income earners in South Africa were less financially vulnerable relative to the lowest income earners. However, the level of financial vulnerability amongst the top 40% of income earners declined progressively between the least vulnerable (25^{th} quantile) and most vulnerable (95^{th} quantile).

Consistent with expectations, consumers with a post-secondary education qualification were less financially vulnerable compared with the base category (upper-secondary), although the slope coefficient became statistically insignificant at the 95^{th} quantile. Moreover, the positive and statistically significant slope coefficients of lower secondary, primary education, and no formal education suggested that these consumers were more financially vulnerable than consumers with an upper-secondary qualification across the different levels of financial vulnerability.

Moreover, on average, the financial vulnerability did not differ among consumers in different marital categories except for single consumers who were more vulnerable than married ones as indicated by the singles slope coefficient that entered with a positive sign at the 1% level in the OLS model. However, the MMQR results indicated that only single consumers between the 25^{th} and 75^{th} quantiles were more financially vulnerable than married ones, as indicated by the positive slope single coefficient that was statistically significant at the 5% level.

The OLS regressions also showed that more financially literate consumers were less financially vulnerable on average, as indicated by the negative slope coefficient that entered significantly at the 1% level. Using the MMQR estimation, financial literacy had a greater alleviating effect on less vulnerable consumers since the slope coefficient magnitude declined progressively from the 25^{th} quantile (left tail) to the 95th quantile (right tail) of financial vulnerability. To reiterate, the left tail was the region of lower financial vulnerability, whereas the right tail was the region of higher financial vulnerability.

Contrary to expectations, there was no statistical difference in financial vulnerability amongst the unemployed, formally employed, and self-employed business owners. However, the economically inactive slope coefficient of -0.192 entered significantly at the 1% level in the mildly variable category (75th quantile) suggesting that employed consumers were more financially vulnerable than unemployed consumers.

Table 3.5: Ordinary least squares and methods of moments quantile regression results

Variable		OLS Coefficient	z-stat	Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
QFIN (Ref: 1st quintile)	2nd quintile	0.033*	1.750	0.075	0.800	0.095	1.190	0.114	1.310	0.141	1.170
		(0.019)		(0.093)		(0.080)		(0.087)		(0.121)	
	3rd quintile	-0.012	-0.550	-0.139	-1.380	-0.108	-1.250	-0.079	-0.840	-0.038	-0.300
		(0.021)		(0.101)		(0.087)		(0.094)		(0.130)	
	4th quintile	-0.012	-0.450	-0.181	-1.540	-0.099	-0.980	-0.023	-0.210	0.084	0.550
		(0.026)		(0.118)		(0.101)		(0.110)		(0.152)	
	5th quintile	-0.149***	-4.580	-0.597***	-4.430	-0.533***	-4.610	-0.474***	-3.770	-0.389**	-2.240
		(0.033)		(0.135)		(0.116)		(0.126)		(0.174)	
Age (Ref: 16-29)	30-44	0.016	0.850	0.111	1.360	0.078	1.110	0.047	0.620	0.004	0.040
		(0.019)		(0.081)		(0.070)		(0.076)		(0.105)	
	45-59	0.046**	1.990	0.185*	1.900	0.193**	2.300	0.199**	2.200	0.209*	1.660
		(0.023)		(0.097)		(0.084)		(0.091)		(0.126)	
	60+	-0.015	-0.370	-0.157	-1.020	-0.071	-0.540	0.008	0.050	0.120	0.610
		(0.039)		(0.153)		(0.132)		(0.143)		(0.198)	
Gender (Ref: female)	male	0.033**	2.010	0.113*	1.730	0.126**	2.240	0.137**	2.250	0.154*	1.820
		-0.016		(0.065)		(0.056)		(0.061)		(0.085)	
Employment (Ref: own business)	formal employment	(0.005)	0.200	0.040	0.380	0.006	0.070	-0.025	-0.270	-0.070	-0.520
		-0.023		(0.103)		(0.088)		(0.096)		(0.133)	
	econ. inactive	(0.027)	-0.780	-0.109	-0.870	-0.152	-1.420	-0.192*	-1.660	-0.249	-1.550
		-0.035		(0.124)		(0.107)		(0.116)		(0.161)	
	unemployed	0.02	0.640	0.010	0.080	0.084	0.790	0.154	1.330	0.252	1.570
		(0.031)		(0.124)		(0.107)		(0.116)		(0.160)	
	other	0.039	0.780	0.389*	1.880	0.038	0.210	-0.286	-1.480	-0.746	-2.780
		(0.05)		(0.207)		(0.178)		(0.193)		(0.269)	

Table 3.5: Ordinary least squares and quantile regression results (continued)

Reference category		OLS Coefficient	z-stat	Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Location (Ref: urban)	small urban	0.007	0.390	0.045	0.660	0.021	0.360	-0.001	-0.020	-0.033	-0.370
		(0.018)		(0.069)		(0.059)		(0.064)		(0.089)	
	rural	0.028	1.360	0.130	1.370	0.135*	1.650	0.139	1.570	0.145	1.180
		(0.020)		(0.095)		(0.082)		(0.089)		(0.123)	
Income (Ref: 1st quintile)	2nd quintile	-0.013	-0.520	-0.072	-0.650	-0.053	-0.550	-0.035	-0.330	-0.009	-0.060
		(0.024)		(0.111)		(0.096)		(0.104)		(0.144)	
	3rd quintile	0.02	0.720	0.135	1.090	0.047	0.440	-0.034	-0.300	-0.150	-0.940
		(0.028)		(0.123)		(0.106)		(0.115)		(0.159)	
	4th quintile	-0.05	-1.590	-0.276**	-2.310	-0.276***	-2.690	-0.276**	-2.480	-0.276*	-1.790
		(0.032)		(0.120)		(0.103)		(0.112)		(0.155)	
	5th quintile	-0.137***	-3.330	-0.572***	-3.960	-0.537***	-4.330	-0.505***	-3.760	-0.460**	-2.470
		(0.041)		(0.144)		(0.124)		(0.134)		(0.186)	
Education (Ref: upper secondary)	no education	0.091**	2.45	0.639***	3.350	0.443***	2.700	0.262	1.470	0.006	0.020
		(0.037)		(0.191)		(0.164)		(0.178)		(0.247)	
	primary education	0.074**	2.53	0.337***	2.160	0.358***	2.670	0.378***	2.600	0.406**	2.010
		(0.029)		(0.156)		(0.134)		(0.146)		(0.202)	
	lower secondary	0.035	2.23	0.186**	2.460	0.156**	2.400	0.128*	1.820	0.088	0.910
		(0.016)		(0.075)		(0.065)		(0.070)		(0.097)	
	post-secondary	-0.108	-3.88	-0.387***	-3.730	-0.333***	-3.740	-0.284***	-2.940	-0.214	-1.600
		(0.028)		(0.104)		(0.089)		(0.097)		(0.134)	

Table 3.5: Ordinary least squares and quantile regression results (continued)

Reference category		OLS Coefficient	z-stat	Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Marital (Ref: married)	single	0.050***	2.69	0.166**	2.180	0.158**	2.410	0.150**	2.110	0.139	1.410
		(0.019)		(0.076)		(0.065)		(0.071)		(0.098)	
	widower	0.034	1.07	0.148	1.150	0.119	1.070	0.092	0.770	0.054	0.320
		(0.031)		(0.129)		(0.111)		(0.120)		(0.166)	
	divorced	-0.006	-0.12	0.066	0.350	-0.058	-0.360	-0.173	-0.980	-0.337	-1.380
		(0.05)		(0.189)		(0.163)		(0.176)		(0.245)	
Financial literacy index	Financial literacy	-0.053***	-8.57	-0.200***	-7.790	-0.186***	-8.460	-0.174***	-7.270	-0.156***	-4.700
		(0.006)		(0.026)		(0.022)		(0.024)		(0.033)	
Social grants recipient	social grants	0.077***	4.17	0.336***	3.850	0.302***	4.030	0.271***	3.330	0.227**	2.010
		(0.018)		(0.087)		(0.075)		(0.082)		(0.113)	
Informal saving	informal saving	0.005	0.26	-0.010	-0.130	0.022	0.330	0.052	0.710	0.094	0.930
		(0.020)		(0.079)		(0.068)		(0.073)		(0.102)	
	constant	1.522	35.22	3.581***	20.040	4.085***	26.540	4.552***	27.340	5.213***	22.370
		(0.043)		(0.179)		(0.154)		(0.166)		(0.233)	
Observations		1000		1000		1000		1000		1000	
Mean variance inflation factor		1.900									

Notes: The table shows the impact of QFIN on financial vulnerability using MMQR and OLS regressions. Quintiles of income are computed based on the individuals' monthly income. The dependent variable was converted using the inverse hyperbolic sine formula in OLS regression. *** p<0.01, **p<0.05, *p<0.01. () are robust standard errors.

Furthermore, Table 3.5 above shows that, on average, consumers who were between 45 and 59 years old were more financially vulnerable than those in the base category. However, the MMQR estimations showed that the higher financial vulnerability among consumers aged between 45 and 59 years was more pronounced among those in the higher financially vulnerable categories. This was indicated by a progressively increasing slope coefficient magnitude from the 25th quantile to the 95th quantile. However, there was no statistically significant difference in financial vulnerability across the other age categories on average and across the conditional distribution of financial vulnerability.

As expected, the social grants slope coefficients were positive and statistically significant at the mean and across the entire financial vulnerability distribution. This suggests that social grant recipients were more financially vulnerable than non-recipients, particularly those in the least financially vulnerable category (25th quantile). The OLS model was subjected to post-estimation diagnostic tests, which showed the absence of multicollinearity, as indicated by a mean VIF of 1.900. Moreover, the standard errors were corrected for heteroscedasticity using the robust command in Stata 16.

3.5.3 Robustness check

In this section, the robustness of the QFIN index was tested against the alternative financial inclusion measures. The rationale was to test whether improvement in the quality of financial inclusion had a more pronounced negative effect on consumers' financial vulnerability. To achieve this, the bank account ownership and a narrower financial inclusion index were regressed against the FVI using the MMQR model controlling for covariates listed in Table 3.2 above. The narrower index of financial inclusion excluded indicators of appropriateness, flexibility, and affordability which is similar to the one computed by Churchill and Marisetty (2020), Iddrissu et al. (2019), and Zhang and Posso (2019) as discussed in Section 2.4.2 of Chapter 2. Thereafter, the size of the slope coefficients of the bank account and narrower index of financial inclusion were compared against those of the QFIN index tabulated in Table 3.5. The expectation was that the QFIN index had a larger negative slope coefficient given that it contains more information regarding the inclusiveness of the consumer in the financial market.

Table 3.6 below shows that bank account ownership had a statistically insignificant influence on the financial vulnerability of South Africans among those in the least vulnerable category (25th quantile) and mildly vulnerable category (50th quantile). However, bank account owners

in the more vulnerable categories (75th and 95th quantile) were more financially vulnerable as indicated by positive slope coefficients that entered significantly at the 5% level.

Using the relatively narrower financial inclusion index, it was shown that only the 5th quintile (top 20%) entered with a negative and statistically significant slope coefficient, which is analogous to the QFIN quintile coefficients presented in Table 3.5 above. However, the magnitude of the coefficient sizes was smaller than the QFIN index top 20% quintile coefficients presented in Table 3.5 above. This suggests that a broader focus on the quality of financial inclusion could have a more pronounced negative impact on financial vulnerability, although only consumers with the highest QFIN (top 20%) had a lower financial vulnerability. Since the robustness check focused on the financial inclusion variable, one can refer to Appendices 3E-3F which show the results including the control variables for each of the estimations summarised in Table 3.6.

Table 3.6: Robustness check using alternative measures of financial inclusion

		Narrower index of financial inclusion				**Bank account**
		2nd quintile	**3rd quintile**	**4th quintile**	**5th quintile**	
Q25	Coefficient	0.033	0.090	-0.099	-0.345***	0.035
		(0.390)	(1.080)	(-1.160)	(-3.330)	(0.480)
Q50	Coefficient	0.083	0.110	-0.043	-0.284***	0.086
		(1.120)	(1.510)	(-0.570)	(-3.130)	(1.370)
Q75	Coefficient	0.132	0.130	0.013	-0.224**	0.138
		(1.620)	(1.620)	(0.160)	(-2.240)	1.980
Q95	Coefficient	0.202*	0.159	0.093	-0.139	0.211**
		(1.770)	(1.410)	(0.800)	(-0.990)	(2.170)

Notes: The table shows the impact of QFIN impact on financial vulnerability using the MMQR estimation.. *** p<0.01, **p<0.05, *p<0.01. In parentheses are z-statistics.

3.6. Discussion

This section discusses the results by drawing a comparison between previous results and theoretical expectations. The results revealed that only consumers with the highest QFIN (top

20%) were less financially vulnerable and the effect was more pronounced amongst those in the left tail of the financial vulnerability distribution. These results confirm the study's hypothesis that an increase in QFIN will reduce the financial vulnerability of consumers despite variability in the magnitude across the financial vulnerability distribution. Moreover, the measure of QFIN had a more pronounced negative effect on consumer financial vulnerability relative to narrower measures. This implies that policymakers ought to put more emphasis on improving the quality of the financial inclusion of consumers as this has greater welfare benefits. Also, financial service providers ought to employ a bottom-up approach in the design of financial products to ensure that their financial products are affordable and meet the preferences of consumers in different demographic categories. In turn, this could increase the uptake and use of a broader suite of financial products, which would homogenously reduce financial vulnerability.

Noteworthy, the composite index of QFIN captured the use of various formal financial products including insurance, savings, and credit. Therefore, various theories were employed to explain the relationship between the QFIN measure and financial vulnerability as explained in Section 3.2.2. The findings are consistent with the debt intermediation theory, social insurance theory, and complementarity hypothesis which suggest that platforms for consumers to save, borrow and insure contribute to reducing consumer financial vulnerability. In other words, the results indicated that consumers that have diverse quality financial products are likely to be associated with lower financial vulnerability, which is consistent with the aforementioned theories combined.

Given that previous studies used different measures of financial inclusion and financial vulnerability, some comparisons ought to be made with this caveat in mind. The current study found that males were more financially vulnerable, which is contrary to several previous studies that reported higher financial vulnerability among females (Koomson et al., 2021; Song et al., 2020; Wiersma et al., 2020). Moreover, the finding is not consistent with the social capital theory which suggests that females are likely to be more vulnerable due to a lack of economic opportunities compared with males. Although this finding appears to be an anomaly, it is necessary to interpret the results taking into consideration of South Africa's context. In the current study, about a quarter of the banked population consisted of social grant recipients of which approximately 80.45% of social grant recipients were females as shown in Appendix 2G of Chapter 2. Noteworthy, the social grants system in South Africa has been digitised and disbursed through the formal financial system. Thus, the social grant payment system has not

only provided a safety net to women, but it has contributed to closing the gender gap in access to formal financial products in the country, thereby reducing financial vulnerability among females.

Similar to the results of studies conducted by Luo and Li (2022), Charkrabaty and Makhurjee (2021), and Song et al. (2020), the results of the current study showed that wealthier consumers were less financially vulnerable. Thus, a high income provides individuals with the capacity to accumulate precautionary savings, engage in social activities, and meet basic living costs. However, for the most part, the top 40% of income earners were less financially vulnerable, which partially reflects the high-income inequality in South Africa where more than 68% of household wealth is held by 20% of consumers (International Monetary Fund, 2020). Although income explained financial vulnerability in the study, employment status did not significantly influence it which corroborates Koomson et al.'s (2021), Dimova et al.'s (2018), and Gyasi et al.'s (2019) results. This implies that consumers' income level determines their ability to lower their financial vulnerability irrespective of the income source.

The failure to find differences in financial vulnerability across geographic locations is contrary to the results by Luo and Li (2022), Charkrabaty and Makhurjee (2021), and Koomson et al. (2021). As highlighted above, South Africa's social grant payment system provides recipients with a debit card, which has contributed to narrowing the financial inclusion gap across geographical areas since 70.83% of social grant recipients were in rural and semi-urban areas as shown in Appendix 2G of Chapter 2. Although social grants might be inadequate to meet all needs, they might considerably provide a buffer to recipients thereby narrowing the welfare gap across geographical locations in South Africa.

The result that more educated consumers were less financially vulnerable was consistent with the previous findings reported by, for example, Arellano et al. (2019), Song et al. (2020), and N'dri and Kakinaka (2020). This confirmed the assertion that labour market rewards could be higher among consumers with a higher educational qualification which, in turn, improves their welfare (Allonso-Villar et al., 2012; Blaug, 1972). Moreover, Demirgüç-Kunt and Klapper (2012) argue that individuals with lower education qualifications lack the skillset required to participate in formal financial markets which could limit their capacity to employ financial products that contribute to lower financial vulnerability.

Apart from education, marital status was found in the study to influence the financial vulnerability of consumers. In addition, consistent with the results of Song et al. (2020), Lyons

et al. (2020), and Koomson et al. (2021), single consumers were found to be more financially vulnerable than married consumers. The lower financial vulnerability of married individuals compared with single consumers could be due to their higher capacity to engage in social activities (Lee & Bhargava, 2004). Furthermore, married consumers could reduce their solvency problems by pooling funds, which increases the likelihood of meeting basic living costs (Reyers, 2019; Wiersma et al., 2020).

Consistent with expectations, individuals with higher financial literacy exhibited lower financial vulnerability. This corroborates the assertion that financially literate consumers are more likely to have better financial management, save for rainy days, and employ risk-mitigating financial products like insurance, which contributes to lower financial vulnerability (De Beckker et al., 2019). Moreover, lower financial vulnerability among financially literate consumers could be explained by financial advice-seeking behaviour which enhances financial decision-making (Goyal & Kumar, 2021).

As reported above, social grant recipients were relatively more financially vulnerable than non-recipients. This could be attributed to the higher cost of living since in 2015 the upper-bound poverty line was R992, whereas the social grants ranged between R329.28 and R1386.21 (SASSA, 2019). By November 2021, the social grants ranged between R450 and R1890, although the upper-bound poverty line was R1335, which implies that most social grant recipients remain financially vulnerable as they might be unable to cover basic living costs. Contrary to Ksoll et al. (2016) and Habyarimana and Jack (2018), the study reported that informal savings did not influence financial vulnerability. This confirms the argument that informal financial channels might not have the economies of scale to pool risks and sustainably enhance consumers' welfare (Besley, 1995), particularly when measured by a multi-faceted financial vulnerability measure.

3.7. Conclusion

Financial inclusion has been considered one of the pathways to reducing the financial vulnerability of consumers. To examine the link between financial inclusion and financial vulnerability, several studies have employed narrow measures, yet these concepts are multi-dimensional. Therefore, based on the FinScope 2015 consumer survey data of South Africa, the study has contributed to the literature by computing a more comprehensive index of financial vulnerability and QFIN using PPCA. Thereafter, the impact of QFIN on consumers at various levels of financial vulnerability was examined by estimating the MMQR.

The results suggested that only consumers with the highest QFIN (top 20%) were less financially vulnerable although the magnitude was greater among the less financially vulnerable consumers. Nonetheless, these results confirm the study's hypothesis that an increase in QFIN will reduce the financial vulnerability of consumers. Interestingly, unlike previous studies, females were found to be less financially vulnerable relative to males. Moreover, the results indicated that education, income, marital status, and financial literacy influenced financial vulnerability though this was not uniform across consumers with varying levels of financial vulnerability.

Given the above-mentioned results, the following policy recommendations are made: Firstly, since the results indicated that QFIN resulted in lower financial vulnerability for only 20% of consumers, financial service providers are encouraged to engage in a bottom-up approach to designing financial products that universally improve consumers' welfare. Moreover, policymakers should be increasing efforts to improve the quality of financial inclusion among consumers since it had a more pronounced negative impact on the financial vulnerability of consumers. Secondly, unlike previous related studies, females in South Africa were found to be less financially vulnerable than males. Noteworthy, the FinScope 2015 consumer survey data reveals that about a quarter (24.28%) of bank account holders were social grant recipients and women constitute about 80.45% of social grant recipients in South Africa, which could explain the higher inclusion of women in the financial system and their lower financial vulnerability. To this end, one could argue that the social welfare system in South Africa is contributing to narrowing the gender welfare gap, although the long-run effects are unknown. Thirdly, the findings emphasise the need for implementing policies that promote equitable distribution of income are required to mitigate financial vulnerability given that only the top 40% of income earners were less financially vulnerable.

The current study had some limitations that need to be considered in the interpretation of the results. Firstly, since the study relied on a cross-sectional dataset, future studies could employ panel data to establish the dynamism between QFIN and financial vulnerability. Secondly, the study's findings are based on the context of South Africa due to data limitations. Hence, as data becomes available, future studies could consider a broader sample from other countries in Sub-Saharan Africa.

Despite this chapter's attempt to model the link between QFIN and financial vulnerability measured along multiple dimensions, it does not account for adverse shocks. That is, adverse

shocks might negatively impact consumers' ability to meet basic living costs, which worsens consumers' vulnerability. Therefore, the analysis explained in this chapter was extended by assessing the channels through which financial inclusion could build financial resilience to the income shock induced by the worldwide COVID-19 pandemic. The following chapter, however, disaggregates financial inclusion based on products from formal and informal sectors as shown in Table 4.1 (see Chapter 4). The reason was that the FinScope 2021 consumer survey data of South Africa used in Chapter 4 did not have quality indicators of affordability and appropriateness of financial products. As mentioned above, some relevant results of this chapter are presented in the appendices below.

APPENDICES

Appendix 3A: Indicators and coding of the financial vulnerability index

Item		Variable description
	Code	**Saving vulnerability**
L1_1	0	You have enough money left for savings after covering all your spending needs
	1	Sometimes
	2	Do not have enough money left for savings after covering all your spending needs
		Expenditure vulnerability
L5_3	0	Do not usually have problems making ends meet
	1	Neutral
	2	Usually have problems making ends meet
L15_1	0	Have never gone without enough food to eat because you did not have enough money to buy food
	1	Rarely go without enough food to eat because you did not have enough money to buy food
	2	Sometimes Have never gone without enough food to eat because you did not have enough money to buy food
	3	Often gone without enough food to eat because you did not have enough money to buy food
L15_2	0	Have not gone without medicine or medical treatment that was needed
	1	Rarely gone without medicine or medical treatment that was needed
	2	Sometimes gone without medicine or medical treatment that was needed
	3	Often gone without medicine or medical treatment that was needed
L15_3	0	Often gone without energy to heat your home or cook food except for blackouts or load shedding
	1	Rarely gone without energy to heat your home or cook food except for blackouts or load shedding
	2	Sometimes gone without energy to heat your home or cook food except for blackouts or load shedding
	3	Often gone without energy to heat your home or cook food except for blackouts or load shedding
		Lifestyle vulnerability
L9_5	0	Eaten out at a branded family restaurant such as Spur, Saddles, and Panarotti.
	1	Have not eaten out at a branded family restaurant such as Spur, Saddles, and Panarotti.
L9_8	0	Attended a live performance at the theatre
	1	Have not attended a live performance at the theatre
L9_11	0	Have visited a private game or safari lodge
	1	Have not visited a private game or safari lodge
L9_19	0	Eaten out at an exclusive restaurant
	1	Have not eaten out at an exclusive restaurant

Appendix: 3B: Proportion for each indicator in the financial vulnerability index

k	Eigenvalues	Proportion explained	Cumulative explained
1	4.168	0.463	0.463
2	1.680	0.187	0.650
3	0.845	0.094	0.744
4	0.609	0.068	0.811
5	0.429	0.048	0.859
6	0.414	0.046	0.905
7	0.360	0.040	0.945
8	0.253	0.028	0.973
9	0.241	0.027	1.000

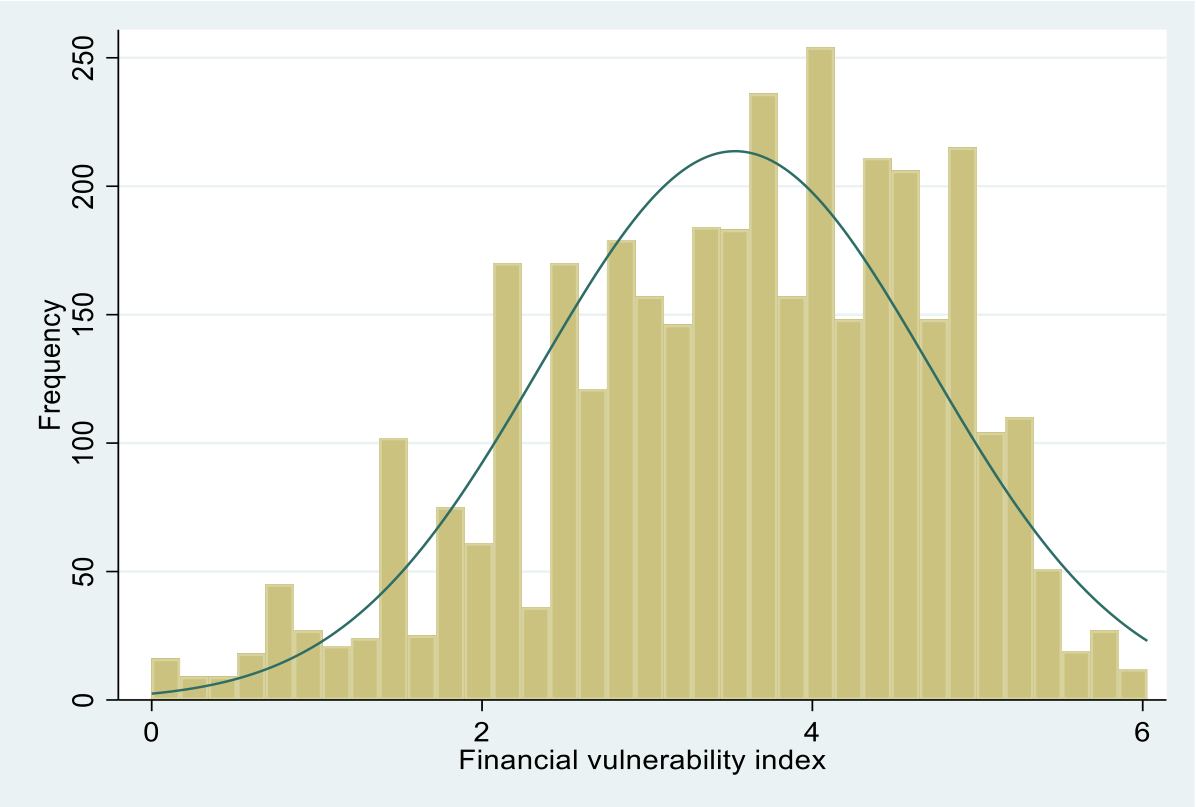
Note: The table provides the explained proportion of each constituent indicator in the financial vulnerability index based on the PPCA estimation.

Appendix 3C: Polychoric correlation matrix for the financial vulnerability index

	L1_1	L5_3	L15_1	L15_2	L15_3	L9_5	L9_8	L9_11	L9_19
L1_1	1.000								
L5_3	0.347	1.000							
L15_1	0.323	0.431	1.000						
L15_2	0.262	0.304	0.711	1.000					
L15_3	0.219	0.267	0.640	0.579	1.000				
L9_5	0.483	0.337	0.484	0.365	0.330	1.000			
L9_8	0.410	0.261	0.303	0.169	0.148	0.667	1.000		
L9_11	0.377	0.189	0.313	0.246	0.194	0.638	0.632	1.000	
L9_19	0.411	0.267	0.313	0.218	0.183	0.707	0.589	0.639	1.000

Note: The table provides the correlation between the constituent indicator in the financial vulnerability index. The correlation matrix is derived from the PPCA estimation.

Appendix 3D: Frequency distribution of the financial vulnerability index



Notes: The figure shows the distribution of the financial vulnerability index of South African consumers. For national representativeness, the data used weights that are aligned to those of Statistics South Africa.

Appendix 3E: Association between bank account ownership and financial vulnerability

Variable		Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Bank account ownership		0.035	0.480	0.086	1.370	0.138**	1.980	0.211**	2.170
		(0.071)		(0.063)		(0.069)		(0.097)	
Age (Ref: 16-29)	30-44	0.171***	2.670	0.163***	2.880	0.155**	2.480	0.143	1.640
		(0.064)		(0.056)		(0.062)		(0.087)	
	45-59	0.145*	1.850	0.192***	2.780	0.239***	3.140	0.307***	2.870
		(0.078)		(0.069)		(0.076)		(0.107)	
	60+	-0.175	-1.460	-0.072	-0.680	0.032	0.280	0.180	1.100
		(0.120)		(0.106)		(0.117)		(0.163)	
Gender (Ref: female)	male	0.097*	1.870	0.090**	1.960	0.082	1.620	0.071	1.010
		(0.052)		(0.046)		(0.051)		(0.071)	
Employment (Ref: own business)	formal employment	0.019	0.230	-0.010	-0.130	-0.038	-0.470	-0.079	-0.700
		(0.083)		(0.073)		(0.081)		(0.113)	
	econ. inactive	-0.182*	-1.820	-0.233***	-2.640	-0.283***	-2.920	-0.356***	-2.610
		(0.100)		(0.088)		(0.097)		(0.136)	
	unemployed	0.023	0.240	0.028	0.320	0.032	0.340	0.039	0.290
		(0.097)		(0.086)		(0.095)		(0.132)	
	other	0.067	0.280	-0.126	-0.590	-0.319	-1.370	-0.595	-1.820
		(0.239)		(0.211)		(0.233)		(0.327)	

Appendix 3E: Association between bank account ownership and financial vulnerability (continued)

Variable		Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Location (Ref: urban)	small urban	0.129**	2.370	0.081*	1.690	0.033	0.620	-0.036	-0.480
		(0.054)		(0.048)		(0.053)		(0.074)	
	rural	0.171**	2.310	0.142**	2.170	0.112	1.560	0.070	0.700
		(0.074)		(0.065)		(0.072)		(0.101)	
Income (Ref: 1st quintile)	2nd quintile	-0.065	-0.710	-0.063	-0.790	-0.061	-0.690	-0.059	-0.470
		(0.091)		(0.080)		(0.089)		(0.124)	
	3rd quintile	0.006	0.060	-0.086	-0.950	-0.179*	-1.790	-0.310**	-2.220
		(0.103)		(0.091)		(0.100)		(0.140)	
	4th quintile	-0.273***	-2.800	-0.327***	-3.800	-0.382***	-4.010	-0.459***	-3.440
		(0.098)		(0.086)		(0.095)		(0.133)	
	5th quintile	-0.745***	-6.540	-0.767***	-7.630	-0.789*	-7.110	-0.819***	-5.270
		(0.114)		(0.101)		(0.111)		(0.155)	
Education (Ref: upper secondary)	no formal education	0.699***	4.630	0.560***	4.200	0.420***	2.860	0.221	1.070
		(0.151)		(0.133)		(0.147)		(0.206)	
	primary education	0.501***	4.350	0.481***	4.730	0.460***	4.110	0.431***	2.750
		(0.115)		(0.102)		(0.112)		(0.157)	
	lower secondary	0.294***	4.920	0.281***	5.330	0.267***	4.600	0.248***	3.050
		(0.060)		(0.053)		(0.058)		(0.081)	
	post-secondary	-0.491***	-6.170	-0.393***	-5.590	-0.294***	-3.790	-0.152	-1.400
		(0.080)		(0.070)		(0.077)		(0.109)	

Appendix 3E: Association between bank account ownership and financial vulnerability (continued)

Variable		Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Marital (Ref: married)	single	0.118**	1.960	0.131**	2.470	0.145**	2.470	0.164	1.990
		(0.060)		(0.053)		(0.059)		(0.082)	
	widower	0.134	1.400	0.086	1.010	0.037	0.400	-0.031	-0.240
		(0.096)		(0.085)		(0.093)		(0.131)	
	divorced	-0.133	-0.820	-0.170	-1.200	-0.208	-1.330	-0.262	-1.190
		(0.161)		(0.142)		(0.157)		(0.219)	
Financial literacy index	financial literacy	-0.246***	-12.900	-0.238***	-14.150	-0.230***	-12.410	-0.218***	-8.410
		(0.019)		(0.017)		(0.019)		0.026	
Social grants recipient	social grants	0.382***	5.470	0.344***	5.580	0.306****	4.500	0.251***	2.640
		(0.070)		(0.062)		(0.068)		(0.095)	
Informal saving	informal saving	-0.055	-0.940	-0.057	-1.110	-0.060	-1.060	-0.063	-0.800
		(0.058)		(0.051)		(0.057)		(0.079)	
	constant	3.573***	25.400	4.099***	32.860	4.627***	33.700	5.378***	27.650
		(0.141)		(0.125)		(0.137)		(0.195)	
	Observations	1000		1000		1000			

Notes: The table shows the results of the association between the narrower financial inclusion index and financial vulnerability using the MMQR. *** p<0.01, **p<0.05, *p<0.01. In parentheses are robust standard errors. Quintiles of income were computed based on the individuals' monthly income. Z-stat denotes z-statistic and Ref. denotes the reference category.

Appendix 3F: Association between narrower financial inclusion index and financial vulnerability

Variable		Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Narrower index (Ref: 1st quintile)	2nd quintile	0.033	0.390	0.083	1.120	0.132	1.620	0.202*	1.770
		(0.084)		(0.074)		(0.081)		(0.114)	
	3rd quintile	0.090	1.080	0.110	1.510	0.130	1.620	0.159	1.410
		(0.083)		(0.073)		(0.080)		(0.112)	
	4th quintile	-0.099	-1.160	-0.043	-0.570	0.013	0.160	0.093	0.800
		(0.086)		(0.075)		(0.083)		(0.116)	
	5th quintile	-0.345***	-3.330	-0.284***	-3.130	-0.224**	-2.240	-0.139	-0.990
		(0.103)		(0.091)		(0.100)		(0.140)	
Age (Reference: 16-29)	30-44	0.179***	2.770	0.162***	2.850	0.144**	2.320	0.120	1.370
		(0.065)		(0.057)		(0.062)		(0.087)	
	45-59	0.165**	2.090	0.204***	2.950	0.244***	3.200	0.300***	2.800
		(0.079)		(0.069)		(0.076)		(0.107)	
	60+	-0.137	-1.120	-0.038	-0.350	0.061	0.520	0.201	1.220
		(0.122)		(0.107)		(0.117)		(0.165)	
Gender (Reference: female)	male	0.088*	1.690	0.074	1.610	0.059	1.180	0.039	0.550
Employment (Ref: own business)	formal employment	0.046	0.560	0.004	0.050	-0.038	-0.470	-0.097	-0.870
		(0.082)		(0.072)		(0.080)		(0.112)	
	econ. inactive	-0.219**	-2.180	-0.276***	-3.140	-0.333***	-3.440	-0.415***	-3.050
		(0.100)		(0.088)		(0.097)		(0.136)	
	unemployed	-0.028	-0.290	-0.010	-0.120	0.007	0.080	0.033	0.250
		(0.098)		(0.086)		(0.095)		(0.133)	
	other	0.169	0.750	-0.051	-0.260	-0.270	-1.240	-0.582	-1.900
		(0.226)		(0.199)		(0.219)		(0.307)	

Appendix 3F: Association between narrower financial inclusion index and financial vulnerability (continued)

Variable		Q25 Coefficient	z-stat	Q50 Coefficient	z-stat	Q75 Coefficient	z-stat	Q95 Coefficient	z-stat
Location (Ref: urban)	small urban	0.105*	1.920	0.066	1.380	0.028	0.530	-0.027	-0.360
		(0.055)		(0.048)		(0.053)		(0.074)	
	rural	0.201***	2.720	0.163**	2.510	0.125*	1.750	0.071	0.710
		(0.074)		(0.065)		(0.071)		(0.100)	
Income (Ref: 1st quintile)	2nd quintile	-0.037	-0.410	-0.049	-0.620	0.110	-0.700	-0.079	-0.640
		(0.091)		(0.080)		(0.088)		(0.123)	
	3rd quintile	-0.014	-0.140	-0.096	-1.060	-0.177*	-1.790	-0.293**	-2.100
		(0.103)		(0.090)		(0.099)		(0.139)	
	4th quintile	-0.277***	-2.830	-0.312***	-3.630	-0.347***	-3.670	-0.397***	-2.990
		(0.098)		(0.086)		(0.095)		(0.133)	
	5th quintile	-0.671***	-5.870	-0.694***	-6.920	-0.717***	-6.500	-0.751***	-4.850
		(0.114)		(0.100)		(0.110)		(0.155)	
Education (Ref: upper secondary)	no formal education	0.667***	4.340	0.530***	3.930	0.394***	2.650	0.200	0.960
		(0.154)		(0.135)		(0.149)		(0.209)	
	primary education	0.436***	3.730	0.428***	4.160	0.419***	3.700	0.406**	2.560
		(0.117)		(0.103)		(0.113)		(0.159)	
	lower secondary	0.258***	4.260	0.243***	4.560	0.227***	3.880	0.206**	2.500
		(0.061)		(0.053)		(0.059)		(0.082)	
	post-secondary	-0.436	-5.410	-0.339***	-4.780	-0.241***	-3.090	-0.103	-0.940
		(0.081)		(0.071)		(0.078)		(0.109)	

Appendix 3F: Association between narrower financial inclusion index and financial vulnerability (continued)

		Q25		Q50		Q75		Q95	
Reference category		**Coefficient**	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**	**Coefficient**	**z-stat**
Marital (Ref: married)	single	0.116*	1.910	0.124**	2.340	0.133**	2.280	0.145	1.780
		(0.060)		(0.053)		(0.058)		(0.082)	
	widower	0.107	1.090	0.077	0.900	0.047	0.500	0.005	0.040
		(0.098)		(0.086)		(0.094)		(0.132)	
	divorced	-0.148	-0.930	-0.189	-1.350	-0.230	-1.500	-0.289	-1.340
		(0.159)		(0.140)		(0.154)		(0.216)	
Financial literacy index	Financial literacy	-0.227***	-11.720	-0.222***	-13.060	-0.217***	-11.610	-0.211	-8.020
		(0.019)		(0.017)		(0.019)		(0.026)	
Social grants (Ref: non-recipient)	social grants	0.351***	4.980	0.327***	5.280	0.303***	4.440	0.268	2.810
		(0.071)		(0.062)		(0.068)		(0.096)	
Informal saving	informal saving	-0.022	-0.380	-0.028	-0.550	-0.034	-0.600	-0.042	-0.530
		(0.058)		(0.051)		(0.056)		(0.079)	
	constant	3.623***	25.420	4.163	33.020	4.700***	34.010	5.464	27.990
		(0.143)		(0.126)		(0.138)		(0.195)	
	Observations	1000		1000		1000		1000	

Notes: The table shows the results of the association between the narrower financial inclusion index and financial vulnerability using MMQR. *** p<0.01, **p<0.05, *p<0.01. In parentheses are robust standard errors. Quintiles of income were computed based on the individuals' monthly income. Z-stat denotes z-statistic. Ref. denotes reference category.

CHAPTER FOUR

THE ROLE OF FINANCIAL INCLUSION IN BUILDING RESILIENCE TO THE COVID-19-INDUCED INCOME SHOCK IN SOUTH AFRICA

4.1 Introduction

The need to bolster financial resilience, the ability to recover from an adverse shock, has been brought to the fore by the recent Coronavirus disease-19 (COVID-19) pandemic.[15] South Africa, for example, was one of the highly affected countries by the COVID-19 pandemic in Africa considering that it experienced the highest decline in the national income in Africa between 2020 and 2021 (Awoyemi et al., 2022), and accounted for 40% of the COVID-19 related deaths in Africa (World Health Organisation, 2022). Thus, the South African government placed the economy on lockdown between March 2020 and April 2020 to curb the contagion, which was in tandem with the economic lockdowns of South Africa's key trading partners, tourism source markets, and regional countries.

Despite curbing the contagion, the COVID-19 protocols negatively affected the economies of many countries. The negative impact of the COVID-19 pandemic on the livelihoods of households dependent on income from the informal sector was more severe in developing countries where the informal sector employs approximately 86% of the working-age people (International Labour Organisation, 2020). This partly explains the increase in food insecurity to 265 million in 2020 from 130 million before the shock (WBG, 2021). In South Africa, for instance, unemployment increased by 2.2 million jobs by the end of the first quarter of 2020 although 40% of the lost jobs were regained by mid-2021 (Statistics South Africa, 2020; World Bank, 2021). Against this backdrop, 48% of adults experienced an adverse income shock that was induced by the COVID-19 pandemic (FinScope, 2021).

A shock is an unanticipated exogenous event that could either adversely or positively affect households. Furthermore, shocks can be idiosyncratic or covariate. A shock such as the illness,

[15] COVID-19 was first reported in China on the 12th of December 2019 (Wu et al., 2020), and this resulted in the death of 6 207 461 people globally between December 2019 and April 2022 (World Health Organisation, 2022).

death, or job loss of a family member which is idiosyncratic and unique to a household can be managed since they affect only a particular household or individual (Deaton, 1992). However, an economic shock such as the COVID-19 pandemic or the 2007-2008 global financial crisis which is experienced by many households in a given area or region could be difficult to manage because it affects many communities (Morduch, 1995).

Considering the above, drawing on various theoretical perspectives, different channels of financial inclusion can be an avenue through which consumers build financial resilience to adverse idiosyncratic and covariate shocks. The theory of precautionary saving suggests that consumers can accumulate precautionary savings that would provide liquidity in the event of a negative shock (Carroll & Kimballe, 2001; Ersado et al., 2003). Moreover, the theory of social insurance suggests that insurance could build financial resilience by reducing reliance on cutting essential expenditures as a coping mechanism against adverse shocks and providing a cushion after a negative shock (Chetty & Looney, 2006). Apart from the insurance channel, risk-sharing theories propose that consumers can cope with negative shocks by receiving remittances and borrowing from people within their networks despite the limited effectiveness of this when there is a covariate shock as opposed to an idiosyncratic shock (Deaton, 1992; Gertler & Gruber, 1997; Jack & Suri, 2014). In addition, assuming the absence of credit constraints, access to credit such as short-term loans could cushion households in the event of adverse shocks, such as illness or death (Morduch, 1995).

According to the hedonic view of subjective well-being (SWB), consumers derive satisfaction based on their cognitive evaluation of their lives. As such, if a consumer were to be financially resilient enough to bounce back from a shock, he/she would evaluate his/her life positively, thereby experiencing greater life satisfaction (Diener, 2000; Nanda & Banerjee, 2021). Therefore, the examination of the role of financial inclusion in financial resilience is appropriate since financial resilience might be found to contribute positively to financial satisfaction which is associated with higher SWB.

Several studies on developing economies in a rural setting have investigated whether financial inclusion could improve consumers' financial resilience. Some of these studies have reported that households with insurance and saving accounts were able to bounce back after negative covariate shocks induced by drought and natural hazards (De Janvry et al., 2016; Janzen & Carter, 2019; Kast et al., 2018). However, Akampumuza and Matsuda (2017), Karlan et al. (2017), and Lensink et al. (2017) found that financial inclusion did not have a statistically

significant role in offsetting the negative impact of drought and the reduction in agricultural prices on household consumption.

Some studies have investigated whether mobile money account owners could become financially resilient to adverse shocks given that they were likely to receive remittances from users within their network at a lower transaction cost. These studies reported that idiosyncratic shocks (Geng et al., 2018; Naito et al., 2021; Tabetando & Matsumoto, 2020) and agriculture-related shocks, such as pet disease outbreak and drought (Afawubo et al., 2020; Riley, 2018; Suri et al., 2021), had a lower negative impact on the consumption of mobile money users compared with non-mobile money users. However, other studies confirmed that informal risk-sharing arrangements, such as savings groups, helped households to cope with illness (Beaman et al., 2014; Carlson et al., 2015).

Although Mahmud and Riley (2021) investigated the coping mechanisms of households during the COVID-19 pandemic, such as offering farm labour and selling critical assets, they did not examine the role of financial inclusion in offsetting the negative impact of COVID-19 on consumers' consumption. The COVID-19 pandemic provided a unique opportunity for the investigation of the extent to which various channels of financial inclusion could contribute to financial resilience to a nationwide covariate economic shock that resulted in the decline of income of most consumers simultaneously. This is a departure from existing studies that investigated the impact of financial inclusion on financial resilience to region-specific weather shocks, agriculture sector-specific shocks, and idiosyncratic shocks in the African context.

Considering that previous studies have tested the precautionary saving theory, social insurance theory, and risk-sharing theory under agricultural-specific and region-specific weather-related shocks, this study makes a theoretical contribution by testing these theories under a nationwide economic shock caused by the COVID-19 pandemic that resulted in a decline in consumers' incomes. These theories were tested in South Africa's context by examining whether various channels of financial inclusion, both formal and informal, could build financial resilience under a nationwide economic shock that reduced the incomes of most consumers during the novel COVID-19 pandemic. Table 4.1 below shows how the study disaggregated credit, insurance, and savings from both formal and informal sectors in South Africa's context.

Table 4.1: Categorisation of financial products in South Africa

Category	Insurance	Credit	Savings and investment
Formal	Funeral policy Household contents Life cover for debt Disability cover Cover for dreaded diseases Medical insurance or hospital plans Funeral or disability cover from employer or sports team	Credit card Home loan Overdraft Bank loan Temporal loan Store card	Saving account Fixed deposit account Money market account Unit trust Postbank savings
Informal	Funeral cover with an undertaker Funeral cover through the church Funeral cover through the funeral home Funeral cover through the burial society	Friends or family Colleagues *Mashonisa* *Stokvel* Pawn shop village bank	*Stokvel* Family and friends Home saving Saving club Village bank saving

Investigating how various channels of financial inclusion influenced financial resilience to the COVID-19-induced income shock in South Africa's context was important for two reasons. Firstly, South Africa was one of the most highly affected countries during the COVID-19 pandemic given that it accounted for approximately 40% of the total COVID-19-related deaths in Africa and experienced the highest decline in national income in Africa between 2020 and 2021 (Awoyemi et al., 2022). Moreover, as explained above, approximately 48% of the consumers experienced a decline in income between September 2020 and September 2021 due to the COVID-19 protocols imposed by the government (Statistics South Africa, 2020; World Bank, 2021). Therefore, South Africa presents an interesting case study to examine how different channels of financial inclusion could have improved financial resilience to the COVID-19-induced income shock. These findings can be generalised to other African countries and inform policymakers on the extent to which financial inclusion could build financial resilience to future economic shocks, which is one of the World Bank Group's priorities under its COVID-19 Crisis Response to Resilient Recovery approach (WBG, 2022). Secondly, South Africa has one of the advanced financial markets with the highest levels of bank account ownership, savings, and credit use (Demirgüç-Kunt et al., 2022). Hence, the findings could inform other developing countries how this translates to financial resilience to a countrywide adverse economic shock, such as the one induced by the COVID-19 pandemic.

The rest of this chapter is organised as follows: Section 4.2 discusses the underpinning theory. Section 4.3 reviews the empirical literature. Section 4.4 explains the data source. Section 4.5 provides the background of the COVID-19 lockdown regulations in South Africa. Section 4.6 explains the methodology. Section 4.7 reports the results and discusses the results. Section 4.8 concludes, makes recommendations, and suggests areas for further research.

4.2 The role of using financial products in building financial resilience

The discussion in this section points to the potential role of financial inclusion in building financial resilience to unforeseen adverse events from a theoretical perspective. More specifically, this section details how savings, insurance, mobile finance, and credit could help consumers to cope with adverse shocks.

Firstly, consumers could mitigate the negative impact of adverse shocks by accumulating precautionary savings. The precautionary saving theory posits that when a decision maker is faced with the possibility of liquidity constraints due to adverse shocks in the future, he/she might decrease consumption and save money as a precautionary measure (Carroll & Kimball,

2001). In other words, the likelihood of future idiosyncratic or covariate future shocks and uncertainty might intensify saving as a hedge against unanticipated liquidity constraints and defer consumption to ensure future consumption (Alderman & Alwang, 2003). Therefore, consumers can commit to accumulating precautionary savings in bank accounts or mobile money accounts, thereby hedging against future illiquidity risk.

Secondly, financial markets could enable consumers to share risks amongst people within their network in response to an adverse shock. The risk-sharing theory by Gertler and Gruber (1997), and Townsend (1994) suggests that households will bounce back from adverse shocks through access to the aggregate resources in the community. Typically, consumers in developing countries might rely on informal risk-sharing institutions such as rotating savings and credit associations (ROSCAs) and village loan and savings associations (VLSAs) to share risks among members. These trust-based risk-sharing institutions enable consumers to accumulate savings and access loans from the pooled savings. Thus, consumers can bounce back from shocks by borrowing and receiving remittances from those within their networks. Moreover, these trust-based risk-sharing institutions enable talented consumers to borrow money for projects, which might generate income and improve their financial resilience to financial shocks (Dupas & Robinson, 2013; Ksoll et al., 2016). However, informal risk-sharing institutions might have limited value during covariate financial shocks since all members might want to draw loans from the pooled savings at once (Besley, 1995; Mahmud & Riley, 2021).

Furthermore, Jack and Suri (2014) proposed a risk-sharing model which suggests that a reduction in transaction costs could facilitate the transfer of remittances in the absence of information asymmetry, thereby enabling consumers to smooth their consumption. They contend that mobile finance could reduce transaction costs of remitting funds, which might permit users to bounce back from an adverse shock through the receipt of remittances remotely from a wide pool of consumers within their network.

Thirdly, households can smooth consumption by borrowing from financial markets. Quach's (2016) theoretical model linking credit and consumer welfare, as explained in Section 3.3.2 of Chapter 3, posits that consumers can invest borrowed funds into income-generating activities. However, the underlying assumptions are that there are no constraints to borrowing, on the one hand, and that the borrowers have the talent to generate wealth through investing their credit in income-generating projects, on the other hand. This, in turn, would lead to higher income and reduce income variance which would enhance financial resilience. Apart from investing

the borrowed funds, short-term loans from both the formal and informal sectors could provide the liquidity required to cushion the borrowers against unforeseen events (Besley, 1995; Morduch, 1995). For example, consumers could obtain revolving credit and use overdrafts from a bank to finance their consumption after idiosyncratic and covariate shocks. In addition, in South Africa, consumers could opt to cushion themselves after a shock by borrowing informally from a *mashonisa*, an informal lender that offers uncollateralised flexible loans at usury rates (James, 2018).

Fourthly, purchasing insurance would help consumers to hedge risks and smooth consumption in the event of income variability due to adverse shocks. As explained in Section 3.2.2 of Chapter 3, it is assumed that highly risk-averse consumers might adopt costly tactics, such as selling assets, reducing food consumption, or taking children out of school to ensure a smooth consumption path after the shock. Therefore, the theory of social insurance suggests that the purchase of insurance might help consumers to circumvent maladaptive risk coping mechanisms and protect themselves against unforeseen idiosyncratic or covariate shocks (Chetty & Looney, 2006).

4.3 Review of the empirical literature

In light of the above discussion on how savings, insurance, mobile finance, and credit could help consumers to cope with adverse shocks, this section reviews several studies conducted in developing countries on how consumers bounced back after idiosyncratic or covariate shocks through the use of formal and informal financial services.

There have been mixed results on the impact of financial inclusion on consumption smoothing after adverse covariate shocks. De Janvry et al. (2016) reported that smallholder farmers in a Mexican state that had taken out weather index insurance experienced an increase in per capita household expenditure after a weather shock, which showed welfare gains from insurance use. Similarly, as a response to drought, Janzen and Karter (2019) reported that insured households in rural Kenya were on average 96% less likely to sell livestock and 49% less likely to reduce meal consumption. This financial resilience could be attributed to the cushion provided by insurance since insured consumers will not need to divert their liquid cash to finance out-of-pocket expenditures after a shock. In Bangladesh, Hussain et al. (2019) reported that holders of formal accounts were able to raise emergency funds, but the effect was more pronounced among more wealthy and educated consumers. However, the estimations did not account for any adverse shocks and thus did not provide conclusive evidence that bank account ownership

helps consumers to bounce back after negative shocks. Recently, Mahmud and Riley (2021) reported that rural consumers in Uganda responded to the financial shock of COVID-19 by cutting their food expenditures, borrowing more, and depleting their savings. However, they only focused on the consumers' response to the pandemic and did not explicitly examine whether being financially included contributed to financial resilience to the COVID-19 pandemic.

In rural Uganda, Akampumuza and Matsuda (2017) reported that there was no statistically significant decline in credit users' consumption after a weather shock. Similarly, Lensik et al. (2017) reported that lower agricultural prices had a negative but statistically insignificant impact on banked consumers' consumption. Moreover, Karlan et al. (2017) investigated whether VSLA membership in rural areas smoothed consumption after a drought in Ghana, Uganda, and Malawi and reported that there was a decline in monthly per capita consumption, but it was not statistically indistinguishable from zero. However, the results of studies conducted by Akampumuza and Matsuda (2017), Karlan et al. (2017), and Lensik et al. (2017) revealed that conventional financial services might not always yield financial resilience when households are affected by covariate shocks, although the effects could differ with context.

Studies have found that mobile money has helped consumers to cope after covariate shocks since it allowed remote risk-sharing due to cheaper transfer costs. In addition, it helped consumers to accumulate savings that could provide liquidity in times of adverse shocks. Using a sample in the Lake Kivu region of Rwanda, Blumenstock et al. (2016) investigated how mobile money account owners were able to cope after an earthquake and found that they could receive money transfers whereas non-mobile money account owners were unable to receive remittances. However, Blumenstock et al.'s (2016) study showed that the use of mobile money increases the chances of receiving remittances after an environmental shock but did not explicitly specify whether the remittances enabled the recipients to cover basic living costs. In Tanzania, Riley (2018) reported that only mobile money users were able to circumvent a decline in consumption after a village-level rainfall shock. However, in contrast, Abiona and Kopensteinner (2020) found that per capita expenditure was smoothed after village-level rainfall shocks among Tanzanian households who had adopted mobile money. In a related study, Afawubo et al. (2020) reported that mobile money account owners in Togo were financially resilient to rainfall shocks and soil degradation but failed to withstand shocks such as floods, a decline in agricultural prices, and outbreaks of animal diseases. This suggests that

mobile money account ownership has its limitations as it might not offset the negative effect of all adverse environmental and weather shocks on consumption.

As mentioned earlier, apart from covariate shocks, households are susceptible to idiosyncratic shocks. Several studies have claimed that the negative effects of idiosyncratic shocks on consumption can be mitigated by financial inclusion. For example, using a sample from 118 locations in Kenya, Jack and Suri (2014) found that the consumption of mobile money account owners was unaffected by adverse shocks while those without mobile money accounts reduced consumption by 7%-10% on average. The reason was that mobile money account owners could remotely receive remittances across a diverse network which helped smooth their consumption path after an adverse shock. Similarly, Geng et al. (2018) found that non-users of mobile money in rural Kenya had lower household food expenditures after health shocks and resorted to cutting expenditures on education to cope with the health shock. In a related study in rural Uganda, Tabetando and Matsumuto (2020) showed that a health shock resulted in a decline in school-age child educational expenditure by 9.3% in the case of non-mobile money account owners compared with an 8.3% decline in the case of mobile money account owners. This suggests that mobile money accounts enabled households to receive remittances and accumulate savings for 'rainy days' which circumvented costly coping mechanisms like lowering expenditure on education.

In Kenya, consumers can now receive or send digital loans through an innovative product called M-Shwari. Therefore, Suri et al. (2021) investigated how the M-Shwari loans could improve financial resilience to negative shocks, such as death, livestock death, illness, fire, droughts, theft, and crop disease. The results suggested that households who obtained M-Shwari loans were 6.3% less likely to forego expenditures after negative shocks. This confirmed that fintech-enabled credit provision bolstered consumers' financial resilience to adverse shocks. In Tanzania, Naito et al. (2021) reported that mobile money users experienced an increase in remittances after a negative health shock. However, the study did not examine how mobile money account ownership influenced consumers' consumption and ability to meet basic living costs after the shock. Recently, using a representative sample in Ghana, Sakyi-Nyarko et al. (2022) found that the ability to raise emergency funds was higher amongst bank account owners compared with mobile money owners users. Nonetheless, the study did not account for adverse shocks unlike the studies conducted by Naito et al. (2021) and Suri et al. (2021).

Other studies have focused on the role of informal risk-sharing arrangements in building financial resilience to several idiosyncratic shocks. Beaman et al. (2014) reported that households in central Mali involved in savings groups experienced higher food security despite experiencing health shocks. Furthermore, using survey data from six cities in Colombia, Urrea and Maldonado (2013) found that the ability of consumers to bounce back from district-level agricultural shocks, death, and natural disasters was greater amongst those saving and borrowing through informal channels as opposed to formal channels. Similarly, Carlson et al. (2015) reported that Nigerian consumers that used informal channels to save and borrow were more likely to cope with adverse community-level weather shocks and health shocks. This was attributed to the flexible terms of informal borrowing and informal savings compared with formal channels. Using a representative sample in Uganda, Mawejie (2019) found that consumers' involvement in informal groups increased the likelihood of them coping with negative shocks through selling assets. However, saving with a formal institution was associated with less reliance on cutting consumption as a coping strategy against negative shocks. These results confirm that not all financial products and channels might have a homogenous effect on consumers' welfare (Kling et al., 2022).

Except for those conducted by Akampumuza and Matsuda (2017), Karlan et al. (2017), and Lensik et al. (2017), most studies reviewed suggest that financial inclusion helps consumers to build financial resilience to covariate shocks. However, the studies in Africa investigated the role of financial inclusion in mitigating the effect of covariate shocks that were mostly related to the agricultural sector and region-specific weather shocks. To the best of the researcher's knowledge, no study has investigated the role of financial inclusion in building financial resilience to a nationwide economic shock that induced a decline in consumers' incomes. Thus, the study examined whether various channels of financial inclusion could offset the negative impact of the COVID-19 induced-income shock in South Africa's context.

Considering the above, the study hypothesised that financially included were financially resilient to the adverse income shock induced by the COVID-19 pandemic. This is because precautionary saving could provide liquidity to consumers in the event of unforeseen life events while insurance can help consumers to hedge the risk of several adverse life events such as death, property damage, and illness. Moreover, credit markets help consumers to borrow against unforeseen life events by accessing short-term loans whereas remittance platforms or informal risk-sharing arrangements enable consumers to share risks following an adverse shock. On the other hand, credit enables consumers to invest in high-risk high-return projects

that could yield income that bolsters their financial resilience to adverse shocks. In the event of a nationwide economic shock that induced a decline in consumers' income, financially included consumers were more likely to be financially resilient.

4.4 Stylised facts of COVID-19 lockdown in South Africa

This section provides a synopsis of South Africa's COVID-19 lockdown regulations to provide an understanding of how they could have negatively influenced consumers' ability to meet basic living costs. As shown in Figure 4.1 below, there were five levels of varying lockdown protocols in South Africa with Alert Level 1 being the least stringent and Alert Level 5 being the most stringent. On 27 March 2020, South Africa was placed under Alert Level 5 which suspended almost all economic activity except for entities that manufactured or supplied essential goods or services. Moreover, retail stores were prohibited from operating under normal working hours and restricted from selling essential goods on the condition that they adhered to COVID-19 health protocols. In addition, under Alert Level 5, people were restricted to move unless they wanted to employ essential services.

As the transmission rates of COVID-19 declined, South Africa transitioned to Alert Level 3 between 1 June 2020 and 17 August 2020. Several businesses were permitted to operate under Alert Level 3, although under strict COVID-19 regulations. For instance, restaurants, bars, and taverns were opened and entertainment, cultural, and sporting activities were allowed, but operating hours were not permitted beyond 2100 hours and 50% capacity. South Africa downgraded to Alert Level 1 lockdown between 21 September 2020 and 28 December 2020. During this phase, almost all economic activity including domestic and international travel for business and leisure returned despite the requirement to adhere to COVID-19 health guidelines. However, recreational businesses, such as gymnasiums, restaurants, and cinemas were not allowed to accommodate more than 50% of their capacity.

Owing to a rise in COVID-19 infections in South Africa, mainly triggered by a rapid-spreading Beta variant, the country was placed on adjusted Alert Level 3 from 29 December 2020 to 28 February 2021. Consequently, the curfew was between 2100 hours to 0600 hours, and all liquor outlets and recreation spaces were closed to the public. Also, all enterprises were only permitted to operate at 50% capacity while adhering to COVID-19 health guidelines. The transmission rate and new cases of COVID-19, however, declined in the subsequent period resulting in South Africa moving to adjusted Alert Level 2 from 1 March 2021 to 30 May 2021.

However, South Africa moved to Alert Level 4 between June 2021 and July 2021 which implied that enterprises such as restaurants could operate at 50% capacity subject to COVID-19 health protocols, and a curfew was placed among other restrictive measures.

From 13 September 2021 to 30 September 2021, adjusted Alert Level 1 was enforced, which meant that outdoor and indoor activities were allowed, although a curfew was imposed between 2230 hours and 0400 hours. Owing to the decline in infection rates and COVID-19-related deaths, the national state of disaster was lifted by the President of South Africa on 5 April 2022 implying that the COVID-19 alert levels ceased to apply thereafter.[16]

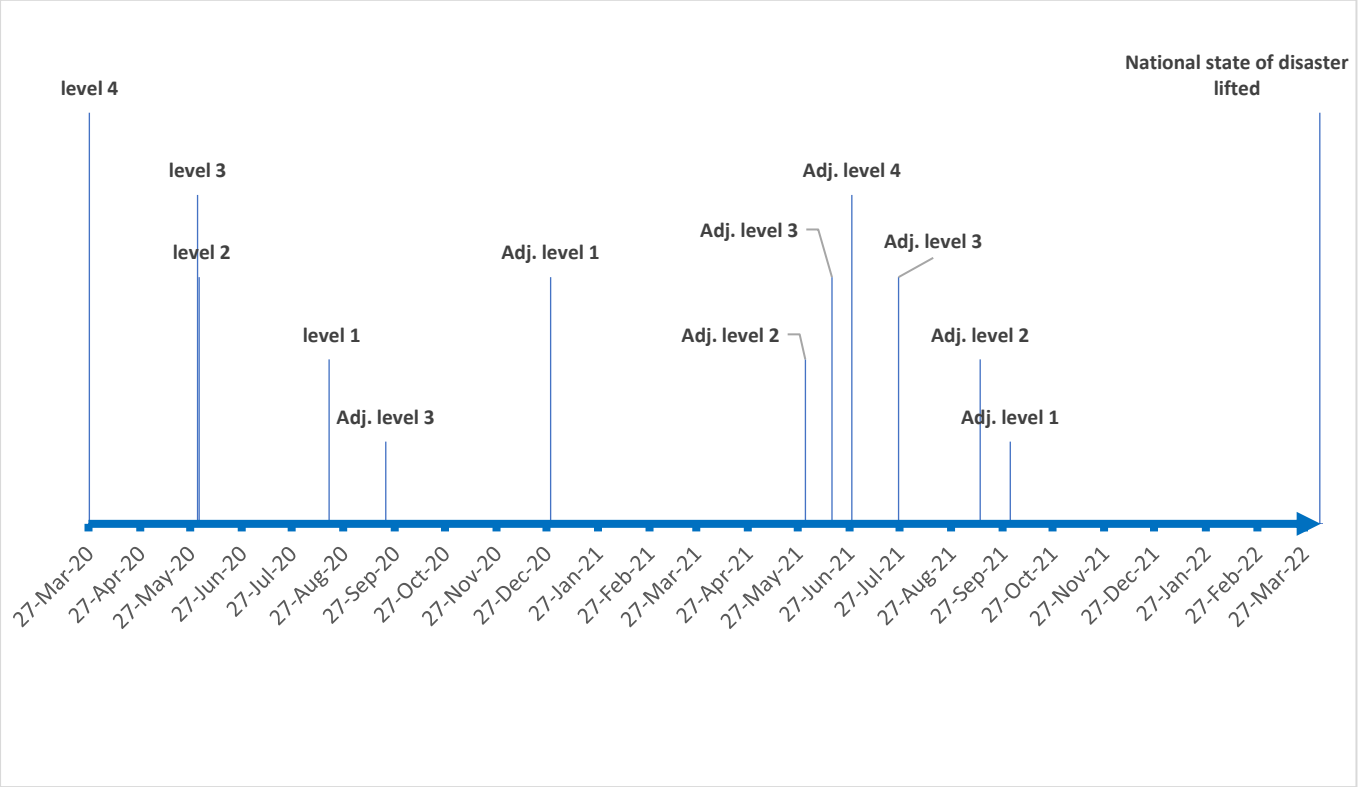


Figure 4.1: Timeline of COVID-19 lockdown regulations in South Africa

Notes: The figure shows the timeline of COVID-19 lockdown regulations in South Africa between March 2020 and March 2022. Adj. level refers to an adjusted level.

[16] The measures that were taken by the South African government to curb the spread of COVID-19 were accessed from the following link: https://www.gov.za/

Moreover, other countries including South Africa's major trading partners adhered to strict COVID-19 protocols to suppress the transmission of the virus. Noteworthy, South Africa's major trading partners include China, the United States, Germany, Japan, the United Kingdom, India, and the United Arab Emirates (South African Revenue Service, 2022). The COVID-19 protocols varied in severity across different jurisdictions during the period which was in tandem with the economic lockdown in South Africa. Despite the differences in severity, the COVID-19 protocols across many countries included the closure of schools, travel restrictions, cancellation of public events, workplace closures for non-essential industries, and restrictions on public gatherings *inter alia* (Oxford University, 2023).[17] As a result, there was a disruption in the global supply chain and a slump in demand for export goods from South Africa's major trading partners, which had a negative knock-on effect on employment across many export-oriented sectors in South Africa. That is, South Africa's export of goods and services declined by 12.295% in 2020 and 3.279% in 2021 relative to 2019 (pre-pandemic period) (World Bank, 2021). This could have adversely affected employment in South Africa's export-oriented industries because major trading partners could not absorb the domestic exports.

Moreover, South Africa's top ten tourism source markets including the United Kingdom, Germany, the United States, France, Australia, Holland, India, Canada, and Italy placed their economies on lockdowns, which reduced tourist arrivals between 2020 and 2021. Consequently, tourist arrivals in South Africa declined by 71% in 2020 from 15.8 million in 2019 to approximately 4.5 million in 2020 (Statistics South Africa, 2021), which contributed to a decline in the total employment in the tourism industry and other sectors dependent on it. Furthermore, several regional countries such as Zimbabwe, Lesotho, Swaziland, and Zambia imposed economic lockdowns that were mostly in tandem with South Africa's COVID-19 protocols (Oxford University, 2023). These policies negatively affected trade between these countries, and the employment that is dependent on the exports to these countries.

Due to the COVID-19 protocols in and outside South Africa, most firms were forced to retrench their employees whereas a few workers were forced to take leave without pay as most enterprises had to temporarily shut down (Institute for Economic Justice, 2021). Consequently, there was a surge in unemployment in South Africa such that 2.2 million consumers lost their

[17] The policy response to COVID-19 pandemic for several countries between 2020 and 2022 are obtainable from the following link: https://ourworldindata.org/covid-stringency-index

jobs by the last quarter of 2020 despite 40% of the loss in employment being recovered by mid-2021 (Statistics South Africa, 2020; World Bank, 2021). Moreover, the FinScope 2021 consumer survey data revealed that approximately 48% of adults in South Africa experienced a decline in their income between September 2020 and September 2021. This could explain why about 49% of consumers in South Africa could not meet basic living costs in South Africa during the COVID-19 pandemic between September 2020 and September 2021 (FinScope, 2021). Intuitively, it could be argued that the income shock induced by the COVID-19 pandemic might have partly contributed to consumers' failure to meet basic living costs. Against this backdrop, the COVID-19 pandemic presents a unique opportunity to assess how various channels of financial inclusion could have offset the negative income shock induced by a nationwide economic shock. The following section explains the methodology that was employed to address this objective.

4.5 Methodology

4.5.1 Empirical model

To examine the role of financial inclusion in building financial resilience to the income shock induced by the COVID-19 pandemic, this chapter used the FinScope 2021 consumer survey data from South Africa as explained in Section 1.7 of Chapter 1. Preliminarily, the impact of the income shock induced by the COVID-19 pandemic on consumers' ability to meet basic living costs was investigated while controlling for socio-demographic variables excluding financial inclusion variables as follows:

$$C_i=\alpha_0+\beta_1 Shock_i+\beta_2 X_i+\varepsilon_i \quad (4.1)$$

where C_i is coded 1 if consumer *i* could meet the basic living costs in the past 12 months and 0 otherwise; Shock takes the value 1 if consumer *i* experienced an income reduction/was retrenched/could not operate owing to restrictions/stopped working for some time during the COVID-19 pandemic and 0 otherwise. The variables "shock" and "consumption" capture the responses of a consumer related to his/her income and consumption in the previous 12 months at the time of the survey which was conducted in September 2021. That means a consumer's response to his/her ability to meet basic living costs and change in income was anytime between September 2020 and September 2021. X_i represents a vector of control variables that comprise age, marital status, education, employment, and geographic location (see Table 4.2 below).

A statistically significant and negative slope coefficient on the shock variable (β_1) was interpreted as a decline in consumers' ability to meet basic living costs after the COVID-19-induced income shock and *vice versa*. As explained in Section 4.2, consumers can employ financial services from both formal and informal channels to build financial resilience to adverse shocks. With that in mind, the shock variable interacted with financial inclusion to assess whether financial inclusion could offset the negative impact of the COVID-19-induced income shock on consumption after accounting for several covariates as follows:

$$C_i=\alpha_0+\beta_1(\text{Shock*FI})_i+\beta_2 X_i+\varepsilon_i \quad (4.2)$$

where FI is coded 1 if consumer *i* was financially included and 0 otherwise. However, financial inclusion was disaggregated to assess the channels through which a consumer can build resilience to the income shock induced by COVID-19. Therefore, financial inclusion is coded 1 if a person had a bank account, mobile account, informal savings, formal savings, formal insurance, informal insurance, formal credit, informal credit, and 0 otherwise. Moreover, ε_i signifies an error term and the other variables are indicated above in the explanation of Equation 4.1. In addition, since financial resilience to a shock might not be attributable to one financial instrument, each estimation controlled for other financial inclusion variables following Jack and Suri (2014), Tabetando and Matsumoto (2020), and Abiona and Koppensteiner (2020).

In Equation 4.2 above, Shock*FI_i is an interaction term of financial inclusion (formal or informal) and COVID-19-induced income shock. The construction of the interaction term based on the product of two binary variables of shock and the financial inclusion proxy variable follows Lensik et al. (2017), Geng et al. (2018), Tabetando and Matsumoto (2020), and Naito et al. (2021). The coefficient of interest (β_1) was expected to enter with a positive sign and statistically significant suggesting that financially included consumers were able to bounce back after the COVID-19-induced income shock. Conversely, a negative interaction slope coefficient that was statistically significant suggested that financially included consumers could not meet basic living costs after the adverse income shock induced by the COVID-19 pandemic. Furthermore, an interaction slope coefficient that was statistically insignificant would suggest that the consumption of consumers remained indistinguishable from zero whether they were or not financially included after the COVID-19-induced income shock.

Table 4.2: Description of variables and coding

Variable	Coding
Shock and consumption	
Shock	The main impact of COVID-19 was a reduction in income/got retrenched/could not to operate due to restrictions/stopped work for some time (1 - Yes; 0 - otherwise)
Consumption	How often have you not been able to cover living costs? (1- It has never happened in the past 12 months, 0-otherwise)
Financial inclusion	
Mobile finance	1 if used *momo*/send cash/e-wallet/cash-send/instant-money/send-money/send-*imali*, 0 – otherwise
Formal saving	1 if saving book at bank/stokvel bank/unit trust/saving policy/fixed deposit/money market/ structured deposits/ shares/ cryptocurrency/ government bonds
Informal saving	1 – stokvel/savings group/ village bank/ family/home under the mattress
Formal credit	1 - bank loan/insurance credit/retail store credit/employer credit/microfinance/credit card/overdraft, 0 - otherwise
Informal credit	1 - *mashonisa*/*umgalelo*[18]/neighbours/family members/village bank, 0 - otherwise
Formal insurance	1 - asset insurance/life cover/medical insurance/ dreaded disease/funeral store/funeral cover from employer/ sporting team insurance/ insurance from the bank, 0 - otherwise
Informal insurance	1 - burial society/funeral cover from church/ funeral home/funeral policy by an undertaker, 0 - otherwise
Socio-demographic variables	
Marital status	0 -single, 1 - married, 2 - widowed, 3 - separated/widowed
Education	0 - upper secondary, 1 - no formal education, 2 - primary education, 3 - lower secondary, 4 - post-secondary
Employment	0 - employed, 1 - own business, 2 - economically inactive, 3 - unemployed
Age	Individual's age
Location	0 - rural, 1 - urban
Gender	0 - female, 1 - male
Income	income quartiles: 1st quartile (lowest 20% earners) up to 4th quartiles (highest 20% earners)
Indebtedness	0 - currently not paying off debt, 1 – currently paying off debt
COVID relief grant	0 - non-recipient, 1 - recipient of COVID-19 relief grant

[18] *Umgalelo* are informal groups where members contribute a predetermined amount of money and share the pooled savings on a rotational basis (Bahre, 2007).

4.5.2 Empirical strategy

4.5.2.1 Identification problem

In estimating Equation 4.2, it was hypothesised that financial inclusion would build financial resilience after the adverse income shock induced by the COVID-19 pandemic. However, there might be a potential endogeneity problem arising from selection bias. That is, the treatment variable representing the individual's choice of using financial products interacted with income change during the COVID-19 pandemic is non-random and could have possible relationships with the individual's characteristics resulting in selection bias. The selection bias could occur when there are factors such as financial literacy and employment that influence the selection probabilities of financially included individuals, which may also influence the individual's ability to meet basic living costs. To mitigate endogeneity resulting from selection bias, a more accurate assessment of the impact of financial inclusion on consumption after the shock was required controlling for both unobservable and observable characteristics by randomly assigning individuals to treatments (Imbens & Wooldridge, 2009).

In light of the above, Equation 4.2 was estimated using propensity score matching (PSM) techniques to lower selection bias since it mimics characteristics of a randomised controlled trial by matching subjects with controls such that covariate values are similar resulting in an estimation of treatment effects by drawing a comparison with the matched pairs. That is, PSM was chosen to estimate Equation 4.2 to compare the control and treated groups by creating a quasi-randomisation environment because it enables a direct comparison between treated and control subjects without making further adjustments. The ensuing section explains the mechanics of the PSM in more detail.

4.5.2.2 Propensity score matching

PSM matches each treated individual with a similar untreated individual before estimating the mean difference in the outcome variable between the treated and the untreated individuals (Rosenbaum & Rubin, 1983). In the study, the treated group was represented by financially included consumers who experienced a shock whereas the control group was represented by financially excluded consumers who experienced a shock. By applying the PSM, the study's focus was the average treatment effect on the treated (ATT) which is expressed as follows (Imbens & Wooldridge, 2009):

$$ATT=E[Y(1)-Y(0)|T=1] \quad (4.3)$$

where Y(1) and Y(0) denote outcome variables that refer to the ability to meet the basic living costs of treated and untreated individuals, respectively. *T* signifies a treatment indicator. However, only E[Y(1)|T=1] is observable in the dataset and E[Y(0)|T=1] is missing implying that the counterfactual cannot be observed. In other words, a simple comparison of the consumption of individuals with and without treatment might introduce self-selection bias in the estimated effects, which is formally expressed as follows:

$$E[Y(1)-Y(0)|T=1]=ATT+E[Y(0)|T=1-Y(0)|T=0] \quad (4.4)$$

By creating a comparable counterfactual individual for treated individuals, PSM could mitigate the self-selection bias due to observables in the estimations of the ATT. After matching the treatment units, the PSM assumes that there are no systematic disparities between the treated and untreated units in the unobservable characteristics.

There are several assumptions on which PSM is predicated. The key assumption is the overlap condition which suggests that every observation has a probability of being treated and accounted for. In addition, PSM is based on the conditional independence assumption which states that no unobservable variable affects the probability of treatment and the outcome variable after conditioning the covariates (Rosenbaum & Rubin, 1985). Considering the assumption of overlap and conditional independence, the ATT is estimated as follows:

$$ATT=E[Y(1)|T=1, p(x)]-E[Y(0)|T=0,p(x) \quad (4.5)$$

The ATT estimates might be prone to poor matching, which warrant remedial specifications. Therefore, to avoid bias from poor matching, the study used the nearest neighbour approach, which matches the treated and control groups by taking each treated unit and looking for the control unit with the closest propensity score. Thereafter, the difference between the outcome of the treated unit and the matched control unit was computed which yielded the ATT of interest by taking the mean difference.

To apply the PSM, several estimators are employed because there is variation in the handling of the common support problem, the definition of the neighbourhood for each treated individual, and the weight assigned to these neighbours. Examples of PSM estimators include radius matching, kernel matching, nearest neighbour matching, stratification matching, and local linear matching. However, to ease the interpretation of results, this study employed two PSM estimators that use kernel matching and nearest neighbour matching.

When applying nearest neighbour matching, the individual from the comparison group is selected as a matching partner from the treated individual that is closest as indicated by the propensity score. Though one can estimate the nearest neighbour matching 'with replacement' or 'without replacement', this study used the former option. The latter case permits an untreated individual to be used only once as a match, unlike the former case when the untreated individual is used more than once as a match. The reason for using the 'with replacement' option was that it increases the quality of matching and reduces bias, particularly when the distribution of the propensity score is dissimilar in the control group and treatment group (Caliendo & Kopeinig, 2008). Moreover, using the option of nearest neighbour matching 'with replacement' minimises the number of distinct non-participants included in the construction of the counterfactual outcome, thereby increasing the estimator's variance (Caliendo & Kopeinig, 2008). For robustness, the study's estimations were done using one nearest neighbour and four nearest neighbours termed NN(1) and NN(4), respectively. Although matching more distant neighbours such as NN(4) might lower the estimator's variance, it increases the bias (Abadie & Imbens, 2006).

There is a possibility of a large disparity between the propensity scores of the two closest individuals available for matching which results in poor matches. This bias could result from the loss of too many cases due to failure to find a good match, which renders the final sample unrepresentative. As a remedy, caliper restrictions were used since they impose a threshold distance between the matched units such that a treated observation is excluded from the estimation if this threshold distance is exceeded resulting in less biased estimates (Caliendo & Kopeinig, 2008). In the study, a caliper of 0.1 was applied to the ATT estimation using the NN(1) and NN(4) matching. The reason was the absence of propensity scores after invoking a caliper restriction between 0.01 and 0.09 using the NN(1) and NN(4) matching.

Nearest neighbour matching, however, uses only a few observations from the comparison group in the construction of the counterfactual outcome of a treated individual. To mitigate this shortcoming, kernel matching was used because it uses weighted means of all individuals in the control group to compute the counterfactual outcome (Caliendo & Kopeinig, 2008). Consequently, unlike nearest neighbour matching, kernel matching will likely yield lower variance because it uses more information from the comparison group to compute the counterfactual outcome of the treated individual (Caliendo & Kopeinig, 2008). Moreover, compared to nearest neighbour matching, kernel matching could yield more accurate matches if the nearest neighbour is numerically distant. In addition, kernel matching mitigates the

selection bias by assuming that the selection is not related to the dependent variable and is conditional on several observed indicators (Berg, 2011; Heckman et al., 1998).

The fundamental assumption of kernel matching is that of conditional independence which asserts that the treatment status is randomised and conditional on a particular set of observed variables. Similar to nearest neighbour matching kernel matching estimates the probability of each individual participating in the control and treatment groups. Furthermore, kernel matching estimations put more weight on untreated subjects that are like the treated subjects (Baser, 2006; Heckman et al., 1998). However, in estimating the ATT using kernel matching, biased standard errors might be yielded owing to the failure to account for the variation that arises from the PSM. To produce standard errors and confidence intervals that are not biased, a bootstrapping method with 100 replications was used (Handouyahia et al., 2013).

4.5.2.3 Diagnostic tests for kernel and nearest neighbour matching

Subsequently, there were post-estimation diagnostic tests to assess whether there was a covariate balance after estimating the ATT using nearest neighbour matching and kernel matching. To achieve this, variance ratios and standardised mean differences were used to ensure that the covariate balance assumption was satisfied after nearest neighbour matching. A standardised mean difference compares the balance in the measured variables between the control and treated subjects in the matched sample compared with the unmatched sample. Considering this, standardised mean difference values that are closer to zero indicate better covariate balance and *vice versa* (Austin, 2009). In comparison, the variance ratio, measured as the ratio of a treatment group to a control group, assesses the covariate balance of the propensity score between groups. The variance ratio of a balanced sample must be close to one, which would indicate that the variance of the propensity scores between the treatment group and control group is equal (Rubin, 2001; Stuart, 2010).

For each of the kernel matching estimations, the covariate balance is satisfied when the matched sample in the density plots shows only one line implying that there are no large deviations between the treated group and control group. In the current study, the *kmatch density* command in Stata 16 was used after each kernel matching estimation (Bittmann, 2019). Considering that the overlap condition is a vital assumption of PSM, density plots were drawn to ascertain whether the overlap condition was satisfied after each nearest neighbour matching estimation using the *effects overlap* command in Stata 16. The overlap assumption is satisfied when there is a probability of seeing observations in both the control and treatment group at

each combination of covariate values. However, the overlap condition is violated when the estimated density has too much mass around 0 and 1 since the estimated plot densities would have very little mass in the regions in which they overlap (Busso et al., 2014; Cattaneo, 2010).

4.6 Results and discussion

Before presenting the estimation results, this section explains the profile of consumers unaffected and affected by the COVID-19-induced income shock by presenting the descriptive statistics of the socio-demographic variables and the results of the chi-square tests. Thereafter, the empirical results from the PSM estimations are presented and discussed.

Table 4.3 below provides summary statistics of the demographic variables, channels of financial inclusion, and consumption of consumers in South Africa. Females constituted more than half (53.99%) of the respondents, whereas 52.12% of South Africans resided in rural areas. While only 2.95% had no formal education qualification, the highest qualification for approximately four-fifths of consumers was between primary and upper secondary level. Furthermore, slightly above one-fifth (22.16%) of the respondents were married, while the rest were unmarried. Although 77.28% of consumers owned bank accounts, more consumers managed their financial lives through informal channels considering that less than one-fifth of the consumers used formal saving channels compared with approximately one-third who saved informally.

Furthermore, Table 4.3 shows that only 22.69% of the consumers used formal credit whereas about one-third (30.81%) borrowed from informal channels. Comparatively, more consumers employ formal channels to insure themselves against life events since about two-fifths (39.88%) of consumers used formal insurance compared with 36.76% who were informally insured. In addition, just above half (52.02%) of the consumers were not affected by the income shock induced by the COVID-19 pandemic. Despite nearly one-third of consumers (27.10%) receiving social grants as a cushion against an income shortfall, about half (51.18%) of South Africans were able to meet basic living costs.

Table 4.3: Summary statistics

Variable	Frequency	Percent	Variable	Frequency	Percent
Consumption			**COVID-shock**		
meeting basic living costs	2899	51.18	no shock	2832	52.02
not meeting basic living costs	2765	48.82	shock	2612	47.98
Education			**Indebtedness**		
upper secondary	2141	37.8	not paying off debt	2291	40.45
no formal education	167	2.95	paying off debt	3373	59.55
primary education	461	8.14	**Covid-19 relief grant**		
lower secondary	1959	34.59	non-recipient	5230	92.34
post-secondary	936	16.53	recipient	434	7.66
Social grant recipients			**Mobile finance**		
non-recipient	4129	72.9	user	2137	37.73
recipient	1535	27.1	non-user	3527	62.27
Income			**Marital status**		
1st quartile	1417	25.02	single	3661	65.7
2nd quartile	1958	34.57	married	1235	22.16
3rd quartile	1371	24.21	widowed	395	7.09
4^{th} quartile	918	16.21	separated/divorced	281	5.04
Gender			**Location**		
female	3058	53.99	rural	2952	52.12
male	2606	46.01	urban	2712	47.88
Formal insurance			**Formal saving**		
not insured	3405	60.12	no formal saving	4581	80.88
insured	2259	39.88	formal saving	1083	19.12
Informal insurance			**Informal saving**		
not insured	3582	63.24	no informal savings	3968	70.06
insured	2082	36.76	informal saving	1696	29.94
Formal credit			**Bank accounts**		
no formal credit	4379	77.31	no bank account	1252	22.42
formal credit	1285	22.69	bank account ownership	4333	77.58
Informal credit					
no informal credit	3919	69.19			
informal credit	1745	30.81			

Notes: The table shows the descriptive statistics of socio-demographic variables and various financial products and services in both formal and informal sectors. Income quartiles were computed based on individuals' monthly income. The results are nationally representative based on weights benchmarked to Statistics South Africa.

Table 4.4 below summarises the chi-square test results of the socio-demographic profile of consumers whose income was affected and unaffected by the COVID-19-induced income shock. Consumers with upper and lower secondary educational qualifications and in the second quartile and third quartiles of income earners were more affected by the COVID-19-induced income shock compared with other income categories. In addition, economically inactive consumers, entrepreneurs, males, urbanites, and single consumers had a lower decline in income after the COVID-19-induced income shock compared with others. Except for the employment category, the statistical differences among different demographic categories in terms of the COVID-19-induced income shock were weak since the Cramer's V test scores were less than 0.2 throughout.

Table 4.4: Chi-square test on consumers affected by the COVID-19 shock

Variable	Category	no shock	shock	chi-square	p-value	Cramer's V
education	upper secondary	34.600	41.540	115.475***	0.000	0.146
	no formal education	4.200	1.340			
	primary	9.990	5.590			
	lower secondary	36.580	32.200			
	post-secondary	14.620	19.330			
gender	female	58.550	48.970	50.183***	0.000	0.096
	male	41.450	51.030			
income quartiles	1st quartile	29.520	19.100	130.923***	0.000	0.155
	2nd quartile	35.980	32.850			
	3rd quartile	19.560	29.750			
	5th quartile	14.940	18.300			
location	rural	54.560	48.700	18.666***	0.000	0.059
	urban	45.440	51.300			
employment	employed	30.760	43.950	400.029***	0.000	0.271
	own business	8.230	18.530			
	economically inactive	28.390	10.800			
	unemployed	56.970	43.030			
marital status	single	65.770	65.800	27.118***	0.000	0.071
	married	20.640	23.730			
	widowed	8.560	5.230			
	separated/divorced	5.030	5.230			
social grants	non-recipient	67.200	79.250	100.107***	0.000	-0.136
	recipient	32.800	20.750			

Notes: The income quartiles were computed from individuals' monthly income. *** denotes statistical significance at the 1% level.

Table 4.5 below summarises the ATT estimations of the impact of COVID-19-induced income shock on consumers' consumption while controlling for socioeconomic variables excluding financial inclusion as shown in Equation 4.1 above. As expected, the shock coefficient entered with a negative sign and was statistically significant at the 1% level using nearest neighbour matching and kernel matching. This implied that the consumption of consumers who were affected by the COVID-19-induced income shock significantly declined compared with consumers that did not experience the shock.

Table 4.5: The impact of COVID-19-induced income shock on consumption

Dependent variable: Consumption			
PSM	**Shock coefficient**	**z-stat**	**p-value**
NN(1)	-0.110***	-6.100	0.000
	[0.018]		
NN(4)	-0.096***	-6.050	0.000
	[0.016]		
Kernel	-0.094***	-4.480	0.000
	[0.021]		

Note: The table shows the results of the impact of COVID-19-induced income shock on consumption based on kernel matching and nearest neighbour matching. ***p<0.01. [] are robust standard errors.

There were several diagnostic tests to ensure that the assumption of overlap and covariate balance was satisfied. As shown in Figures 4.2 and 4.3 below, the density plots for the matched sample from the NN(1) and NN(4) matching were almost indistinguishable suggesting that matching on the estimated propensity score balanced the covariates. Concerning the kernel matching estimations, Figure 4.4 below shows that the density plots of the matched group and control group were almost indistinguishable suggesting that kernel matching on the estimated propensity score balanced the covariates. Moreover, as shown in Appendices 4A and 4B, the variance ratios and standardised mean differences for nearest neighbour matching and kernel matching were close to 1 and 0, respectively, which provides evidence for covariate balance in the model.

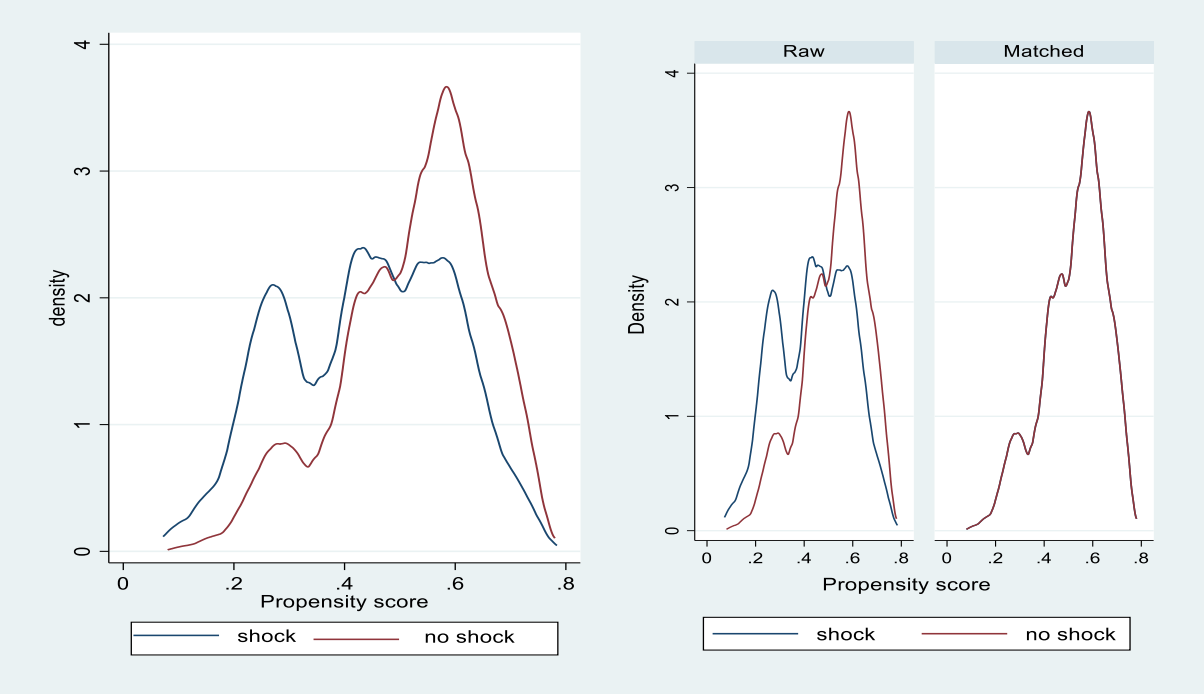


Figure 4.2: Density plot for NN(1) matching: The shock effect on consumption

Note: The figure shows the density plots after estimating the impact of the COVID-19-induced income shock on consumption using NN (1) matching.

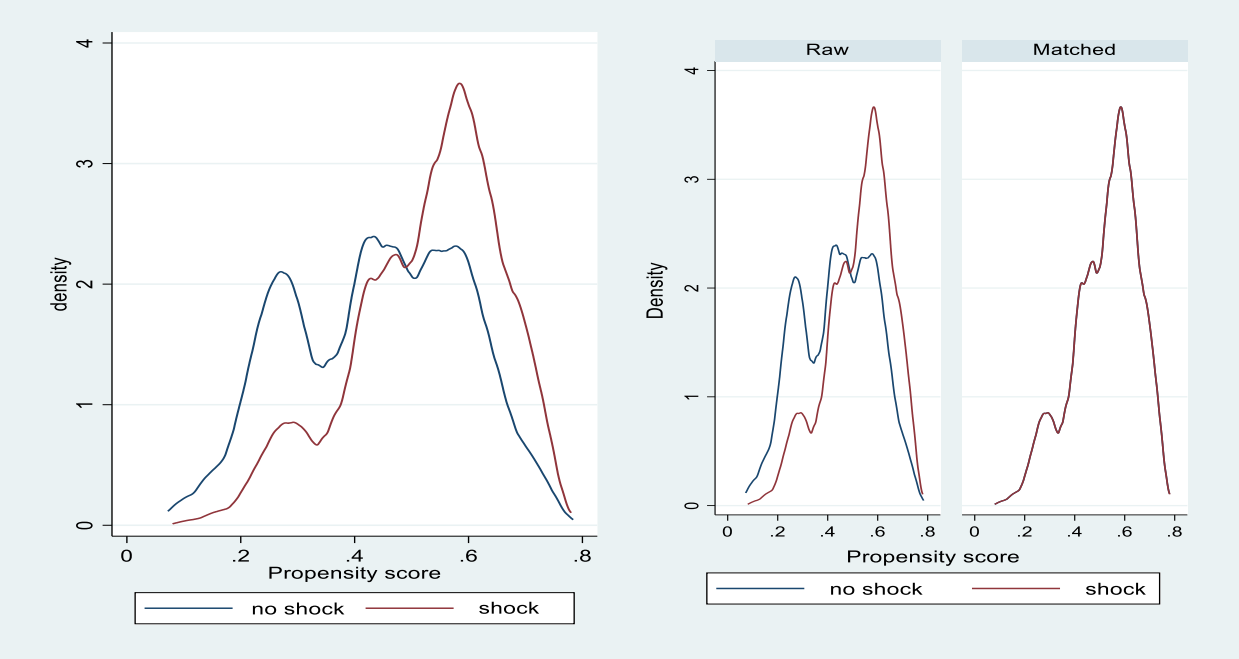


Figure 4.3: Density plot for NN(4) matching: The shock effect on consumption

Note: The figure shows the density plots after estimating the impact of the COVID-19-induced income shock on consumption using NN (4) matching.

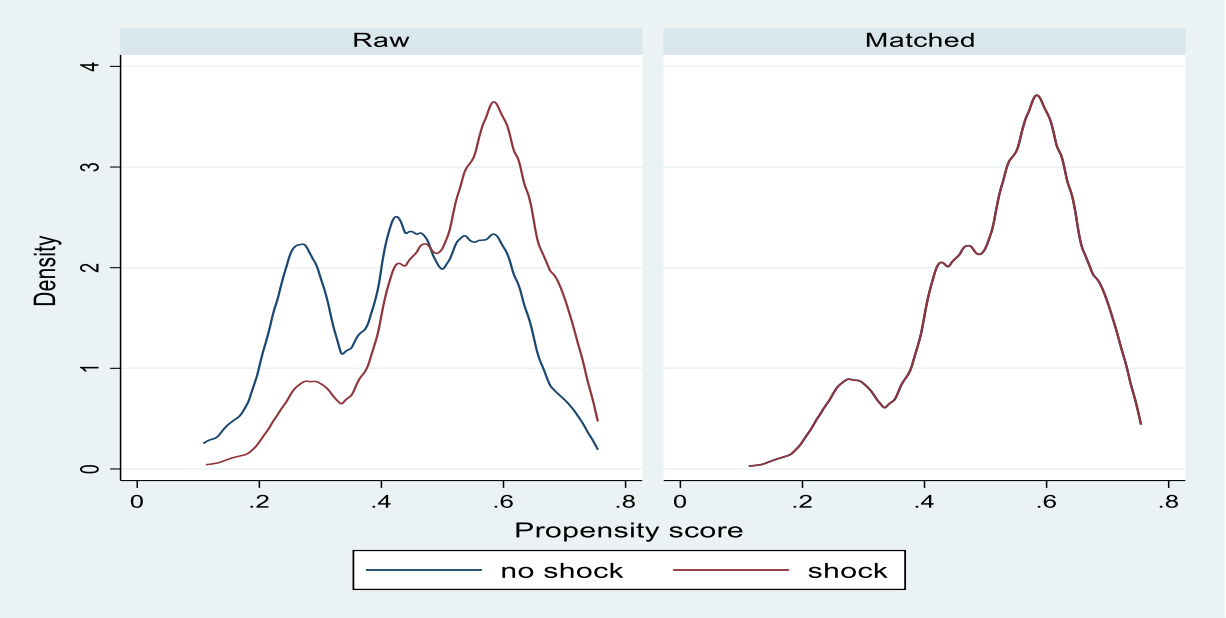


Figure 4.4: Density plot for kernel matching: The shock effect on consumption

Note: The figure shows the density plots after estimating the impact of the COVID-19-induced income shock on consumption using kernel matching.

Table 4.6 below shows that borrowing, saving, and insuring through informal channels reduced the probability of consumers meeting basic living costs after the COVID-19-induced income shock, unlike a similar group that did not use them. This is indicated by the negative slope coefficients of shock*informal borrowing, shock*informal savings, and shock*informal insurance, which were statistically significant at the 1% level in the NN(1), NN(4), and kernel matching estimations.

Table 4.6 shows that slope coefficients of the shock *formal saving, shock*formal credit, and shock*formal insurance were negative but statistically indistinguishable from zero at all conventional levels in the NN(1), NN(4), and kernel matching estimations. Therefore, consumers who used formal credit, formal savings, and formal insurance did not reveal a statistically significant difference in consumption smoothing from the matched group that did not employ these financial products during the COVID-19 pandemic. The results suggest that there might have been some element of resistance to the income shock induced by the COVID-19 pandemic among consumers who borrowed, saved, and purchased insurance through formal financial channels since the decline in consumption was not statistically significant. These results resemble those of earlier studies conducted by Akampumuza and Matsuda (2017), Karlan et al. (2017), and Lensik et al. (2017) who found a statistically insignificant decline in

the consumption of users of formal credit and bank account owners in Uganda, Malawi, Ghana, and Mexico after covariate shocks (weather shocks and decline in agricultural prices).

Contrary to the study's hypothesis which stated that financial inclusion increased financial resilience to the income shocks induced by the COVID-19 pandemic, the results confirmed that consumers who employed informal channels of borrowing, saving, and insurance could not meet basic living costs after the COVID-19-induced income shock. The findings related to informal channels of financial inclusion are contrary to the expectations of the risk-sharing theory, social insurance theory, and precautionary saving theory. This is because the theories suggest that consumers can build financial resilience to adverse shocks by receiving remittances from people within their network, accumulating precautionary savings, and purchasing insurance.

There might be some reasons why informal channels of financial inclusion failed to offset the negative effect of the income shock induced by COVID-19. Firstly, these results might be attributed to the lower capacity of informal channels of financial inclusion to offset the negative impacts of adverse covariate shocks (Besley, 1995). For example, loanable funds through informal channels are often unable to cover all the participants' demands since members might become inclined to borrow at the same time as a coping strategy against a covariate shock (Besley, 1995; Mahmud & Riley, 2021). Secondly, as discussed in Section 4.4, the South African government restricted non-essential movement and prohibited gatherings to reduce the spread of COVID-19. Therefore, a possible reason is that saving groups and VSLAs, which rely on in-person attendance, might have been rendered ineffective in offsetting the negative effect of the shock on consumption due to the COVID-19 protocols.

Furthermore, the NN(1) estimation showed that the users of mobile transfer services did not demonstrate a statistically significant decline in consumption after the COVID-19-induced income shock. This was indicated by a negative shock*mobile finance slope coefficient that was not statistically distinguishable from 0. However, the negative shock*mobile finance slope coefficient became statistically significant in the NN(4) and kernel matching estimations which made the results inconclusive. These results contradict those of earlier studies which concluded that mobile finance helps in bolstering financial resilience to adverse covariate shocks, such as agricultural sector-specific shocks and region-specific weather shocks (Afawubo et al., 2020; Naito et al., 2021; Suri et al., 2021). However, in the current study, receiving remittances through mobile finance amongst consumers might have been ineffective due to the nationwide

economic effects of the COVID-19 pandemic that resulted in 2.2 million people becoming unemployed and reduced disposable income for about 47.98% of consumers (Statistics South Africa, 2020). Implicitly, remittances facilitated by mobile finance might not offset the negative effect of a nationwide covariate economic shock since this might have affected most consumers.

Table 4.6: ATT results from nearest neighbour matching and kernel matching

	NN(1)		NN(4)		Kernel	
Interaction variable	**ATT**	**z-stat**	**ATT**	**z-stat**	**ATT**	**z-stat**
shock*formal borrowing	0.004	0.120	0.001	0.040	-0.005	-0.180
	(0.030)		(0.024)		(0.027)	
shock* informal borrowing	-0.096***	-3.620	-0.078***	-3.680	-0.074***	-3.320
	(0.027)		(0.021)		(0.022)	
shock*formal saving	0.008	0.240	-0.029	-1.120	-0.035	-1.330
	(0.032)		(0.026)		(0.026)	
shock*informal saving	-0.114***	-4.360	-0.115***	-5.360	-0.113***	-3.900
	(0.026)		(0.021)		(0.029)	
shock*formal insurance	-0.014	-0.570	-0.019	-0.950	-0.026	-1.140
	(0.024)		(0.019)		(0.023)	
shock*informal insurance	-0.066***	-2.630	-0.071***	-3.520	-0.087***	-3.470
	(0.025)		(0.020)		(0.025)	
shock*mobile finance	-0.039	-1.600	-0.057***	-2.920	-0.062***	-2.690
	(0.024)		(0.020)		(0.023)	

Note: The table shows the results of the impact of financial inclusion on financial resilience to COVID-19-induced income shock based on kernel matching and nearest neighbour matching. For national representativeness, the data were weighted using weights benchmarked to those of Statistics South Africa. In parentheses are robust standard errors. *** denotes statistical significance at the 1% level.

Subsequently, a diagnostic test was done to ascertain whether the overlap condition and covariate balance were satisfied in the nearest neighbour matching and kernel matching estimations, respectively. Figures 4.5 and Figure 4.6 below show that the overlap condition is satisfied in the NN(1) and NN(4) given the considerable gap between the line of the treated and control group after they intersect. Moreover, except for shock*formal insurance, none of the density plots indicates too much probability near 0 or 1 which implies that each individual had a positive probability of being treated, which is consistent with the overlap condition. Furthermore, as shown in Appendices 4C-4O, the standardised mean difference in the matched sample was close to 0 and the variance ratios in the matched sample were close to 1 across the

NN(1) and NN(4) matching estimations. This suggested that the covariate balance assumption was satisfied in the nearest neighbour matching estimations.

For kernel matching estimations, Figure 4.7 below indicates that the density plots of the matched and control sample are almost indistinguishable, which suggests that matching on the estimated propensity score balanced the covariates. Moreover, as shown in Appendices 4P-4V, the standardised mean difference in the matched sample was close to 0 and the variance ratios in the matched sample were close to 1 across the kernel matching estimations. However, the variable 'no formal education' in the shock*informal savings estimations had a variance ratio of 1.38 in the matched sample using kernel matching as shown in Appendix 4S which indicates an imbalance in the matching of this variable.

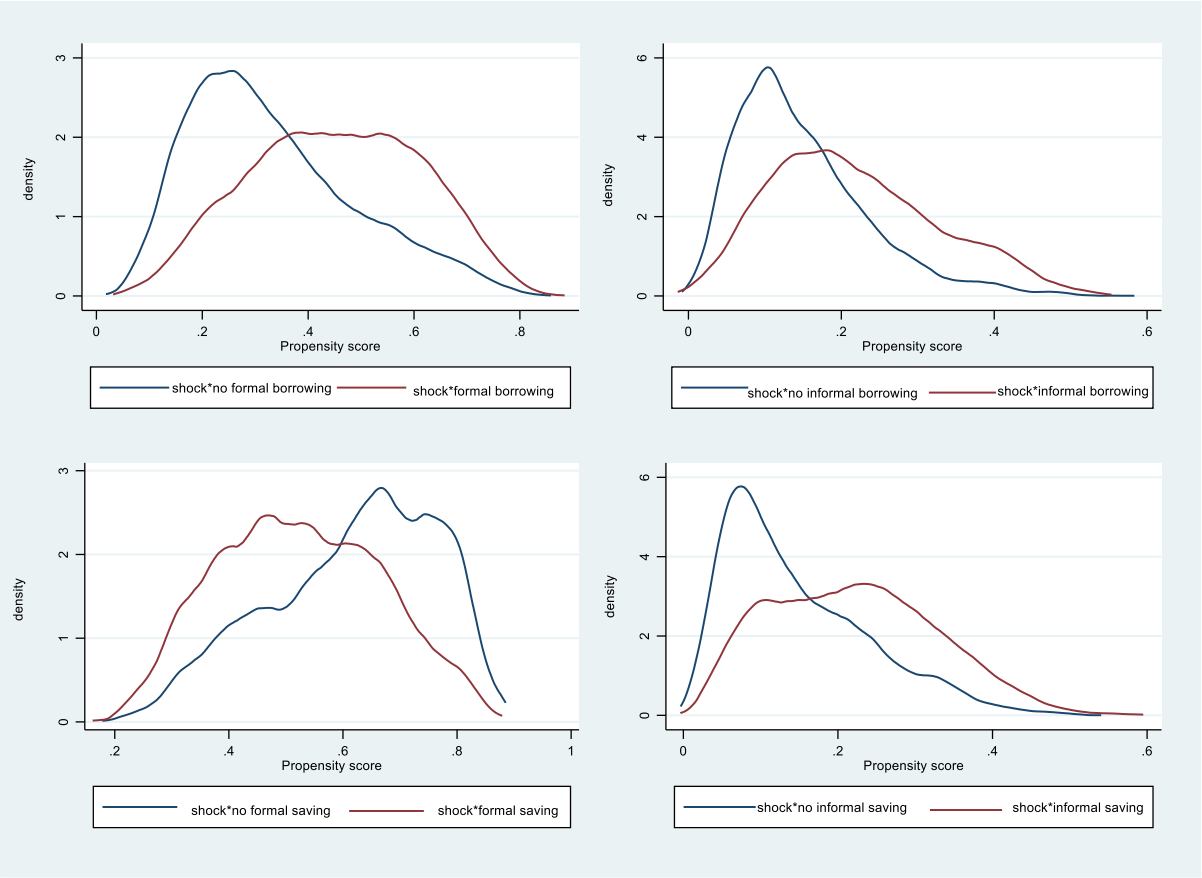


Figure 4.5: Overlap condition – NN(1) matching estimates

Note: The figure shows the density plots after examining whether formal and non-formal financial services could offset the negative impact of the COVID-19-induced income shock on consumption using NN (1) matching.

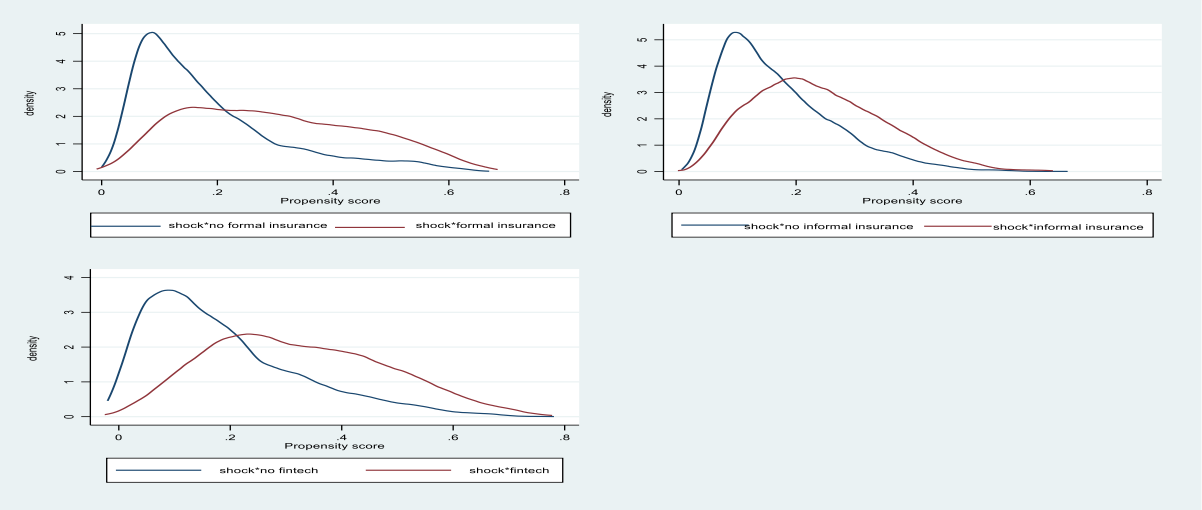


Figure 4.6: Overlap condition – NN(4) matching estimates

Note: The figure shows the density plots after examining whether formal and non-formal financial services could offset the negative impact of the COVID-19-induced income shock on consumption using NN (4) matching.

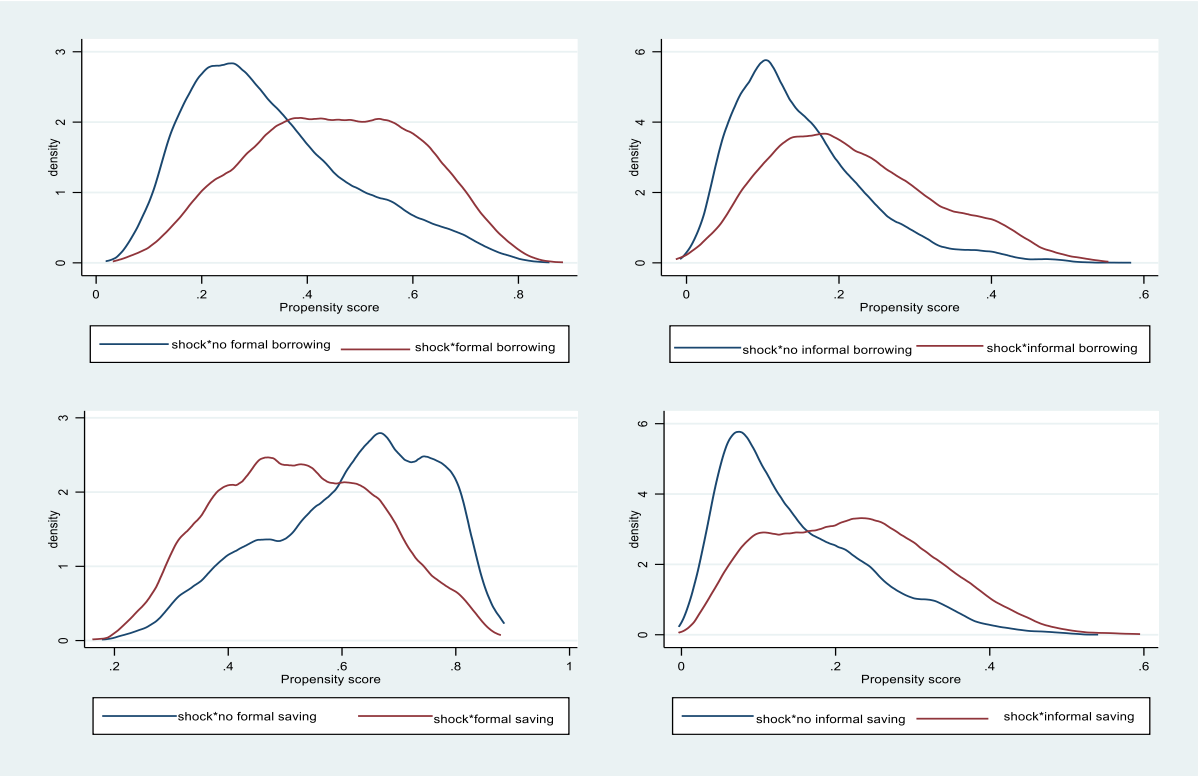


Figure 4.6: Overlap condition – NN(4) matching estimates (continued)

Note: The figure shows the density plots after examining whether formal and non-formal financial services could offset the negative impact of the COVID-19-induced income shock on consumption using NN (4) matching.

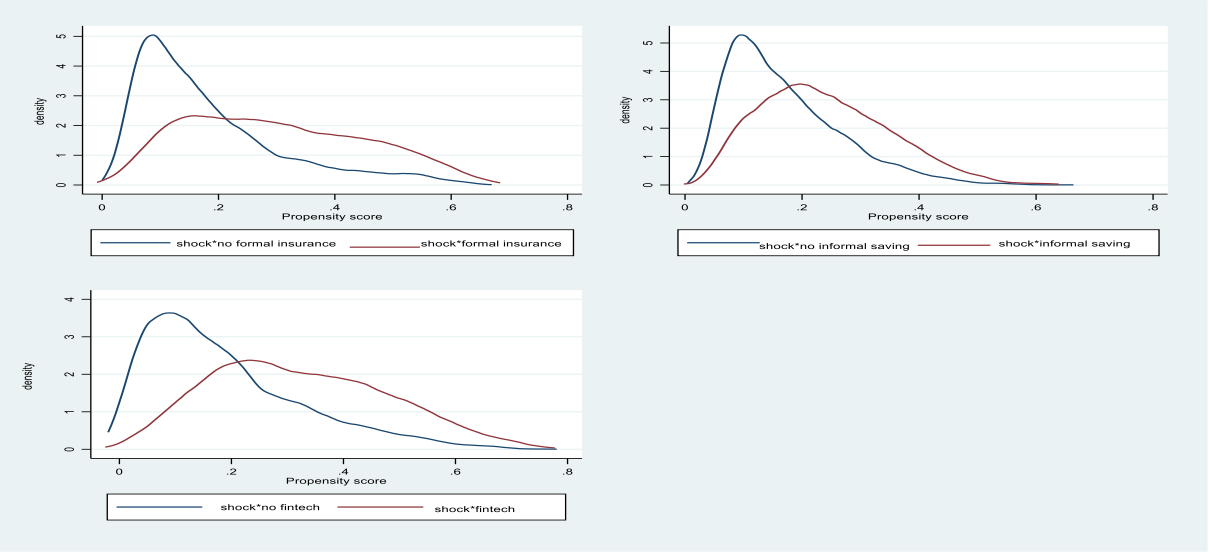


Figure 4.7: Density plots for kernel matching estimates

Note: The figure shows the density plots after examining whether formal and non-formal financial services could offset the negative impact of the COVID-19-induced income shock on consumption using kernel matching.

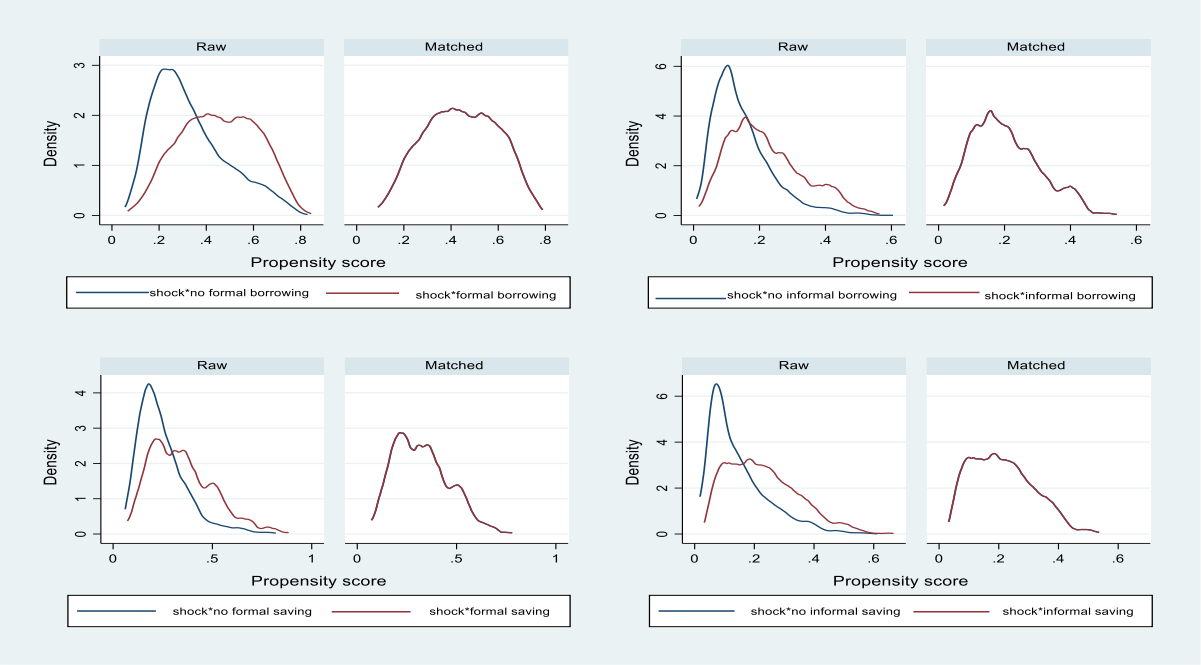


Figure 4.7: Density plots for kernel matching estimates (continued)

Note: The figure shows the density plots after examining whether formal and non-formal financial services could offset the negative impact of the COVID-19-induced income shock on consumption using kernel matching.

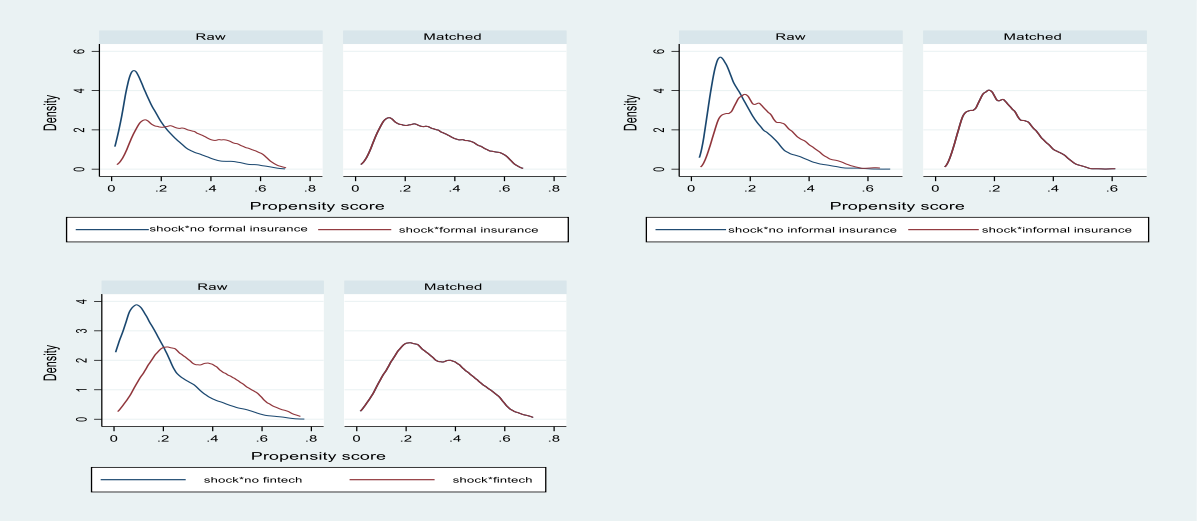


Figure 4.7: Density plots for kernel matching estimates (continued)

Note: The figure shows the density plots after examining whether formal and non-formal financial services could offset the negative impact of the COVID-19-induced income shock on consumption using kernel matching.

As shown in Table 4.6 above consumers who used informal channels to borrow, save and insure themselves were unable to build financial resilience to the COVID-19-induced income shock, which warranted an inquiry into the possible reason for this. Possibly, debt repayment might have explained the results since about three-fifths of consumers were indebted as shown in Table 4.3 above. In other words, paying off debt might have reduced consumers' liquidity resulting in a lower ability to meet basic living costs. Consequently, debt repayments could have dampened the impact of financial inclusion on financial resilience to the negative economic shock due to COVID-19. Therefore, Equation 4.2 was re-estimated by disaggregating consumers according to indebtedness which took the value of 1 if a consumer was still paying off debt and 0 otherwise. For this robustness check, only NN(1) and kernel matching were estimated.

Table 4.7 below shows that users of mobile finance who were indebted experienced a decline in consumption after the COVID-19-induced income shock based on the NN(1) estimation. Similarly, consumers who used formal channels to borrow and save but were still paying off their debt failed to meet basic living costs after the COVID-19-induced income shock. This was indicated by the negative slope coefficients of shock*formal borrowing and shock*formal saving that were statistically significant at the 10% and 5% levels, respectively, using kernel matching. However, the shock*formal saving slope coefficient became statistically insignificant at conventional levels when the model was estimated using NN(1).

Consumers that saved, insured, and borrowed through informal channels failed to meet basic living costs irrespective of their indebtedness as indicated by the negative interaction slope coefficients based on the NN(1) and kernel matching estimations. However, the failure to offset the COVID-19-induced income shock was more pronounced among the indebted consumers who relied on informal means to insure, borrow and save, as indicated by statistically significant and larger negative slope coefficients across both estimates of NN(1) and kernel matching. Therefore, the robustness check indicated that indebtedness might reduce financial resilience to adverse shocks, particularly in the case of those who rely on informal channels to borrow, save, and insure. Therefore, financial education targeting debt management and financial planning might help financially included consumers to become more financially resilient to future covariate shocks. Noteworthy, the disaggregated estimates for shock*formal borrowing according to debt levels using NN(1) were not presented owing to collinearity problems with the education, marital, and geographical location variables.

Table 4 7: Propensity score matching: Disaggregated by debt repayment

	NN(1) matching				**Kernel matching**			
	Debt =1		**Debt =0**		**Debt =1**		**Debt = 0**	
	ATT	**z-stat**	**ATT**	**z-stat**	**ATT**	**z-stat**	**ATT**	**z-stat**
shock*formal borrowing					-0.458*	-1.710	-0.003	-0.090
					(0.268)		(0.038)	
shock*informal borrowing	-0.095***	-3.390	-0.056	-0.460	-0.232*	-1.660	-0.232	-1.600
	(0.028)		(0.121)		(0.140)		(0.145)	
shock*formal saving	-0.048	-1.330	-0.085	-1.160	-0.171**	-2.290	-0.088	-1.210
	(0.036)		(0.073)		(0.075)		(0.073)	
shock*informal saving	-0.125***	-4.020	-0.162***	-3.010	-0.081***	-2.890	-0.168***	-3.380
	(0.031)		(0.054)		(0.028)		(0.050)	
shock*formal insurance	-0.031	-1.140	0.052	1.210	-0.025	-0.910	0.071*	1.800
	(0.028)		(0.043)		(0.027)		(0.039)	
shock*informal insurance	-0.105***	-3.590	-0.139***	-2.760	-0.111***	-4.420	-0.096*	-1.930
	(0.029)		(0.050)		(0.025)		(0.050)	
shock*mobile finance	-0.055**	-2.030	-0.025	-0.550	-0.040	-1.610	-0.042	-0.950
	(0.027)		(0.045)		(0.025)		(0.044)	

Notes: The table shows the results of the impact of financial inclusion on financial resilience to COVID-19-induced income shock based on kernel matching and nearest neighbour matching. For national representativeness, the data were weighted using weights benchmarked to those of Statistics South Africa. ***p<0.01, **p<0.05, *p<0.10. () are robust standard errors.

4.7 CONCLUSION

Consumers in developing countries remain vulnerable to adverse covariate shocks and idiosyncratic shocks which could reduce their welfare. The precautionary saving theory, social insurance theory, Quach's (2016) theory on credit and welfare, and risk-sharing theories suggest that consumers can build financial resilience to adverse shocks by accumulating savings, borrowing, purchasing insurance, and receiving remittances. The rationale is that, on the one hand, the accumulation of precautionary savings and credit could provide liquidity in the event of unforeseen adverse life events. On the other hand, insurance helps to mitigate and circumvent costly coping mechanisms in the event of an adverse shock. Moreover, the use of these financial services helps talented consumers to invest in entrepreneurial projects that could generate income which improves consumers' financial resilience to adverse shocks.

Several empirical studies have investigated how financially included consumers were able to offset negative shocks. However, unlike most studies that focused on region-specific weather shocks and agricultural sector-specific covariate shocks, the current studies are yet to investigate the role of financial inclusion in building financial resilience to a global economic shock that negatively affected the incomes of most consumers simultaneously. The COVID-19 pandemic provides a unique example of a worldwide aggregate shock that resulted in a decline in the incomes of many consumers. Therefore, to fill the gap in the literature, the study investigated whether various channels of financial inclusion built financial resilience to the COVID-19-induced income shock in South Africa's context.

Contrary to the study's hypothesis, the results from the nearest neighbour matching and kernel matching revealed that the consumers in the study who used informal credit, informal insurance, mobile transfer services, and informal savings could not meet basic living costs after the COVID-19-induced income shock. However, those who saved, insured, and borrowed through formal channels did not experience a statistically significant decline in consumption after the COVID-19-induced income shock. Further inquiry showed that the failure to meet basic living costs after the COVID-19-induced income shock was more pronounced among indebted consumers who used informal financial services and mobile financial services. Thus, the obligation to reimburse creditors might have lowered liquidity after the shock, which reduced the financial resilience-building effect of various channels of financial inclusion after the COVID-19-induced income shock.

The results have several policy implications. Firstly, since more indebted consumers were less likely to meet basic needs after the COVID-19-induced income shock despite being financially included, policymakers should increase awareness of debt management through financial education programs which would enhance their financial resilience to future economic shocks. Secondly, access to formal financial products should be increased and consumers should be educated about the effectiveness of these products considering that those who relied on informal channels of borrowing, insurance, and saving were less financially resilient after the income shock induced by the COVID-19 pandemic.

The study did have a limitation of using cross-sectional data, however, which might be addressed in future studies using panel data. Firstly, the use of a panel dataset could have provided more powerful and efficient estimates because it contains more degrees of freedom, higher sample variability, and contains information on both the intertemporal dynamics and the individual entities, thereby controlling the effects of missing variables (Hsiao, 2006). Secondly, using a cross-sectional dataset precluded the dynamic analysis of the impact of various channels of financial inclusion on financial resilience to COVID-19-induced shock during different phases of the pandemic. For dynamic analysis, the panel data from the National Income Dynamic Study Coronavirus Rapid Mobile Survey in South Africa could have been used given that it provided five waves of panel data related to consumers' livelihoods during the COVID-19 pandemic between May 2020 and May 2021. However, the National Income Dynamic Study Coronavirus Rapid Mobile Survey could not be used because there were no questions related to the use of financial products and services.

As highlighted in Section 4.1, the examination of the role of financial inclusion in financial resilience is pertinent since higher resilience contributes positively to higher financial satisfaction, which enhances consumers' SWB (Nanda & Banerjee, 2021). Apart from increasing financial resilience, improvement in the quality of financial inclusion improves asset accumulation and, in turn, enhances consumers' SWB. Therefore, the following chapter focuses on the indirect effect of QFIN on SWB through asset accumulation. Before proceeding to the following chapter, the appendices of Chapter 4 are presented below.

APPENDICES

Appendix 4A: Shock effect on consumption: nearest neighbour covariate balance test

		NN(1)				NN(4)			
		Standardised differences		Variance ratio		Standardised differences		Variance ratio	
Control variables		Raw	Matched	Raw	Matched	Raw	Matched	Raw	Matched
age	age squared	-0.192	-0.021	0.461	0.859	-0.192	-0.018	0.461	0.823
gender	male	0.195	0.033	1.030	1.000	0.195	0.019	1.030	1.000
employment	own business	0.308	0.005	2.000	1.008	0.308	0.006	2.000	1.010
	economically inactive	-0.462	0.018	0.466	1.047	-0.462	0.008	0.466	1.022
	unemployed	-0.129	0.003	0.891	1.003	-0.129	0.010	0.891	1.011
location	urban	0.113	0.012	1.006	0.999	0.113	0.021	1.006	0.999
marital	married	0.074	0.030	1.105	1.040	0.074	-0.007	1.105	0.992
	widowed	-0.131	-0.017	0.634	0.935	-0.131	-0.001	0.634	0.998
	separated/divorced	0.009	0.042	1.038	1.194	0.009	0.008	1.038	1.034
education	no formal education	-0.180	-0.016	0.318	0.874	-0.180	-0.005	0.318	0.960
	primary education	-0.167	0.017	0.580	1.071	-0.167	0.015	0.580	1.063
	lower secondary	-0.088	0.017	0.944	1.013	-0.088	-0.015	0.944	0.989
	post-secondary	0.127	-0.014	1.250	0.979	0.127	-0.027	1.250	0.961

Appendix 4B: Shock impact on consumption: Kernel matching covariate balance test

Control variables	Raw			Matched		
	Treated	Untreated	Ratio	Treated	Untreated	Ratio
age squared	960348.600	2084328.000	0.461	943242.100	1171892.000	0.805
male	0.250	0.243	1.030	0.250	0.250	1.000
own business	0.152	0.076	2.000	0.149	0.148	1.008
economically inactive	0.095	0.204	0.466	0.094	0.091	1.034
unemployed	0.196	0.220	0.891	0.195	0.194	1.009
urban	0.250	0.248	1.006	0.250	0.250	0.999
married	0.181	0.164	1.105	0.177	0.182	0.975
widowed	0.050	0.078	0.634	0.048	0.047	1.020
separated/divorced	0.050	0.048	1.038	0.049	0.051	0.966
no formal education	0.013	0.041	0.318	0.011	0.012	0.960
primary education	0.052	0.090	0.580	0.051	0.052	0.988
lower secondary	0.219	0.232	0.944	0.220	0.220	0.999
post-secondary	0.157	0.125	1.250	0.158	0.164	0.958

Appendix 4C: Formal borrowing interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.006	0.074	0.547	0.834
gender	male	0.192	0.003	1.004	0.999
employment	own business	0.129	0.055	1.293	1.105
	economically inactive	-0.367	0.005	0.467	1.015
	unemployed	-0.499	0.040	0.491	1.102
education	no formal education	-0.209	0.000	0.138	1.000
	primary	-0.281	-0.019	0.285	0.892
	lower secondary	-0.410	0.030	0.658	1.050
	post-secondary	0.521	-0.054	1.901	0.972
location	urban	0.247	0.096	0.972	0.974
marital	married	0.229	0.035	1.294	1.031
	widowed	-0.085	0.117	0.734	1.757
	separated/divorced	0.067	0.012	1.294	1.043
financial inclusion	formally insured	0.655	-0.028	0.957	1.021
	informally insured	0.140	0.023	1.065	1.007
	formally saved	0.596	0.015	1.818	1.005
	informally saved	0.227	0.044	1.166	1.021
	mobile finance	0.671	-0.006	1.005	1.004
	Covid-19 grant recipient	-0.125	0.042	0.636	1.203
	Number of observations	5360	1390		
	Treated observations	695	695		
	Control observations	4665	695		

Note: The table shows a summary of the covariate balance test after examining whether formal borrowing could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4D: Informal borrowing interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.133	-0.053	0.638	0.787
gender	male	0.061	-0.082	1.008	1.002
employment	own business	0.196	-0.067	1.458	0.907
	economically inactive	-0.272	0.053	0.604	1.145
	unemployed	-0.046	0.016	0.959	1.016
education	no formal education	-0.095	-0.018	0.541	0.877
	primary	-0.068	0.056	0.797	1.239
	lower secondary	-0.016	-0.015	0.990	0.990
	post-secondary	0.012	-0.040	1.023	0.937
location	urban	-0.016	-0.073	1.000	0.999
marital	married	0.034	-0.076	1.047	0.916
	widowed	-0.041	0.035	0.866	1.146
	separated/divorced	0.008	0.050	1.033	1.236
financial inclusion	formal insurance	0.009	-0.052	1.004	0.983
	informal insurance	0.312	0.028	1.109	1.001
	formal saving	0.057	-0.017	1.090	0.977
	informal saving	0.322	0.048	1.222	1.016
	formal borrowing	-0.299	-0.038	0.611	0.924
	mobile finance	0.211	-0.031	1.076	0.997
	Covid-19 grant recipient	-0.008	0.087	0.976	1.369
	Number of observations	5360	1706		
	Treated observations	853	853		
	Control observations	4507	853		

Note: The table shows a summary of the covariate balance test after examining whether informal borrowing could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4E: Formal saving interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.045	-0.040	0.592	0.790
gender	male	0.152	0.007	1.007	0.999
employment	own business	0.239	0.078	1.549	1.127
	economically inactive	-0.286	-0.011	0.575	0.972
	unemployed	-0.427	0.015	0.561	1.032
education	no formal education	-0.178	-0.020	0.227	0.801
	primary	-0.239	0.032	0.369	1.208
	lower secondary	-0.404	0.013	0.659	1.022
	post-secondary	0.432	0.018	1.738	1.014
location	urban	0.168	-0.080	0.990	1.026
marital	married	0.159	-0.053	1.207	0.953
	widowed	-0.075	0.102	0.761	1.597
	separated/divorced	0.060	-0.021	1.262	0.930
financial inclusion	informal borrowing	0.477	0.034	1.248	1.001
	formal borrowing	0.005	-0.037	1.006	0.972
	formal insurance	0.583	-0.058	0.976	1.041
	informal insurance	0.230	0.031	1.088	1.005
	mobile finance	0.662	0.025	0.991	0.984
	Covid-19 grant recipient	-0.117	-0.038	0.655	0.861
	Number of observations	5360	1162		
	Treated observations	581	581		
	Control observations	4779	581		

Note: The table shows a summary of the covariate balance test after examining whether formal saving could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4F: Informal saving interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.173	-0.003	0.566	0.973
gender	male	0.014	-0.038	1.003	0.996
employment	own business	0.159	-0.080	1.367	0.885
	economically inactive	-0.318	0.056	0.539	1.170
	unemployed	-0.131	-0.040	0.879	0.956
education	no formal education	-0.116	0.021	0.458	1.197
	primary education	-0.195	0.080	0.475	1.549
	lower secondary	-0.148	-0.008	0.893	0.993
	post-secondary	0.151	0.020	1.274	1.028
location	urban	-0.021	0.026	0.999	1.003
marital	married	0.021	-0.003	1.029	0.996
	widowed	-0.113	0.035	0.654	1.168
	separated/divorced	-0.018	0.077	0.930	1.441
financial inclusion	informal borrowing	0.303	0.028	1.200	1.009
	formal borrowing	0.258	0.013	1.321	1.010
	formal insurance	0.243	0.035	1.060	1.001
	informal insurance	0.280	0.007	1.104	1.001
	mobile finance	0.508	0.031	1.079	0.990
	Covid-19 grant recipient	-0.051	-0.023	0.843	0.922
	Number of observations	5360	1706		
	Treated observations	853	853		
	Control observations	4507	853		

Note: The table shows a summary of the covariate balance test after examining whether informal saving could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4G: Formal insurance interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.030	-0.009	0.549	0.827
gender	male	0.139	-0.013	1.011	1.001
employment	own business	0.134	0.005	1.311	1.009
	economically inactive	-0.320	-0.026	0.547	0.937
	unemployed	-0.360	0.051	0.656	1.096
education	no formal education	-0.189	-0.010	0.219	0.890
	primary education	-0.236	0.021	0.396	1.117
	lower secondary	-0.315	0.017	0.760	1.023
	post-secondary	0.405	0.024	1.789	1.022
location	urban	0.121	0.034	0.999	0.997
marital	married	0.159	0.000	1.214	1.000
	widowed	-0.036	0.023	0.883	1.089
	separated/divorced	0.080	-0.065	1.365	0.808
	informal borrowing	0.008	-0.043	1.007	0.968
financial inclusion	formal borrowing	0.557	0.050	1.678	1.018
	informal saving	0.228	0.050	1.177	1.026
	formal saving	0.445	0.042	1.725	1.031
	mobile finance	0.471	-0.070	1.108	1.023
	Covid-19 grant recipient	-0.069	-0.015	0.792	0.948
	Number of observations	5360	2210		
	Treated observations	1105	1105		
	Control observations	4255	1105		

Note: The table shows a summary of the covariate balance test after examining whether formal insurance could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4H: Informal insurance interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.019	0.016	0.665	0.824
gender	male	-0.041	0.008	0.993	1.002
employment	own business	0.100	-0.017	1.228	0.971
	economically inactive	-0.236	0.000	0.656	1.000
	unemployed	-0.138	0.014	0.872	1.017
education	no formal education	-0.126	-0.017	0.424	0.868
	primary education	-0.090	-0.025	0.738	0.912
	lower secondary	-0.107	0.029	0.926	1.026
	post-secondary	0.013	-0.037	1.024	0.940
location	urban	-0.132	0.031	0.982	1.010
marital	married	0.052	-0.033	1.070	0.962
	widowed	-0.026	0.048	0.916	1.197
	separated/divorced	-0.007	0.044	0.973	1.213
financial inclusion	informal borrowing	0.317	0.035	1.213	1.011
	formal borrowing	0.214	-0.027	1.273	0.978
	formal insurance	0.158	-0.031	1.050	0.997
	informal saving	0.308	-0.017	1.221	0.995
	formal saving	0.250	-0.011	1.396	0.989
	mobile finance	0.380	-0.008	1.100	1.001
	Covid-19 grant recipient	0.010	-0.004	1.032	0.988
	Number of observations	5360	1958		
	Treated observations	979	979		
	Control observations	4381	979		

Note: The table shows a summary of the covariate balance test after examining whether informal insurance could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4I: Mobile finance interaction with shock: NN(1) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.296	0.053	0.413	1.013
gender	male	0.184	-0.005	1.010	1.001
employment	own business	0.222	0.011	1.542	1.017
	economically inactive	-0.413	-0.045	0.431	0.878
	unemployed	-0.250	0.043	0.765	1.065
education	no formal education	-0.195	-0.010	0.205	0.890
	primary	-0.320	0.019	0.237	1.140
	lower secondary	-0.356	-0.025	0.727	0.968
	post-secondary	0.343	-0.019	1.667	0.982
location	urban	0.125	-0.036	0.999	1.006
marital	married	0.013	0.002	1.018	1.003
	widowed	-0.179	-0.009	0.492	0.957
	separated/divorced	-0.044	0.008	0.831	1.039
financial inclusion	informal borrowing	0.093	0.007	1.075	1.005
	formal borrowing	0.481	-0.011	1.607	0.996
	informal insurance	0.211	0.005	1.094	1.001
	formal insurance	0.348	-0.005	1.075	1.001
	informal saving	0.350	0.005	1.255	1.001
	formal saving	0.418	0.011	1.690	1.008
	covid grant recipient	-0.059	0.029	0.821	1.113
	Number of observations	5360	2324		
	Treated observations	1162	1162		
	Control observations	4198	1162		

Note: The table shows a summary of the covariate balance test after examining whether mobile finance could offset the negative effect of the COVID-19-induced income shock on consumption using NN (1) matching.

Appendix 4J: Formal borrowing interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
	age squared	-0.006	-0.005	0.547	0.759
gender	male	0.192	0.003	1.004	0.999
employment	own business	0.129	0.005	1.293	1.008
	economically inactive	-0.367	-0.013	0.467	0.963
	unemployed	-0.499	0.030	0.491	1.075
education	no formal education	-0.209	-0.012	0.138	0.842
	primary	-0.281	0.004	0.285	1.026
	lower secondary	-0.410	0.001	0.658	1.002
	post-secondary	0.521	-0.023	1.901	0.987
location	urban	0.247	0.047	0.972	0.985
marital	married	0.229	-0.016	1.294	0.987
	widowed	-0.085	0.049	0.734	1.237
	separated/divorced	0.067	-0.039	1.294	0.876
financial inclusion	formally insured	0.655	-0.001	0.957	1.001
	informally insured	0.140	-0.021	1.065	0.994
	formally saved	0.596	0.018	1.818	1.006
	informally saved	0.227	-0.015	1.166	0.994
	mobile finance	0.671	0.008	1.005	0.995
	Covid-19 grant recipient	-0.125	-0.018	0.636	0.929
	Number of observations	5360	1390		
	Treated observations	695	695		
	Control observations	4665	695		

Note: The table shows a summary of the covariate balance test after examining whether formal borrowing could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4K: Informal borrowing interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.133	0.006	0.638	0.879
gender	male	0.061	-0.013	1.008	0.999
employment	own business	0.196	0.003	1.458	1.004
	economically inactive	-0.272	-0.004	0.604	0.991
	unemployed	-0.046	0.024	0.959	1.024
education	no formal education	-0.095	-0.009	0.541	0.934
	primary	-0.068	0.022	0.797	1.086
	lower secondary	-0.016	0.011	0.990	1.008
	post-secondary	0.012	-0.014	1.023	0.977
location	urban	-0.016	-0.019	1.000	0.999
marital	married	0.034	-0.022	1.047	0.974
	widowed	-0.041	0.012	0.866	1.045
	separated/divorced	0.008	0.006	1.033	1.026
financial inclusion	formal insurance	0.009	-0.046	1.004	0.984
	informal insurance	0.312	0.000	1.109	1.000
	formal saving	0.057	-0.018	1.090	0.975
	informal saving	0.322	-0.007	1.222	0.998
	formal borrowing	-0.299	-0.041	0.611	0.917
	mobile finance	0.211	-0.048	1.076	0.996
	Covid-19 grant recipient	-0.008	0.036	0.976	1.129
	Number of observations	5360	1706		
	Treated observations	853	853		
	Control observations	4507	853		

Note: The table shows a summary of the covariate balance test after examining whether informal borrowing could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4L: Formal saving interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.045	0.005	0.592	0.823
gender	male	0.152	-0.003	1.007	1.000
employment	own business	0.239	0.017	1.549	1.025
	economically inactive	-0.286	0.014	0.575	1.036
	unemployed	-0.427	0.003	0.561	1.006
education	no formal education	-0.178	0.016	0.227	1.229
	primary education	-0.239	0.059	0.369	1.439
	lower secondary	-0.404	0.002	0.659	1.003
	post-secondary	0.432	0.028	1.738	1.022
location	urban	0.168	0.000	0.990	1.000
marital	married	0.159	0.010	1.207	1.010
	widowed	-0.075	0.039	0.761	1.175
	separated/divorced	0.060	-0.004	1.262	0.988
financial inclusion	informal borrowing	0.477	-0.001	1.248	1.000
	formal borrowing	0.005	-0.062	1.006	0.955
	formal insurance	0.583	-0.014	0.976	1.009
	informal insurance	0.230	0.054	1.088	1.010
	mobile finance	0.662	0.003	0.991	0.998
	Covid-19 grant recipient	-0.117	0.013	0.655	1.057
	Number of observations	5360	1162		
	Treated observations	581	581		
	Control observations	4779	581		

Note: The table shows a summary of the covariate balance test after examining whether formal saving could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4M: Informal saving interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.173	0.000	0.566	0.968
gender	male	0.014	-0.006	1.003	0.999
employment	own business	0.159	-0.015	1.367	0.976
	economically inactive	-0.318	0.019	0.539	1.053
	unemployed	-0.131	-0.037	0.879	0.959
education	no formal education	-0.116	0.019	0.458	1.174
	primary education	-0.195	-0.003	0.475	0.985
	lower secondary	-0.148	0.002	0.893	1.002
	post-secondary	0.151	-0.024	1.274	0.969
location	urban	-0.021	0.011	0.999	1.001
marital	married	0.021	-0.001	1.029	0.998
	widowed	-0.113	0.028	0.654	1.131
	separated/divorced	-0.018	0.040	0.930	1.196
financial inclusion	informal borrowing	0.303	-0.016	1.200	0.996
	formal borrowing	0.258	0.005	1.321	1.004
	formal insurance	0.243	0.018	1.060	1.000
	informal insurance	0.280	0.014	1.104	1.001
	mobile finance	0.508	0.017	1.079	0.994
	Covid-19 grant recipient	-0.051	0.031	0.843	1.119
	Number of observations	5360	1706		
	Treated observations	853	853		
	Control observations	4507	853		

Note: The table shows a summary of the covariate balance test after examining whether informal saving could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4N: Formal insurance interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.030	-0.005	0.549	0.778
gender	male	0.139	0.003	1.011	1.000
employment	own business	0.134	0.016	1.311	1.029
	economically inactive	-0.320	-0.005	0.547	0.988
	unemployed	-0.360	0.016	0.656	1.028
education	no formal education	-0.189	-0.008	0.219	0.915
	primary	-0.236	0.013	0.396	1.074
	lower secondary	-0.315	0.011	0.760	1.014
	post-secondary	0.405	0.012	1.789	1.011
location	urban	0.121	0.030	0.999	0.997
marital	married	0.159	-0.011	1.214	0.989
	widowed	-0.036	0.009	0.883	1.034
	separated/divorced	0.080	-0.031	1.365	0.900
	informal borrowing	0.008	-0.036	1.007	0.973
financial inclusion	formal borrowing	0.557	0.031	1.678	1.011
	informal saving	0.228	0.028	1.177	1.014
	formal saving	0.445	0.000	1.725	1.000
	mobile finance	0.471	-0.009	1.108	1.002
	Covid-19 grant recipient	-0.069	-0.027	0.792	0.908
	Number of observations	5360	2210		
	Treated observations	1105	1105		
	Control observations	4255	1105		

Note: The table shows a summary of the covariate balance test after examining whether formal insurance could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4O: Informal insurance interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.019	0.012	0.665	0.820
gender	male	-0.041	0.015	0.993	1.004
employment	own business	0.100	-0.004	1.228	0.993
	economically inactive	-0.236	0.002	0.656	1.005
	unemployed	-0.138	-0.033	0.872	0.964
education	no formal education	-0.126	0.013	0.424	1.121
	primary education	-0.090	-0.014	0.738	0.950
	lower secondary	-0.107	0.008	0.926	1.007
	post-secondary	0.013	-0.017	1.024	0.971
location	urban	-0.132	0.013	0.982	1.004
marital	married	0.052	-0.012	1.070	0.986
	widowed	-0.026	0.028	0.916	1.110
	separated/divorced	-0.007	0.021	0.973	1.093
financial inclusion	informal borrowing	0.317	0.005	1.213	1.001
	formal borrowing	0.214	-0.023	1.273	0.982
	formal insurance	0.158	0.006	1.050	1.001
	informal saving	0.308	-0.015	1.221	0.995
	formal saving	0.250	-0.001	1.396	0.999
	mobile finance	0.380	0.002	1.100	1.000
	Covid-19 grant recipient	0.010	-0.001	1.032	0.997
	Number of observations	5360	1958		
	Treated observations	979	979		
	Control observations	4381	979		

Note: The table shows a summary of the covariate balance test after examining whether informal insurance could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4P: Mobile finance interaction with shock: NN(4) covariate balance test

Control variables		Standardised differences		Variance ratio	
		Raw	Matched	Raw	Matched
age	age squared	-0.296	0.024	0.413	0.944
gender	male	0.184	0.003	1.010	1.000
employment	own business	0.222	0.013	1.542	1.021
	economically inactive	-0.413	0.009	0.431	1.029
	unemployed	-0.250	0.008	0.765	1.012
education	no formal education	-0.195	0.013	0.205	1.175
	primary education	-0.320	0.010	0.237	1.072
	lower secondary	-0.356	0.008	0.727	1.011
	post-secondary	0.343	-0.012	1.667	0.988
location	urban	0.125	-0.008	0.999	1.001
marital	married	0.013	0.009	1.018	1.012
	widowed	-0.179	0.000	0.492	1.000
	separated/divorced	-0.044	-0.016	0.831	0.934
financial inclusion	informal borrowing	0.093	-0.031	1.075	0.981
	formal borrowing	0.481	0.016	1.607	1.007
	informal insurance	0.211	0.005	1.094	1.001
	formal insurance	0.348	-0.010	1.075	1.002
	informal saving	0.350	0.031	1.255	1.010
	formal saving	0.418	0.010	1.690	1.007
	Covid-19 grant recipient	-0.059	0.021	0.821	1.079
	Number of observations	5360	2324		
	Treated observations	1162	1162		
	Control observations	4198	1162		

Note: The table shows a summary of the covariate balance test after examining whether mobile finance could offset the negative effect of the COVID-19-induced income shock on consumption using NN (4) matching.

Appendix 4Q: Formal borrowing interaction with shock: Kernel matching covariate balance test

	Standardised differences						Variance ratios					
	Raw			Matched (ATT)			Raw			Matched (ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared		1605.391	-0.006	1569.866	1599.296	-0.026	905010.300	1654585.000	0.547	878843.900	1165844.000	0.754
male		0.448	0.192	0.534	0.530	0.009	0.248	0.247	1.004	0.249	0.249	1.000
no formal education		0.032	-0.209	0.005	0.004	0.003	0.004	0.031	0.138	0.005	0.004	1.098
primary		0.086	-0.281	0.024	0.022	0.012	0.023	0.079	0.285	0.024	0.021	1.124
lower secondary		0.369	-0.410	0.197	0.197	0.002	0.153	0.233	0.658	0.159	0.158	1.004
post-secondary		0.141	0.521	0.343	0.331	0.028	0.231	0.121	1.901	0.226	0.222	1.019
own business		0.127	0.129	0.165	0.165	0.000	0.143	0.111	1.293	0.138	0.138	1.001
economically inactive		0.216	-0.367	0.091	0.095	-0.012	0.079	0.169	0.467	0.083	0.086	0.961
unemployed		0.324	-0.499	0.129	0.129	0.000	0.107	0.219	0.491	0.113	0.112	1.002
urban		0.469	0.247	0.577	0.553	0.048	0.242	0.249	0.972	0.244	0.247	0.989
married		0.208	0.229	0.288	0.297	-0.019	0.213	0.165	1.294	0.206	0.209	0.985
widowed		0.072	-0.085	0.053	0.050	0.011	0.049	0.067	0.734	0.050	0.048	1.053
separated/divorced		0.049	0.067	0.065	0.068	-0.011	0.061	0.047	1.294	0.061	0.063	0.967
formal insurance		0.361	0.655	0.654	0.663	-0.018	0.221	0.231	0.957	0.227	0.224	1.014
informal insurance		0.359	0.140	0.416	0.429	-0.026	0.245	0.230	1.065	0.243	0.245	0.993
formal saving		0.159	0.596	0.392	0.377	0.033	0.244	0.134	1.818	0.239	0.235	1.015
informal saving		0.289	0.227	0.393	0.391	0.004	0.239	0.205	1.166	0.239	0.238	1.003
mobile finance		0.340	0.671	0.640	0.648	-0.017	0.226	0.224	1.005	0.231	0.228	1.011
covid grant recipient		0.080	-0.125	0.052	0.052	0.000	0.047	0.073	0.636	0.049	0.049	1.003

Note: The table shows a summary of the covariate balance test after examining whether formal borrowing could offset the negative effect of the COVID-19-induced income shock on consumption using kernel matching. StdDif denotes standardised difference.

Appendix 4R: Informal borrowing interaction with shock: Kernel matching covariance balance test

	Standardised differences						Variance ratios					
	Raw			Matched (ATT)			Raw			Matched (ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared	1474.202	1629.253	-0.133	1487.608	1496.331	-0.008	1052892.000	1649085.000	0.638	1082596.000	1214554.000	0.891
male	0.487	0.456	0.061	0.481	0.491	-0.019	0.250	0.248	1.008	0.250	0.250	1.000
no formal education	0.016	0.031	-0.095	0.018	0.020	-0.017	0.016	0.030	0.541	0.017	0.020	0.878
primary	0.063	0.081	-0.068	0.065	0.064	0.003	0.059	0.074	0.797	0.061	0.060	1.011
lower secondary	0.339	0.347	-0.016	0.350	0.341	0.018	0.224	0.227	0.990	0.228	0.225	1.013
post-secondary	0.174	0.169	0.012	0.166	0.167	-0.002	0.144	0.140	1.023	0.139	0.139	0.998
own business	0.192	0.121	0.196	0.186	0.185	0.002	0.155	0.107	1.458	0.152	0.151	1.004
economically inactive	0.115	0.215	-0.272	0.123	0.121	0.005	0.102	0.169	0.604	0.108	0.106	1.013
unemployed	0.280	0.301	-0.046	0.294	0.294	-0.001	0.202	0.210	0.959	0.208	0.208	1.000
urban	0.478	0.486	-0.016	0.483	0.478	0.009	0.250	0.250	1.000	0.250	0.250	1.002
married	0.233	0.219	0.034	0.231	0.238	-0.016	0.179	0.171	1.047	0.178	0.181	0.982
widowed	0.061	0.071	-0.041	0.060	0.057	0.012	0.057	0.066	0.866	0.056	0.054	1.048
separated/divorced	0.053	0.051	0.008	0.048	0.054	-0.031	0.050	0.048	1.033	0.045	0.051	0.881
formal insurance	0.404	0.400	0.009	0.405	0.400	0.010	0.241	0.240	1.004	0.241	0.240	1.005
informal insurance	0.496	0.344	0.312	0.468	0.473	-0.011	0.250	0.226	1.109	0.249	0.249	1.000
formal saving	0.212	0.189	0.057	0.201	0.211	-0.024	0.167	0.154	1.090	0.161	0.166	0.967
informal saving	0.430	0.278	0.322	0.396	0.415	-0.039	0.245	0.201	1.222	0.240	0.243	0.987
formal borrowing	0.130	0.246	-0.299	0.139	0.154	-0.040	0.113	0.185	0.611	0.120	0.130	0.917
mobile finance	0.468	0.364	0.211	0.443	0.448	-0.012	0.249	0.232	1.076	0.247	0.247	0.998
covid grant recipient	0.074	0.076	-0.008	0.074	0.077	-0.012	0.068	0.070	0.976	0.068	0.071	0.964

Note: The table shows a summary of the covariate balance test after examining whether informal borrowing could offset the negative effect of the COVID-19-induced shock on consumption using kernel matching. StdDif denotes standardised difference.

Appendix 4S: Formal saving interaction with shock: Kernel matching covariance balance test

	Standardised differences						Variance ratios					
	Raw			Matched (ATT)			Raw			Matched (ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared	1558.897	1610.131	-0.045	1540.057	1531.227	0.008	964298.500	1629224.000	0.592	984181.800	1172216.000	0.840
male	0.528	0.453	0.152	0.512	0.531	-0.038	0.250	0.248	1.007	0.250	0.249	1.005
no formal education	0.007	0.031	-0.178	0.007	0.006	0.012	0.007	0.030	0.227	0.007	0.006	1.289
primary	0.029	0.084	-0.239	0.031	0.025	0.028	0.028	0.077	0.369	0.030	0.024	1.253
lower secondary	0.188	0.365	-0.404	0.198	0.198	0.000	0.153	0.232	0.659	0.159	0.159	1.001
post-secondary	0.330	0.150	0.432	0.312	0.317	-0.012	0.222	0.128	1.738	0.215	0.216	0.993
own business	0.212	0.123	0.239	0.193	0.178	0.039	0.167	0.108	1.549	0.156	0.146	1.064
economically inactive	0.107	0.210	-0.286	0.114	0.115	-0.004	0.095	0.166	0.575	0.101	0.102	0.990
unemployed	0.141	0.317	-0.427	0.150	0.147	0.009	0.121	0.216	0.561	0.128	0.125	1.022
urban	0.559	0.476	0.168	0.549	0.547	0.003	0.247	0.249	0.990	0.248	0.248	1.001
married	0.282	0.214	0.159	0.262	0.268	-0.013	0.203	0.168	1.207	0.194	0.196	0.988
informal borrowing	0.312	0.309	0.005	0.317	0.330	-0.028	0.215	0.214	1.006	0.217	0.221	0.981
formal borrowing	0.501	0.194	0.680	0.470	0.462	0.017	0.250	0.157	1.600	0.250	0.249	1.004
formal insurance	0.651	0.371	0.583	0.629	0.638	-0.018	0.228	0.233	0.976	0.234	0.231	1.011
informal insurance	0.468	0.356	0.230	0.457	0.443	0.027	0.249	0.229	1.088	0.249	0.247	1.007
informal saving	0.504	0.278	0.477	0.484	0.474	0.021	0.250	0.201	1.248	0.250	0.249	1.003
mobile finance	0.661	0.347	0.662	0.639	0.648	-0.019	0.224	0.227	0.991	0.231	0.228	1.013
covid grant recipient	0.050	0.079	-0.117	0.053	0.054	-0.003	0.048	0.073	0.655	0.050	0.051	0.991

Notes: The table shows a summary of the covariate balance test after examining whether formal saving could offset the negative effect of the COVID-19-induced income shock on consumption using kernel matching. StdDif denotes standardised difference.

Appendix 4T: Informal saving interaction with shock: Kernel matching covariance balance test

	Standardised differences						Variance ratios					
	Raw			Matched (ATT)			Raw			Matched (ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared	1438.666	1635.978	-0.173	1459.014	1445.437	0.012	944377.400	1667233.000	0.566	968497.300	987829.700	0.980
male	0.467	0.460	0.014	0.458	0.448	0.019	0.249	0.248	1.003	0.249	0.247	1.005
own business	0.181	0.124	0.159	0.170	0.169	0.002	0.148	0.108	1.367	0.141	0.141	1.005
economically inactive	0.102	0.217	-0.318	0.109	0.103	0.017	0.092	0.170	0.539	0.098	0.093	1.052
unemployed	0.249	0.307	-0.131	0.258	0.278	-0.046	0.187	0.213	0.879	0.192	0.201	0.954
no formal education	0.014	0.031	-0.116	0.015	0.011	0.028	0.014	0.030	0.458	0.015	0.011	1.378
primary	0.039	0.086	-0.195	0.040	0.036	0.020	0.037	0.078	0.475	0.039	0.034	1.128
lower secondary	0.287	0.356	-0.148	0.297	0.305	-0.017	0.205	0.229	0.893	0.209	0.212	0.986
post-secondary	0.219	0.160	0.151	0.214	0.217	-0.008	0.171	0.135	1.274	0.168	0.170	0.990
married	0.229	0.220	0.021	0.229	0.238	-0.021	0.177	0.172	1.029	0.177	0.181	0.976
widowed	0.047	0.074	-0.113	0.049	0.045	0.016	0.045	0.068	0.654	0.047	0.043	1.079
separated/divorced	0.048	0.052	-0.018	0.048	0.047	0.004	0.046	0.049	0.930	0.046	0.045	1.019
urban	0.476	0.487	-0.021	0.482	0.477	0.009	0.250	0.250	0.999	0.250	0.250	1.002
informal borrowing	0.430	0.286	0.303	0.405	0.404	0.002	0.245	0.204	1.200	0.241	0.241	1.002
formal borrowing	0.322	0.209	0.258	0.308	0.315	-0.016	0.219	0.166	1.321	0.213	0.216	0.988
formal insurance	0.502	0.382	0.243	0.491	0.483	0.014	0.250	0.236	1.060	0.250	0.250	1.002
informal insurance	0.483	0.346	0.280	0.460	0.453	0.016	0.250	0.226	1.104	0.249	0.248	1.004
formal saving	0.343	0.165	0.420	0.306	0.304	0.004	0.226	0.138	1.641	0.212	0.212	1.004
mobile finance	0.587	0.342	0.508	0.561	0.560	0.002	0.243	0.225	1.079	0.247	0.246	1.000
covid grant recipient	0.064	0.078	-0.051	0.064	0.067	-0.009	0.060	0.072	0.843	0.060	0.062	0.968

Notes: The table shows a summary of the covariate balance test after examining whether informal saving could offset the negative effect of the COVID-19-induced income shock on consumption using kernel matching. StdDif denotes standardised difference.

Appendix 4U: Formal insurance interaction with shock: Kernel matching covariance balance test

	Standardised differences						Variance ratios					
	Raw			Matched(ATT)			Raw			Matched(ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared	1576.916	1611.761	-0.030	1559.487	1555.128	0.004	941976.400	1716990.000	0.549	956233.600	962014.000	0.994
male	0.516	0.447	0.139	0.506	0.510	-0.007	0.250	0.247	1.011	0.250	0.250	1.001
no formal education	0.007	0.034	-0.189	0.008	0.007	0.004	0.007	0.033	0.219	0.008	0.007	1.073
primary	0.033	0.090	-0.236	0.035	0.030	0.022	0.032	0.082	0.396	0.034	0.029	1.169
lower secondary	0.232	0.375	-0.315	0.241	0.238	0.007	0.178	0.234	0.760	0.183	0.181	1.010
post-secondary	0.300	0.136	0.405	0.281	0.266	0.039	0.210	0.117	1.789	0.202	0.195	1.038
own business	0.170	0.123	0.134	0.166	0.157	0.025	0.141	0.108	1.311	0.139	0.133	1.047
economically inactive	0.106	0.223	-0.320	0.110	0.113	-0.007	0.095	0.173	0.547	0.098	0.100	0.981
unemployed	0.176	0.329	-0.360	0.183	0.182	0.002	0.145	0.221	0.656	0.150	0.149	1.004
urban	0.533	0.472	0.121	0.527	0.507	0.040	0.249	0.249	0.999	0.250	0.250	0.998
married	0.275	0.207	0.159	0.264	0.274	-0.021	0.200	0.164	1.214	0.195	0.199	0.979
widowed	0.062	0.071	-0.036	0.061	0.056	0.020	0.059	0.066	0.883	0.058	0.053	1.083
separated/divorced	0.066	0.047	0.080	0.066	0.064	0.009	0.062	0.045	1.365	0.062	0.060	1.031
informal borrowing	0.312	0.309	0.008	0.318	0.319	-0.003	0.215	0.213	1.007	0.217	0.217	0.999
formal borrowing	0.423	0.177	0.557	0.399	0.399	0.000	0.244	0.146	1.678	0.240	0.240	1.001
informal insurance	0.412	0.357	0.114	0.410	0.411	-0.003	0.242	0.229	1.057	0.242	0.242	1.000
informal saving	0.387	0.280	0.228	0.380	0.363	0.036	0.238	0.202	1.177	0.236	0.231	1.019
formal saving	0.342	0.154	0.445	0.324	0.319	0.013	0.225	0.131	1.725	0.219	0.217	1.010
fintech	0.562	0.334	0.471	0.548	0.557	-0.019	0.246	0.222	1.108	0.248	0.247	1.005
covid grant recipient	0.062	0.079	-0.069	0.064	0.068	-0.014	0.058	0.073	0.792	0.060	0.063	0.951

Notes: The table shows a summary of the covariate balance test after examining whether formal insurance could offset the negative effect of the COVID-19-induced shock on consumption using kernel matching. StdDif denotes standardised difference.

Appendix 4V: Informal insurance interaction with shock: Kernel matching covariance balance test

	Standardised differences						Variance ratios					
	Raw			Matched (ATT)			Raw			Matched (ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared	1585.857	1608.761	-0.019	1580.902	1576.201	0.004	1103753.000	1658720.000	0.665	1094754.000	1444819.000	0.758
male	0.444	0.465	-0.041	0.450	0.460	-0.021	0.247	0.249	0.993	0.248	0.248	0.997
no formal education	0.013	0.032	-0.126	0.014	0.013	0.010	0.013	0.031	0.424	0.014	0.012	1.114
primary	0.059	0.082	-0.090	0.061	0.064	-0.011	0.056	0.076	0.738	0.058	0.060	0.961
lower secondary	0.304	0.354	-0.107	0.309	0.300	0.019	0.212	0.229	0.926	0.214	0.210	1.017
post-secondary	0.174	0.169	0.013	0.179	0.179	0.000	0.144	0.140	1.024	0.147	0.147	1.001
own business	0.161	0.126	0.100	0.154	0.159	-0.015	0.135	0.110	1.228	0.131	0.134	0.974
economically inactive	0.127	0.215	-0.236	0.132	0.122	0.025	0.111	0.169	0.656	0.114	0.107	1.065
unemployed	0.247	0.309	-0.138	0.259	0.270	-0.024	0.186	0.214	0.872	0.192	0.197	0.975
urban	0.431	0.497	-0.132	0.446	0.450	-0.009	0.245	0.250	0.982	0.247	0.248	0.999
married	0.239	0.217	0.052	0.236	0.229	0.017	0.182	0.170	1.070	0.181	0.177	1.022
widowed	0.064	0.071	-0.026	0.064	0.064	0.000	0.060	0.066	0.916	0.060	0.060	1.000
separated/divorced	0.050	0.052	-0.007	0.052	0.049	0.014	0.048	0.049	0.973	0.049	0.046	1.060
informal borrowing	0.432	0.282	0.317	0.412	0.420	-0.016	0.246	0.202	1.213	0.243	0.244	0.995
formal borrowing		0.210	0.214	0.297	0.280	0.039	0.212	0.166	1.273	0.209	0.202	1.037
formal insurance	0.465	0.387	0.158	0.455	0.453	0.005	0.249	0.237	1.050	0.248	0.248	1.002
informal saving	0.421	0.276	0.308	0.398	0.402	-0.008	0.244	0.200	1.221	0.240	0.240	0.997
formal saving	0.278	0.174	0.250	0.261	0.251	0.024	0.201	0.144	1.396	0.193	0.188	1.027
mobile finance	0.532	0.347	0.380	0.508	0.510	-0.003	0.249	0.227	1.100	0.250	0.250	1.001
covid grant recipient	0.078	0.075	0.010	0.077	0.077	-0.002	0.072	0.069	1.032	0.071	0.071	0.996

Notes: The table shows a summary of the covariate balance test after examining whether informal insurance could offset the negative effect of the COVID-19-induced shock on consumption using kernel matching. StdDif denotes standardised difference.

Appendix 4X: Mobile finance interaction with shock: Kernel matching covariance balance test

	Standardised differences						Variance ratios					
	Raw			Matched (ATT)			Raw			Matched (ATT)		
Means	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**StdDif**	**Treated**	**Untreated**	**Ratio**	**Treated**	**Untreated**	**Ratio**
age squared	1345.622	1676.256	-0.296	1350.967	1324.463	0.024	727854.900	1763296.000	0.413	741379.500	782260.900	0.948
male	0.533	0.441	0.184	0.523	0.519	0.007	0.249	0.247	1.010	0.250	0.250	1.000
no formal education	0.007	0.035	-0.195	0.007	0.007	0.005	0.007	0.033	0.205	0.007	0.006	1.119
primary	0.021	0.094	-0.320	0.022	0.019	0.012	0.020	0.085	0.237	0.021	0.019	1.137
lower secondary	0.219	0.380	-0.356	0.231	0.227	0.010	0.171	0.236	0.727	0.178	0.175	1.014
post-secondary	0.277	0.140	0.343	0.266	0.254	0.029	0.200	0.120	1.667	0.195	0.190	1.030
own business	0.195	0.115	0.222	0.181	0.186	-0.012	0.157	0.102	1.542	0.149	0.151	0.982
economically inactive	0.083	0.231	-0.413	0.088	0.079	0.025	0.077	0.178	0.431	0.081	0.073	1.103
unemployed	0.212	0.322	-0.250	0.223	0.224	-0.002	0.167	0.218	0.765	0.174	0.174	0.998
urban	0.534	0.471	0.125	0.523	0.529	-0.013	0.249	0.249	0.999	0.250	0.249	1.002
married	0.225	0.220	0.013	0.224	0.214	0.025	0.175	0.172	1.018	0.174	0.168	1.035
widowed	0.037	0.079	-0.179	0.037	0.035	0.008	0.036	0.072	0.492	0.036	0.034	1.052
separated/divorced	0.044	0.053	-0.044	0.045	0.045	-0.001	0.042	0.051	0.831	0.043	0.043	0.994
informal borrowing	0.343	0.300	0.093	0.343	0.342	0.003	0.226	0.210	1.075	0.226	0.225	1.003
formal borrowing	0.393	0.182	0.481	0.362	0.357	0.010	0.239	0.149	1.607	0.231	0.230	1.006
formal insurance	0.448	0.346	0.211	0.434	0.404	0.062	0.248	0.226	1.094	0.246	0.241	1.021
informal insurance	0.534	0.364	0.348	0.518	0.518	0.001	0.249	0.232	1.075	0.250	0.250	1.001
informal saving	0.431	0.267	0.350	0.412	0.401	0.023	0.245	0.196	1.255	0.242	0.240	1.009
formal saving	0.330	0.155	0.418	0.302	0.305	-0.006	0.221	0.131	1.690	0.211	0.212	0.996
covid grant recipient	0.064	0.079	-0.059	0.066	0.061	0.019	0.060	0.073	0.821	0.061	0.057	1.075

Notes: The table shows a summary of the covariate balance test after examining whether mobile finance could offset the negative effect of the COVID-19-induced shock on consumption using kernel matching. StdDif denotes standardised difference.

CHAPTER FIVE

EXPLORING THE INTERRELATIONSHIP BETWEEN QUALITY FINANCIAL INCLUSION, ASSET ACCUMULATION, AND SUBJECTIVE WELL-BEING IN SOUTH AFRICA[19]

5.1. Introduction

In recent years, social policymakers have advocated for welfare-enhancing strategies such as asset-building interventions that provide support for the asset accumulation of low-income households. This is consistent with the United Nations member states' pledge to achieve SDG 1 of ending poverty by 2030 which encompasses asset accumulation and consumption smoothing (UNDP, 2021). Although South Africa's social grant system has contributed to improved welfare indicated by increased income among grant recipients (Satumba et al., 2017), the social policy scholars' argument in favour of asset accumulation programs is premised on the assertion that income transfer programs might not be a sustainable pathway out of poverty (Sherraden & Boshara, 2007). Thus, asset-building programs are important because asset ownership is regarded as a critical element in emerging out of poverty. After all, assets can be transferred to future generations whereby welfare inequalities among households are reduced (Lombe & Sherraden, 2008). In addition, an increase in asset holding serves as a form of insurance against irregular expenses and unforeseen life events (Ibrahim, 2020). For instance, households can sell livestock to cushion themselves against adverse shocks such as drought.

To facilitate asset accumulation, consumers might need structured support through asset-building programs, as they might be unable to do it alone. This view is premised on the institutional theory of saving which posits that an individual cannot save on his/her own but needs institutional support in structuring his/her savings, which could lead to the accumulation

[19] A paper based on this chapter titled "Exploring the interrelationship between financial inclusion, asset accumulation and subjective well-being: Evidence from South Africa" was presented first at the EU-Mediterranean and African Network for Economic Studies Virtual Conference, 9-10 December 2021 and at the World Finance Conference, Turin, Italy, 1-3 August 2022.

of assets (Sherraden, 1991). In addition, the social insurance theory posits that insurance helps consumers to hedge risks of unforeseen life events, which averts asset depletion because consumers become less reliant on costly coping mechanisms like selling assets after negative shocks (Chetty & Looney, 2006). Moreover, Quach's (2016) theoretical model linking credit and welfare and Shaw's (1973) debt intermediation theory suggests that access to credit enables talented consumers to invest in entrepreneurial projects that generate income, which improves their welfare by reducing financial vulnerability and possibly accumulating assets as well.

There are several asset-building programs in several countries such as child development accounts (CDA) in the United States (US) (Huang et al., 2016) and YouthSave in Ghana (Lee et al., 2017). Empirically, it has been confirmed that insurance (Janzen & Carter, 2019; Latif & Magazi, 2021), credit (Doss et al., 2020; Tadesse & Zewdie, 2019), and savings (Doss et al., 2020; Ibrahim, 2020) contribute positively to consumers' asset accumulation.

Although SDG 1 aims to end poverty, in general, the goal contributes to improvement in consumers' SWB. According to the OECD (2013), SWB comprises life evaluation, affect, and eudaimonia. Affect refers to short-term emotional states at a particular point in time comprising happiness, anxiety, and sadness whereas eudaimonia entails the actualisation of human potential (Veenhoven, 2012). However, the study focused on the SWB dimension of life evaluation which refers to an individual's assessment of his/her overall life (Das et al., 2020; Diener & Suh, 1997). Moreover, highlighting SWB in terms of an individual's assessment of his/her life is consistent with previous studies that conceptualised SWB as a consumer perceiving life as satisfying (Brulé et al., 2020; Lai et al., 2021; Zheng et al., 2020).

By accumulating material and non-material wealth, consumers can satisfy their physiological and security needs which results in a subjective assessment of life as satisfying. Sherraden's (1991) asset effects theory suggests that an increase in asset endowment will have a positive impact on one's self-esteem, which is associated with higher SWB. In light of this, several studies have confirmed that physical assets such as household wealth increase consumers' SWB (Brulé et al., 2020; Charles et al., 2019; Cheng et al., 2020; Qi et al., 2021). Apart from physical wealth, financial products could provide security against unforeseen life events which contributes to satisfaction of financial security needs according to the hierarchy of needs theory. As financial security needs are satisfied, consumers' life satisfaction is enhanced too. In light of this, several studies have found that credit, insurance, and savings improve financial

security against unforeseen life events, which is associated with higher SWB (Jayasinghe et al., 2020; Kim & Han, 2022; You & Choi, 2021).

Previous studies have examined the impact of savings, credit, or insurance on asset accumulation, but have not examined how this could, in turn, influence the SWB of consumers. That said, this study contributes to the empirical literature in two ways. Firstly, the study extends the previous studies by assessing how the use of various financial products could influence asset accumulation and, in turn, enhance consumers' SWB in South Africa's context. Secondly, unlike previous studies which relied on single indicators of saving, insurance, and credit, the study differentiated itself by employing a composite measure of quality financial inclusion (QFIN) to assess how this could be associated with asset accumulation and, in turn, the SWB of consumers.

Since South Africans' life satisfaction average score is 4.7 compared with the OECD's 6.5 on a scale of 0-10 (OECD, 2020), the results might inform policymakers as to how an improvement in the quality of financial inclusion could indirectly improve consumers' SWB via asset accumulation. It should be noted that consumers with higher SWB would most likely be more productive, healthy, and innovative, which is instrumental to economic growth (Neve et al., 2013; Oswald et al., 2015). Hence, the study's results would have important implications for policy in emerging economies insofar as using asset-building programs to enhance consumers' SWB, which has indirect positive macroeconomic ramifications.

This chapter proceeds as follows: Section 5.2 explains the relationship between financial inclusion and asset building. Section 5.3 reviews the empirical literature. Section 5.4 explains the data and sample. Section 5.5 explains the methodology. Section 5.6 presents the results, and Section 5.7 discusses the results. Section 5.8 concludes and provides recommendations for future research.

5.2. Interrelationship between asset ownership, quality financial inclusion, and subjective well-being

5.2.1 Quality financial inclusion framework

As explained in Section 2.3.2 of Chapter 2, the study leveraged the utility maximisation theory, bounded rationality theory, and preference for flexibility theory to explain the inclusion of various facets of QFIN. The utility maximisation theory posits that rational consumers are more inclined to purchase goods that maximise their marginal utility at the lowest expense

(Kahneman & Thaler, 2006; Wonder et al., 2008). By the same token, consumers are more likely to use affordable financial products in the financial market. On the other hand, the bounded rationality theory asserts that consumers seek goods that are appropriate to meet their needs (Simon, 1990). Therefore, consumers will likely demand financial products and services that meet their contextual needs in the financial market. Apart from appropriateness, consumers require flexibility according to the preference for flexibility theory. The theory suggests that a decision-maker who might have uncertainties about his/her future consumption utilities will seek to avoid a current commitment to a course of future action and, thus, prefers flexibility (Kreps, 1979; Krishna & Phillip, 2014). To this end, consumers prefer financial products that provide some flexibility such as flexible debt repayment. In light of the theoretical perspectives justifying the need for quality financial products, the following section explains how the use of financial products could contribute to asset accumulation and, in turn, the SWB of consumers.

5.2.2 Saving and asset accumulation

It is argued that individuals can increase asset holdings through institutionalised savings as opposed to doing it individually since structured opportunities would assist in overcoming barriers to saving. This argument is supported by the institutional theory of saving which posits that low-income consumers cannot save alone and accumulate assets owing to a lack of opportunities and access to institutional support (Beverly & Sherraden, 2020; Sherraden, 1991). Contextually institutions are "formal and informal socio-economic relationships, rules and incentives, including the organisation of capitalist enterprises and voluntary associations, and all the laws, procedures, and agents of the state that affect organisations and households" (Sherraden, 1991, p. 124). For example, savings groups are institutions that are usually established by non-governmental groups to provide a platform for poorer households outside mainstream financial markets to save in smaller groups of between 10 and 20 individuals (Ibrahim, 2020). Such institutionalised mechanisms provide incentives and a platform for low-income individuals and families an opportunity to save and accumulate assets.

To provide a platform for participants to improve their welfare through asset accumulation, these institutions typically have structured mechanisms that encompass facilitation, access, information, restrictions, security, and expectations. The expectations involve specific goals, targets, and norms, whereas restrictions refer to the rules which impose limits to access and the use of savings. In addition, security enables safe transactions through trusted financial institutions, while access indicates the availability of affordable and safe saving products

whereas facilitation implies the ease of accessing the savings. Information entails formal and informal financial education that is related to saving products (Beverly & Sherraden, 2020; Sherraden, 1991).

5.2.3 Insurance and asset accumulation

Apart from saving, insurance also plays a role in asset accumulation. Although insurance might not directly have an impact on asset accumulation, it has the potential to help consumers to hedge against the risks of unforeseen life events, thereby circumventing costly coping mechanisms like selling critical assets (Akotey & Adjasi, 2014; Brown & Churchill, 1999; Latif & Magazi, 2021). This is consistent with Chetty and Looney's (2006) theory of social insurance which assumes that risk-averse consumers might use costly measures such as selling assets. In other words, insurance provides liquidity after unforeseen life events which might help risk-averse consumers to avoid risk-coping mechanisms such as selling critical assets, thereby increasing the welfare gains of insurance.

5.2.4. Credit and asset accumulation

Another channel through which consumers could improve their asset holding is access to and the use of credit. In the absence of credit constraints, Quach's (2016) theoretical model linking credit and welfare and Shaw's (1973) debt intermediation theory propose that access to credit on the part of talented consumers might stimulate entrepreneurial activities which would augment their income. As income increases, consumers could improve their livelihoods by purchasing more physical household assets, such as stoves, television sets, and fridges, for example. Furthermore, consumers could increase their assets by purchasing them on credit using credit cards or hire purchases, for instance. Noteworthy, when consumers accumulate assets, their SWB can be improved as explained in the ensuing sections.

5.2.5 The effect of asset ownership and use of financial products on subjective well being

5.2.5.1 Asset effects theory

The link between asset ownership and SWB can be explained by the asset effects theory. The asset effects theory suggests that asset ownership may enhance the self-esteem of consumers, which is associated with higher SWB (Sherraden, 1991). This is because consumers' self-esteem is influenced by how they are perceived by others and this has implications on how they evaluate their lives (Rohe & Stegman, 1994). For example, individuals with more material

possessions are more likely to be held in higher esteem, which could play a positive role in their self-esteem, thereby enhancing their subjective evaluation of life. Moreover, the asset effects theory posits that assets enhance household stability, which is associated with higher SWB. This is because an individual that possesses an asset can sell it to cushion himself or herself in the event of an income shock thereby providing income stability and resilience, which is associated with higher SWB.

5.2.5.2 Hierarchy of needs theory

Apart from the asset effects theory, the link between asset ownership and SWB is explained by Maslow's (1987) hierarchy of needs theory which suggests that consumers seek to fulfill physiological needs, safety needs, social needs, esteem needs, and self-actualisation needs. The hierarchy of needs theory is hinged on the assumption that humans have universal needs and that feelings of SWB are experienced to the extent that the needs are fulfilled. In this context, the focus is on physiological needs which refer to needs that are required for human survival including household assets, clothing, sex, and shelter among others. This was appropriate for this study because it provides a link between fulfilling asset possession and SWB such that having more material possessions necessary for day-to-day life is expected to enhance one's SWB (Hochman & Skopek, 2013; Veenhoven, 1991; Veenhoven & Ehrhardt, 1995). For example, possession of physical assets such as a motor car, refrigerator, and cell phone *inter alia* could fulfill one's physiological needs resulting in higher SWB.

5.2.5.3 The effect of financial product use on subjective well-being

Besides the direct impact of physical wealth on a consumer's SWB, savings, and insurance positively influence it. The theoretical connection between financial inclusion and SWB is borrowed from the second level of the hierarchy of needs theory which indicates the need for security in the sense of freedom from uncertainty (Maslow, 1987). Contextually, the need for financial security can be fulfilled by savings and insurance since they provide a perception of liquidity in the face of financial adversity which could play a positive role in boosting one's SWB (Xiao & Noring, 1994). Therefore, individuals in possession of precautionary funds and insurance tend to feel more financially secure which results in greater life satisfaction (Howell et al., 2013; Ruberton et al., 2016).

Consistent with the first level of the hierarchy of needs theory, credit could ultimately increase consumers' SWB. In the absence of adequate liquidity to meet basic living costs, credit would

allow consumers to satiate physiological needs such as food, medicine, and energy. By satisfying their physiological needs, consumers can increase their SWB (Maslow, 1987). However, if a consumer borrowed money and failed to repay the loan or was in arrears with payment, he/she might experience financial dissatisfaction which is associated with lower SWB (Ngamaba et al., 2020).

Based on the exposition above, the study hypothesised that an increase in the QFIN results in higher asset ownership and, in turn, increases the SWB of consumers. Noteworthy, the study did not focus on the single indicators of insurance, credit, and savings as explained by the theories above. Instead, the study employed a multi-dimensional index of QFIN, developed in Chapter 2, to assess how it is indirectly associated with SWB via asset accumulation. Therefore, Figure 5.1 below shows a path diagram that depicts the causal chain between the mediator (asset ownership), the independent variable (QFIN), and the dependent variable (SWB). The conceptual model generally assumes a three-variable system whereby two causal paths are feeding into the outcome variable (SWB): the impact of QFIN on asset accumulation (Path A), the impact of asset accumulation on SWB (Path B), and the impact of QFIN on SWB (Path C). The ensuing section reviews empirical studies related to asset accumulation and the impact of assets on SWB.

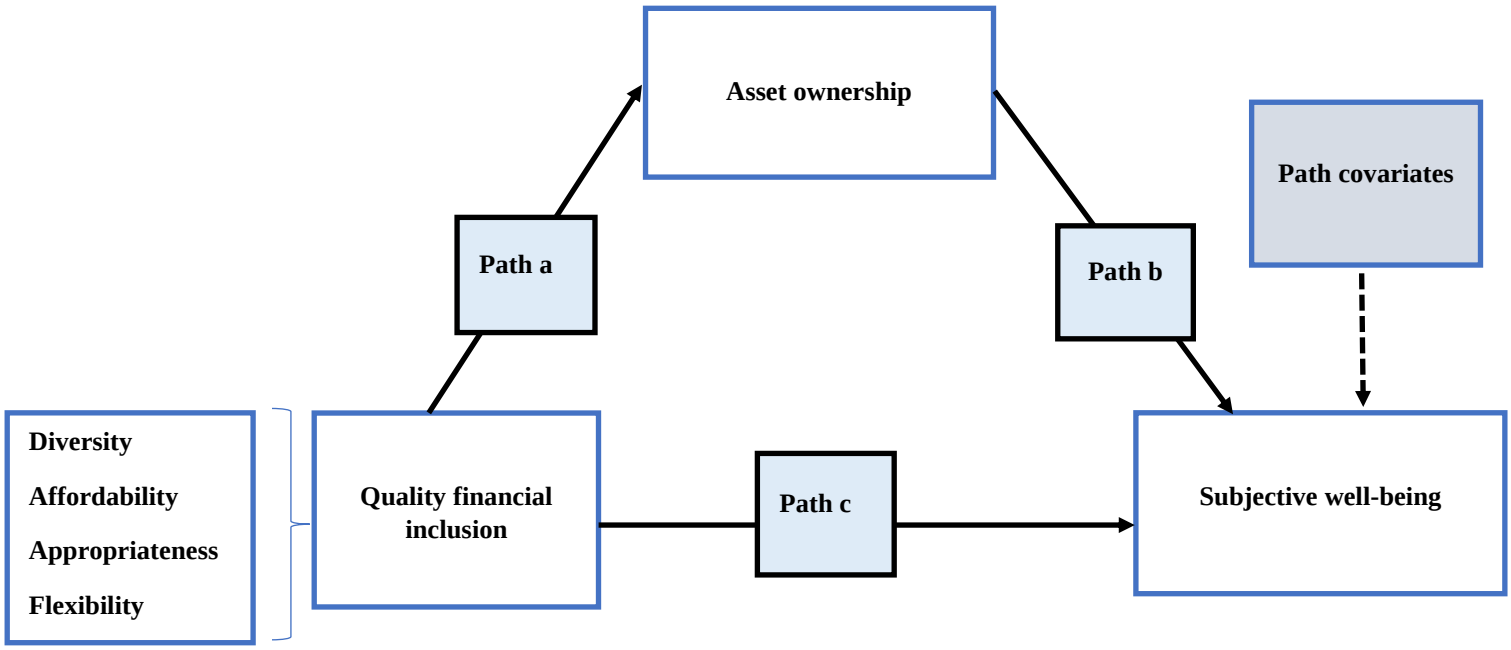


Figure 5.1: Interrelationship between asset ownership, quality financial inclusion, and SWB

5.3 Empirical literature review

5.3.1 Financial inclusion and asset accumulation

Several studies have investigated how the use of financial services, particularly insurance and savings, influences asset accumulation in several countries. Grinstein-Weiss et al. (2012) investigated the impact of the IDA program in the US, which deposits savings in the bank account of participants in the program to encourage asset building. However, this initiative did not translate to improved asset holding measured by homeownership. In contrast, Huang et al. (2016) consumers with disabilities who participated in the IDA program experienced an increase in homeownership compared with non-IDA participants. In Nepal, Prina (2015) showed that ownership of low-cost formal bank accounts resulted in a higher accumulation of non-monetary assets, which included livestock, durables, and poultry. This is because low-income households were provided with a safe platform for accumulating savings and managing their finances, which increased asset holding compared with non-account holders. In Ghana, Lee et al. (2017) investigated the impact of the YouthSave Programme on the accumulation of liquid assets among youths and found that in-school banking was effective in encouraging savings among those who participated in the program compared with the control groups.

Several other studies have investigated how informal savings contributed to asset accumulation. Brune et al. (2016) and Breitweiser (2016) reported that rural households that participated in savings groups in Mozambique and Malawi, respectively, had higher asset ownership than non-participants. In South Africa, Storchi (2018) reported that participants in the SaveAct saving group program in the Eastern Cape had higher asset ownership compared with non-members. The increase in asset holding in savings groups could be explained by precautionary savings that prevented costly coping mechanisms like the selling of assets after adverse shocks. Moreover, the assets were acquired using share-out-funds, which refer to lump sums typically available at the end of a saving cycle. On the other hand, Tita and Aziakpono (2017) reported that both formal and informal savings increased the asset accumulation of South Africans, although the effect was more pronounced for the poor compared with richer consumers.

As mentioned before, VLSAs provide a platform for members to accumulate savings periodically and access credit from pooled funds. The credit enables talented consumers to invest in projects that generate income, and the extra income can be channelled into the acquisition of household assets. Against this backdrop, Ksoll et al. (2016) reported a surge in

asset ownership for the VSLA participants compared with non-VSLA households in Northern Malawi. Furthermore, Kwarteng-Amaning and Sarfo-Mensah (2019) investigated how participation in VSLA influenced livelihoods and asset ownership in association members in rural Ghana. They reported that female participants in the VLSAs increased their influence on decisions concerning household purchases which led to more accumulated assets. However, Karlan et al. (2017) failed to find an impact of VSLA membership on asset ownership in Ghana, Malawi, and Uganda.

Other studies have investigated how ROSCAs influence asset accumulation. The probable reason is that ROSCAs provide an opportunity for participants to borrow and channel pooled savings to enterprises that generate income, which contributes to increased household asset holding. In the US, Ibrahim (2020) investigated the effect of structured savings on asset ownership focusing on the role of ROSCAs in the financial lives of African immigrants. The results indicated that physical non-monetary asset ownership increased by 13.6% after participating in ROSCAs. In addition, it was reported that Nigerian and Indonesian households participating in ROSCAs accumulated various physical assets such as furniture, appliances, poultry, and jewellery compared with non-ROSCA participants (Abimbola et al., 2020; Ajija & Siddiqui, 2021).

Some studies have investigated the effect of insurance on the asset accumulation of households since it prevents the selling of assets as a coping mechanism after negative shocks. Thus, Janzen and Carter (2019) found that Kenyan households that were insured were less likely to sell livestock after negative shocks compared with uninsured households. Similarly, in Ghana, Akotey and Adjasi (2014) reported that Ghanaian consumers that used microinsurance experienced an increase in asset holding. In South Africa, Tita and Aziakpono (2017) found that formal and informal insurance combined increased asset accumulation in South African consumers, particularly among poor consumers. Unlike Tita and Aziakpono (2017), using PSM to mitigate endogeneity concerns, Latif and Magazi (2021) reported that microinsurance provided financial protection and contributed to asset accumulation in South Africa.

In some cases, cash transfers might stimulate asset holding in poor communities. In Niger, for example, Stoeffler et al.'s (2016) results showed that consumers who received cash transfers increased their savings which ignited an increase in assets such as livestock. Recently, Brune et al. (2022) investigated how cash transfers through a safety net program in Yemen influenced

asset accumulation. It was evidenced that asset accumulation increased amongst the program beneficiaries, albeit proportionately less than the amount each household had initially received.

While most asset accumulation interventions have been savings-oriented and insurance-oriented, some interventions to increase asset holding in ultra-poor communities have been driven by credit. In Ethiopia, Tadesse and Zewdie (2019) reported that credit recipients had relatively less asset accumulation than grant recipients, thereby suggesting that grants were a more effective means of transferring assets to the ultra-poor. The reason was that the net wealth of the credit recipients was low due to the high cost of credit compared with interest-free grants. Employing data from Ecuador, Ghana, and India, Doss et al. (2020) reported that credit use increased asset holding, but this was more pronounced amongst men since females had lower use of credit. Augsburg et al. (2018) investigated the impact of labelled micro-credit sanitation programs on asset ownership in rural India, which provided loans linked to preventative health investments such as a toilet. It was found that the uptake of preventative health investments led to increased asset ownership because of the labelling of the loans but only amongst 9% of the micro-credit recipients.

Overall, evidence suggests that access to savings, credit, and insurance increases asset ownership which is consistent with the theoretical predictions. As highlighted above, asset endowment contributes to higher SWB according to the asset effects theory and hierarchy of needs theory. Hence, the ensuing section describes the empirical studies that investigated the impact of asset ownership on SWB.

5.3.2 Asset ownership and subjective well-being

Several studies in developed and developing countries have found that different asset classes have a positive impact on consumers' SWB. For example, Ruberton et al. (2016) reported that checking and savings accounts provided financial security, thereby increasing the life satisfaction of British bank customers. Moreover, Crocker and Padilla (2016) investigated the impact of access to liquid assets, such as cash on hand, on the life satisfaction of unmarried mothers. They reported that unmarried mothers with access to liquid assets had 182% higher odds of being satisfied with life. Recently, Jayasinghe et al. (2020) reported that having problems with accessing financial products might reduce the probability of higher life satisfaction. Brown and Gray (2016) showed that stocks were associated with higher life satisfaction among Australians. However, the effect of liquid saving accounts on life satisfaction was greater amongst consumers below 50 years of age compared with consumers

of that age or older. In Singapore, Hong and Han (2014) reported that an increase in financial assets, such as shares, increased satisfaction for those in the low and middle-life satisfaction classes but not significantly for those in the high-life satisfaction class. These results confirmed that non-tangible financial assets could contribute to reducing psychological stress by satisfying the need for financial security resulting in higher perceived life satisfaction (Maslow, 1987).

Furthermore, several studies have revealed that various classes of physical or tangible assets increased SWB despite disparities across various socio-demographic groups. Ren et al. (2018) and Zumbro (2014) found that home ownership in China and Germany, respectively, had a significant positive impact on consumers' life satisfaction. However, life satisfaction was lower amongst low-income earners who faced difficulty in repaying mortgage loans. Moreover, Zhang and Zhang (2019) reported that housing value appreciation in China significantly increased SWB amongst house owners, and this was greater for low-income owners than it was for high-income owners. However, in the US, Kuroki (2019) reported a positive relationship between home ownership and life satisfaction, but this declined after a surge in housing prices implying that those in expensive areas were likely to be less satisfied with house ownership. Nevertheless, Charles et al. (2019) reported that home ownership increased British consumers' life satisfaction, although the impact was more pronounced amongst females who were self-employed compared with males.

Wu et al. (2019) found that home ownership increased the SWB of Chinese consumers, but this was lower for individuals that had children owing to the high cost of raising them, which offset the positive impact of asset ownership on SWB. Comparatively, Lai et al. (2021) reported that home ownership had a positive impact on the life satisfaction of urban migrants in China, although the effect was more pronounced in those aged 38 and above. In addition, Qi et al. (2021) reported that children that lived in households with few household assets exhibited lower overall life satisfaction, although this was more pronounced in rural dwellers. While results in previous studies assumed a linear association between asset ownership and life satisfaction, Cheng et al. (2020) reported that home ownership increased the life satisfaction of Chinese consumers with diminishing returns. In other words, the additional satisfaction derived from owning a house declined with each additional house purchased.

Apart from home ownership, car ownership was shown to increase consumers' SWB. In the US, Okuliez-Kozaryn et al. (2015) reported that luxury car ownership resulted in lower SWB

as opposed to inexpensive cars owing to the high maintenance costs associated with luxury cars. Nevertheless, luxury car ownership in 18 European states was associated with increased life satisfaction because of the materialistic values of these societies (Brulé et al., 2020).

From the foregoing review, one strand of the empirical literature investigated the impact of material wealth on SWB, while another strand focused on asset building through the use of credit, savings, and insurance. However, to the best of the researcher's knowledge, no study has investigated whether the use of financial products could increase asset accumulation and, in turn, influence consumers' SWB as described by the conceptual model in Figure 5.1 above. Hence, the study extended the previous analysis by examining how QFIN could lead to asset accumulation and, in turn, improve the SWB of South Africans. In essence, this study tested the hypothesis that QFIN increased asset holding and, in turn, increased the SWB of consumers. Moreover, the use of a multi-dimensional index of QFIN is an improvement from previous related studies that examined asset accumulation using single indicators of financial product use.

5.4 Data and sample

This section explains the data and methodology used in the study. Initially, an attempt was made to employ a more recent dataset that provides information on the asset ownership and life satisfaction of South African consumers. However, the National Income Dynamics Study (NIDS) of 2017 administered by the University of Cape Town lacks data on measures constituting the QFIN index. Moreover, the NIDS dataset does not have variables that could influence SWB such as recreational activities, expenditure vulnerability, financial capability, financial awareness, and financial attitude. Owing to the limitations of the dataset of South Africa's NIDS of 2017, the current study relied on the cross-sectional FinScope 2015 consumer survey of South Africa. The FinScope 2015 consumer survey data were used because the survey contained questions on life satisfaction, QFIN, asset ownership, and other essential covariates of SWB, which were relevant to the study.[20] Chapter 1, Section 1.7, presents a detailed description of the FinScope 2015 consumer survey of South Africa.

[20] Appendix 5E below provides a comparison between the datasets of the NIDS of 2017 and the FinScope 2015 consumer survey of South Africa in terms of the variables of interest.

5.5 Methodology

Table 5.1: Description of variables and coding

Variable	Description
SWB	I am satisfied with my life (1=Yes and 0=No)
Asset ownership	Asset index computed using MCA
QFIN	Quality financial inclusion index computed using PPCA
Informal savings	1 = informal savings, 0 = no informal savings
Formal savings	1= formal savings, 0 = no formal savings
Informal insurance	1= informal insurance, 0 = no informal insurance
Formal insurance	1= formal insurance, 0 = no formal insurance
Formal credit	1= formal credit, 0 = no formal credit
Age	Individual's age
Gender	Female = 0 and male = 1
Geographical location	Rural=0, small urban =1, urban=2
Employment	Own business = 0, unemployed = 1, economically inactive=2, formal employment = 3
Marital status	Married = 1, 0 = otherwise
Income	Individual's income
Religion	A supreme being/God/Allah made the universe that we live in (1=Yes and 0=No)
Basic living costs	An equally weighted index for basic living costs was created by summing three items
Lifestyle	An equally weighted lifestyle index was created by summing five items
Financial attitude	Financial security is important to you (1=Completely disagree to 5=Completely agree)
Financial awareness	An equally weighted financial awareness index was created by summing five items
Financial capability	An equally weighted financial capability index was created by summing five items

5.5.1 Empirical model

This section explains the procedure for testing the hypothesis that QFIN increases asset accumulation and, in turn, increases the SWB of consumers. To this end, the empirical models in Equations 5.1a and 5.1b below were estimated simultaneously to estimate the indirect impact of QFIN on SWB through asset ownership:

$$assets_i = a*QFIN_i + \varepsilon_i \quad (5.1a)$$

$$swb_i = b*assets_i + c*QFIN_i + \beta_i X_i + \varepsilon_i \quad (5.1b)$$

where $assets_i$ denotes an asset index for individual *i* (see Section 5.6.2 for the estimation procedure of the asset index); $QFIN_i$ denotes the measure of quality financial inclusion for individual *i*; swb_i represents a binary variable measuring the SWB of individual *i*, which took the value 1 if satisfied with life and 0 otherwise. This follows previous studies that measured SWB based on consumers' life satisfaction (Brulé et al., 2020; Lai et al., 2021; Wu et al., 2019; Zheng et al., 2020). Moreover, X_i denotes a vector of the control variables shown in Table 5.1 above that could influence the SWB of consumer *i*, and ε_i represents the error term.

Based on the models in Equation 5.1, the indirect effect, the direct effect, and the total effect were computed:

$$\text{indirect effect} = a \times b \tag{5.2a}$$

$$\text{direct effect} = c \tag{5.2b}$$

$$\text{total effect} = c + (a \times b) \tag{5.2c}$$

Thereafter, it was determined whether there was full or partial mediation based on Equations 5.2a, 5.2b, and 5.2c. Full mediation is indicated when the direct effect of QFIN on SWB is statistically insignificant, whereas the indirect effect is statistically significant. Put differently, full mediation means that the effect of QFIN on SWB is completely transmitted with the assistance of asset ownership. However, partial mediation occurs when both the direct and indirect effects are statistically significant, and this could be either complementary partial mediation or competitive partial mediation. Complementary partial mediation occurs when both the indirect and direct effects are pointing in the same direction (positive or negative). Conversely, competitive partial mediation occurs when both the indirect effect and direct effect are pointing in the opposite direction. Therefore, in competitive partial mediation, QFIN still explains a portion of SWB which is independent of asset ownership (Nitzl et al., 2016; Zhao et al., 2010). As indicated in Equation 5.1, the study account for several socio-demographic variables that influence SWB, which are shown in Table 5.1 above. Therefore, the discussion in the following section points to the association between these socio-demographic variables and SWB.

5.5.2 Subjective well-being correlates

5.5.2.1 Income

An increase in absolute income is associated with higher SWB this is because higher-income consumers are likely to have better nutrition, quality education, health care, and shelter, which all contribute to higher SWB (Brulé et al., 2020; Charles et al., 2019; Cheng et al., 2020; Kuroki, 2019). In addition, high income provides opportunities for consumers to satiate more idiosyncratic desires, which could provide more avenues for them to be satisfied with life (Diener et al., 2013). Therefore, *á priori*, consumers in higher-income quintiles were expected to have higher SWB.

5.5.2.2 Marital status

Besides income, married individuals are likely to have more affection and a greater sense of belonging which is associated with higher SWB (Lai et al., 2021; Wu et al., 2019; Zhang & Zhang, 2019). Moreover, higher SWB among married individuals is attributed to the social support that is provided by the individual's spouse (Stock, Okun & Witter, 2001). Therefore, married consumers were expected to have higher SWB.

5.5.2.3 Educational qualification

Furthermore, more educated consumers are likely to have a higher evaluation of their life. This is because higher education levels raise one's social status and increase the possibility of getting a higher-income job, which could enhance an individual's SWB. This is consistent with previous studies by Crocker and Padilla (2016), Kuroki (2019), and Charles et al. (2019) who reported that higher education qualifications were associated with higher SWB. Therefore, *á priori*, consumers with higher education qualifications were expected to have higher SWB.

5.5.2.4 Gender

Besides education qualification, gender could influence a consumer's SWB. Joshanloo and Jovanović (2020) argue that the link between life satisfaction and gender is inconclusive because there might be variations across countries and cultures. On the other hand, the social capital theory posits that women are disadvantaged in society resulting in lower-quality jobs and lower income due to irregular work trajectories (Gonçalves et al., 2021). Consequently, women are more likely to have lower SWB than males as s result of economic exclusion. Therefore, *á priori*, it was expected that males had higher SWB relative to females.

5.5.2.5 Employment

In addition, employment could enhance the SWB of consumers. This is because employment could increase income which enables an individual to maintain a better standard of living than unemployed ones. Also, employment might provide an individual with some sense of meaning to life and social validation which enhances his/her SWB (Coad & Blinder, 2014). Consistent with this argument, some studies have revealed that unemployed consumers feel less satisfied with life compared with consumers in other employment categories (Kuroki, 2019; Ren et al., 2018). Thus, *á priori*, unemployed consumers were expected to have a lower SWB compared with other employment categories.

5.5.2.6 Lifestyle

It is posited that engagement in recreational activities could play a role in consumers' evaluation of life. This is consistent with the activity theory which suggests that participation and degree of involvement in recreational activities are associated with greater life satisfaction (Lemon et al., 1972; Rodríguez et al., 2008). On the other hand, satiation of one's needs through engagement in recreational activities could enhance one's SWB according to the hierarchy of needs theory. To this end, it was expected that engagement in recreational activities increased the SWB of consumers.

5.5.2.7 Religiosity

Besides recreation, religiosity has been positively correlated with the SWB of consumers because it has been found to act as a buffer against adverse life circumstances, which is consistent with the terror management theory of religion (Greenberg et al., 1986) and the life stress paradigm (Schnittker, 2001). In both theories, religiosity reduces various forms of anxiety by instilling the belief that God will correct a problem regardless of bad circumstances, which contributes to a positive evaluation of one's life. As such, a religious individual was expected to have a higher SWB and vice versa.

5.5.2.8 Age

In addition, it has been argued that older consumers are more likely to have higher SWB than younger ones. This is because older consumers have accommodative strategies such as downward adjustment of needs, comparison standards, and aspirations. Consequently, these accommodative strategies enhance their SWB by fostering lower aspirations-achievement gaps

among older consumers than among middle-aged ones (Hansen & Slagsvold, 2012). Consistent with this assertion, it was expected that older consumers had higher SWB than younger ones.

5.5.2.9 Meeting basic living costs

As discussed above, higher financial vulnerability negatively impacts consumers' evaluation of life according to the hedonic view of SWB (Diener, 2000; Nanda & Banerjee, 2021). By fulfilling these rudimentary human needs, one's subjective evaluation of life might be enhanced. For example, the inability to afford basic living costs such as medicine and food increases consumers' psychological stress resulting in lower life evaluation as reported by Kim and Chatterjee (2019) and Sabri et al. (2021). Thus, *á priori*, consumers who were unable to meet basic living costs were expected to have lower SWB.

5.5.2.9 Financial literacy

Furthermore, financial literacy has been linked to higher life satisfaction because it improves financial management and preparation for unforeseen events, which could enhance one's perception of the future (Limbu & Sato, 2019; Xiao & Porto, 2017). Moreover, De Beckker et al. (2019) and Stolper and Walter (2017) reported that financial literacy helps consumers to manage their financial resources effectively by improving financial behaviour which, in turn, enhances financial satisfaction. Considering that financial satisfaction is a component of overall life satisfaction, the implication is that financial literacy is associated with higher SWB.

5.5.3 Estimation strategy

This section details the estimation strategy that was used to estimate the empirical models shown in Equation 5.1. To ascertain whether QFIN could increase asset ownership and, in turn, improve consumers' SWB, mediation analysis was warranted. That is, mediation analysis is necessitated when a variable has no direct effect because it is mediated by another variable (Nitzl, 2016). To achieve this, Baron and Kenny's (1986) three-step technique can be used by sequentially estimating three regressions to assess the effect of variable X (independent variable) on Y (dependent variable) as mediated by variable M. Based on Baron and Kenny's (1986) technique, the first condition is that X needs to show a significant effect on Y in the first step otherwise mediation would not exist.

Baron and Kenny's (1986) technique is applicable when the dependent, mediating, and independent variables are continuous since the estimations are hinged on three ordinary least squares regressions (Iacobucci, 2012). However, this approach was refuted by Preacher and

Hayes (2008) and Zhao et al. (2010), who argued that a direct significant effect of X on Y should not be a precondition for the existence of a mediation. Besides, Baron and Kenny's (1986) approach requires a continuous dependent variable, which was inapplicable in the current study where the dependent variable was binary.

Considering the limitations of Baron and Kenny's (1986) technique, the current study used partial least squares path modelling (PLS-PM) in mediation analysis. This is because PLS-PM not only tests several regressions simultaneously but also computes path models with binary dependent variables through linear probability estimations (Hair et al., 2019). Moreover, PLS-PM can estimate complex problems without imposing restrictive distributional assumptions on the data (Hair et al., 2017; Nitzl et al., 2016). Furthermore, PLS-PM has methodological superiority over covariance-based structural equation modelling which is likely to lead to non-convergent and improper results (Henseler et al., 2009).

Although there is no consensus on the appropriate size required for applying PLS-PM, Hair et al. (2018) and Rigdon et al. (2017) contend that PLS-PM can lead to valuable results in the presence of large datasets. Thus, a large sample size used in the study might have helped in drawing robust conclusions on the presence of mediation in a PLS-PM. Considering the above-mentioned reasons, PLS-PM was estimated using the SeminR software package to determine whether QFIN is an indirect pathway for enhancing consumers' SWB via increasing asset ownership.

In determining the indirect effect, the Sobel (1982) test can be applied. However, Preacher and Hayes (2004, 2008) contend that it is inappropriate because the parametric assumptions of paths a and b do not hold for the product of the two paths if it is assumed that a and b do not follow a normal distribution (Shrout & Bolger, 2002). Given that PLS-PM is a non-parametric technique, bootstrapping was appropriate to test the statistical significance of an indirect effect and estimate the standard errors and the confidence intervals of the path coefficients. More specifically, the bootstrapping procedure using 1000 replications was used to estimate the standard errors as the basis of computing the *t*-ratios and confidence intervals of the path coefficients in the PLS path model. Thereafter, the statistical significance of the indirect effects was ascertained using the pseudo-*t*-values (Hair et al., 2021; Nitzl, 2016).

5.5.3 Model diagnostics

Following the estimation, the model was subjected to tests of the variance accounted for (VAF), explanatory power, and multicollinearity. Using the variance inflator factor (VIF), the model was checked for multicollinearity among the variables to avert any bias in the results whereby values greater than four suggested the presence of multicollinearity (Becker et al., 2015). Therefore, variables with a VIF greater than four were discarded from the model to mitigate multicollinearity.[21]

Subsequently, the model's explanatory power was analysed using r-squared values. Unlike covariance-based structural equation modelling whereby the global fitness indices are constructed, there is no valid criterion for the assessment of the model fitness of a PLS-PM (Hair et al., 2021; Henseler & Sarstedt, 2013). However, an adjusted r-squared, which ranges from 0 to 1 has been used as the basis for assessing a model's explanatory power. Therefore, adjusted r-squared values of $\geq 0.75 \leq 1$, $< 0.75 \geq 0.50$, and $< 0.5 \geq 0$ were interpreted as substantial, moderate, and weak, respectively (Hair, Risher, et al., 2019; Henseler et al., 2009; Shmueli & Koppius, 2011).

In the event of mediation, an evaluation of the mediation's strength is warranted. To achieve this, the VAF value is computed as the ratio of the indirect effect-to-total effect as this determines the extent to which the mediation process could explain the dependent variable's variance (Nitzl, 2016). The rule of thumb is that a VAF of less than 20% would indicate nearly zero mediation, a VAF greater than 20% but less than 80% is indicative of partial mediation, and a VAF exceeding 80% is interpreted as full mediation (Nitzl, 2016). Should a VAF exceed 100%, it is considered full mediation, and a negative VAF is interpreted as inconsistent or competitive mediation whereby the direct and indirect paths have differing effects (Hayes, 2009).

This section introduced the empirical model and explained how it was estimated to answer the question of whether QFIN could indirectly influence consumers' SWB through its positive impact on asset ownership. As indicated in the models presented in Equations 5.1, 5.2, and 5.3, an asset index was used as a proxy for asset accumulation. To provide unbiased estimates from

[21] Despite the age-squared variable being useful in explaining the non-linear relationship between age and SWB, it was excluded because the VIF value was 36.04 which exceeded the maximum threshold of four.

PLS-PM, there is a need to have reliable latent variables. Although PLS-PM does not suffer from identification problems in the event of correlated residuals (Falk & Miller, 1992), it might show bias in computing the indirect effect if the mediating construct is unreliable (Henseler et al., 2009). Thus, employing reliable measurements when testing the mediation effects in PLS-PM becomes a pre-condition to averting bias in estimating the indirect effects.

As a preliminary step, the reliability and sample adequacy tests were conducted to validate the inclusion of other latent variables in the PLS-PM. This is because, besides the asset index, the model accounted for variables that could explain variability in SWB including financial capability, financial awareness, basic living costs, and lifestyle. Noteworthy, the indices of basic living costs and lifestyle are derived from the disaggregated index of financial vulnerability computed in Section 3.4.2 of Chapter 3. Hence, the discussion in the following section points to the reliability tests and sample adequacy tests of these variables.

5.6. Variable measurement

5.6.1 Reliability and sample adequacy tests

To measure the reliability of items constituting the indices of assets, financial awareness, lifestyle, financial capability, and basic living costs, three tests were carried out: Cronbach's alpha reliability test, Bartlett's (1950) sphericity test, and the KMO measure of sample adequacy. Section 2.5 of Chapter 2 presents a detailed explanation of these tests. Table 5.2 below shows that the items constituting the indices of assets, financial capability, financial awareness, lifestyle, and basic living costs were reliable given that Cronbach's alpha was beyond the minimum threshold of 0.6. Moreover, KMO values beyond the value of 0.5 across all the indices suggested that items constituting them satisfied the sample adequacy test. In addition, the null hypothesis of Bartlett's test of sphericity was rejected at the 1% level implying that the items constituting the indices were intercorrelated as expected. Thus, as the items constituting the variables satisfied the preliminary tests of reliability and sample adequacy, the variables were included in the estimation of the PLS-PM.[22]

[22] Appendix 5C below provides the list of items constituting the indices of lifestyle, basic living costs, financial awareness, and financial capability.

Table 5.2: Reliability of indices

Variable	Cronbach's alpha	Bartlett's test	KMO value
QFIN index	0.701	***	0.710
Asset index	0.882	***	0.926
Lifestyle index	0.664	***	0.697
Financial capability index	0.834	***	0.851
Basic living costs index	0.786	***	0.820
Financial awareness index	0.685	***	0.695

Notes: The table provides a summary of Cronbach's alpha reliability test, Bartlett's test of sphericity, and KMO sample adequacy tests on various indices. *** indicates statistical significance at the 1% level.

5.6.2 Asset index computation

After these preliminary tests, the asset index was computed to measure an individual's asset holding, as explained in this section. To measure asset ownership, the asset index was computed to measure individual wealth for two reasons. Firstly, income-based measures tend to fluctuate with income or are affected by seasonality, whilst material possessions will remain unaltered regardless of temporal income shocks (Christoph, 2010; Filmer & Pritchett, 2001; Sahn & Stifel, 2003). Secondly, wealth indicators based on assets tend to have less measurement error than income-based wealth measurement since some respondents might be uncomfortable divulging their income level (Meyer & Sullivan, 2003). Against this backdrop, following Tita and Aziakpono (2017) and Latif and Magazi (2021) who employed FinScope consumer surveys from South Africa to compute an asset index, the following question was used to ascertain the respondent's ownership of assets: "Please tell me which of these, if any, are presently in your household or apply to your household?". The response to this question was binary which was coded 1 if yes and 0 otherwise based on a list of 22 movable and immovable assets shown in Appendix 5A.

To compute a composite asset index, Filmer and Pritchett (2001) suggest a technique for computing wealth indices using PCA. However, PCA is particularly useful and appropriate for continuous and quantitative variables (Asselin & Anh, 2008) because it was developed for a set of quantitative variables that are measured in identical units, which makes it unsuitable for categorical data.

Considering the pitfalls of conventional PCA, MCA has been used in some studies since it can accommodate binary data in index computation. For instance, Tita and Aziakpono (2017) and Latif and Magazi (2021) measured asset holding with an index constructed using MCA, which is a data reduction technique used to analyse correlation patterns across sets of variables described by single components termed principal components (Asselin & Anh, 2008). Principal components are latent unobserved variables that account for the maximum variance of a set of variables. Therefore, the first principal component represents the unobserved latent variable, which captures the best representation of all the variables (Greenacre & Pardo, 2006).

The asset index was computed following several steps suggested by Asselin and Anh (2008). The individual's profile in terms of the indicators was computed and applied to the category weights given the normalised scores of indicators on the first factorial axis coming from the MCA of the indicators. However, the dataset did not capture information about the quantity or monetary value of the household assets, which made it impossible to assign weights naturally (Sahn & Stifel, 2003). Therefore, the current study used weights derived from the MCA estimations, and the individual's composite asset index was subsequently calculated as the average of each binary category weighted responses across dimensions as follows:

$$AI_i = \frac{1}{K}\sum_{k=1}^{K}\sum_{J_k}^{J_k} W_{J_k}^{k}\, I_{j_k i}^{k} \qquad \text{where } W_{J_k}^{k} = \frac{s^k}{\sqrt{\lambda_i}} \tag{5.3}$$

where AI_i denotes the asset index for individual *i*; *K* is the number of categorical indicators; j_k is the number of categories of indicator *K*; $W_{J_k}^{k}$ are the weights of the category j_k determined by MCA (the factor score *s* of the first axes is normalised by the eigenvalue λ); and $I_{j_k i}^{k}$ represents the binary variable which takes the value 1 if the individual has the category j_k. By construction, the MCA approach yields negative values at the lower end of the index, which could offer challenging interpretations. Therefore, Asselin and Anh (2008) suggest an adjustment by adding the absolute value of the minimum score to the score to derive a new asset index with positive values using the following formula:

$$C_{min} = \frac{\sum_{K=1}^{K} W_{min}^{K}}{K} \tag{5.4}$$

where C_{min} is the absolute value of the average score; W_{min}^{K} denotes the minimum categorical weight.

5.7. Results

The following sections present the results of the data analysis to determine how life satisfaction varies relative to the socio-economic and demographic characteristics of South Africans. Moreover, the results of the PLS-PM were presented to determine the indirect impact of QFIN on life satisfaction through asset accumulation.

5.7.1 Descriptive statistics

Table 5.3 below shows chi-square test results indicating the profile of consumers who were satisfied and unsatisfied with life. Firstly, the table shows the differences in consumers' SWB in terms of the demographic characteristics of education, income level, geographical location, employment status, and marital status were statistically significant at the 1% level as indicated by the chi-square statistics. Secondly, the table shows that there were no statistical differences in SWB in terms of age and gender. Thirdly, the table indicates a weak association between life satisfaction, education, income, location, and employment since their Cramer's V test statistic was less than 0.2 throughout.

Table 5.3: Results of the chi-square test on consumers' subjective well being

Variable	Category	unsatisfied	satisfied	chi-square statistic	Cramer's V
Education	no formal education	2.300	1.040	135.338 (0.000) ***	0.165
	primary education	9.900	4.860		
	lower secondary	38.600	29.670		
	upper secondary	35.180	43.440		
	post-secondary	14.020	20.990		
Gender	female	55.270	55.600	0.055 (0.815)	-0.003
	male	44.730	44.400		
Income	poorest 20%	40.490	30.980	100.459 (0.000) ***	0.171
	second 20%	21.850	16.980		
	median 20%	8.370	8.340		
	fourth 20%	17.500	20.330		
	richest 20%	11.810	23.380		

Table 5.3: Results of the chi-square test on consumers' subjective well-being (continued)

Variable	Category	unsatisfied	satisfied	chi-square statistic	Cramer's V
Employment	own business	36.310	48.920	132.455 (0.000) ***	0.163
	formal employment	13.840	8.950		
	economically inactive	22.640	25.140		
	unemployed	26.470	16.240		
	other	0.730	0.750		
Age	16-29	29.320	28.720	0.772 (0.856)	0.012
	30-44	35.860	35.310		
	45-59	22.640	23.590		
	60+	12.170	12.380		
Location	urban	37.530	44.260	54.378 (0.000) ***	0.104
	small urban	39.760	41.010		
	rural	22.710	14.740		
Marital status	married	31.010	39.040	51.484 (0.000) ***	0.102
	single	58.250	49.550		
	widower	9.310	8.630		
	divorced	1.430	2.780		

Notes: The table shows the results of the chi-square and Cramer's V test based on consumers' SWB across various demographic variables. ***p<0.01. In parentheses are p-values.

5.7.2 The indirect effect of quality financial inclusion on subjective well-being via asset ownership

Figure 5.2 below shows the path coefficients of the interrelationship between QFIN, asset ownership, and SWB. The results suggest that higher QFIN was associated with higher asset ownership as indicated by a positive path 'a' coefficient of 0.381 that entered significantly at the 5% level. Moreover, asset ownership increased the SWB of consumers given that the path 'b' coefficient entered with a positive sign of 0.071 was statistically significant at the 1% level. On the other hand, QFIN had a positive direct impact on SWB since the path 'c' coefficient was positive and statistically significant at the 1% level.

The results shown in Table 5.4 below are consistent with the study's hypothesis that an increase in QFIN increases asset holding and, in turn, increases consumers' SWB. This is indicated by

the positive indirect effect path coefficient of 0.019 that entered significantly at the 1% level. Since the direct effect and indirect effect were both positive and statistically significant, it provides evidence of the complementary partial mediation of asset ownership in the QFIN-SWB relationship. This complementary partial mediation was confirmed by the VAF of 0.264 which was between the value of 0.2 and 0.8 as shown in Table 5.4. Moreover, the model did not suffer from multicollinearity since the mean VIF of 1.536 was less than the maximum threshold of four.

Table 5.4: PLS-PM estimation of quality financial inclusion on subjective well-being

Indirect effect	T-statistic	Direct effect	T-statistic	VAF	Adj. r^2	Mean VIF
0.019***	11.636	0.053***	2.813	0.264	0.065	1.536
(0.002)		(0.019)				

Notes: The table shows the results of the direct and indirect effects of QFIN on SWB via asset accumulation from the PLS-PM estimations. *** denotes statistical significance at the 1% level. Adj. r^2 represents adjusted r-squared. VAF and mean VIF denote variance-accounted-for and the average variance inflation factors, respectively. In parentheses are robust standard errors estimated using bootstrap with 1000 replications.

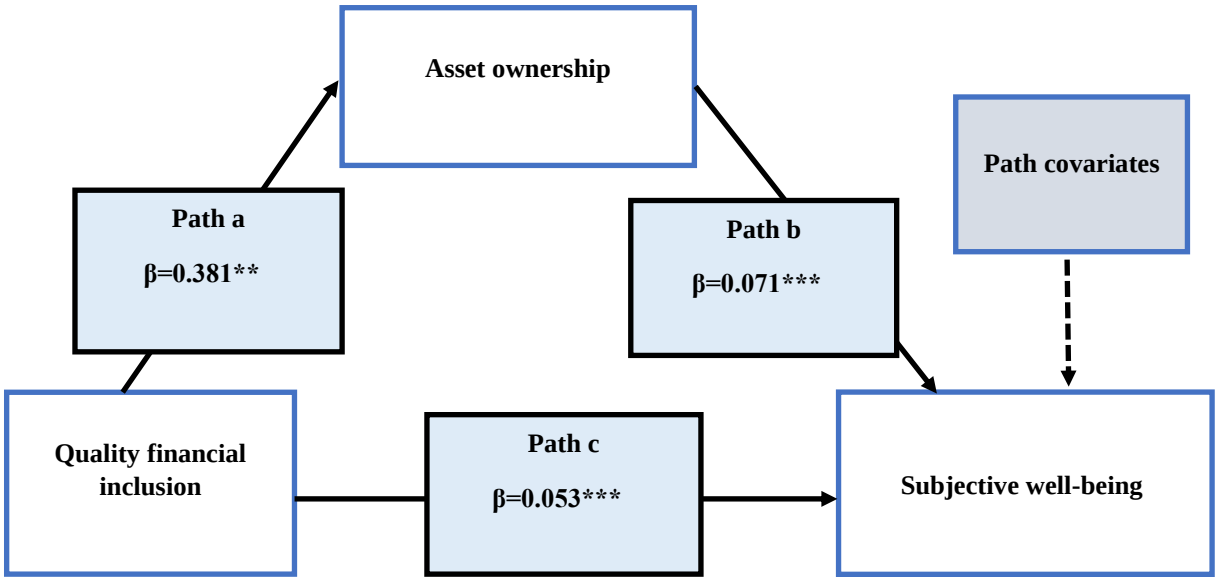


Figure 5.2: Interrelationship between quality financial inclusion, asset ownership, and subjective well-being

As discussed above, the life satisfaction of consumers can be explained by other covariates. Table 5.5 below shows the path coefficients of SWB covariates after the PLS-PM estimation

of the interrelationship between QFIN, asset accumulation, and SWB. Contrary to expectations gender, age, and financial awareness could not explain differences in the SWB of consumers. However, as expected, Table 5.5 below reveals that consumers who could not meet basic living costs (-0.093) had lower SWB as indicated by the negative path coefficients that were statistically significant at the 1% level. That implies that inability to meet basic living costs, such as medicine, food, and energy to heat or cook, could increase psychological stress which would reduce SWB. Moreover, as expected, an increase in religiosity was associated with higher life satisfaction of consumers given that the path coefficients were positive at the 1% level. This is because belief in a supreme God or a supreme being might improve life orientation which could contribute to higher SWB.

Apart from religiosity, differences in SWB were observed across income levels. More specifically, SWB was higher amongst consumers with a higher income as indicated by a positive income path coefficient that was statistically significant at the 1% level. This was expected since higher income enables consumers to meet basic needs and have a better lifestyle, which all contribute to higher SWB. As expected, Table 5.5 shows that consumers with higher financial capability and a positive financial attitude were found to have higher SWB as indicated by their positive slope coefficients that entered significantly at the 1% level. This is because financial capability and a positive financial attitude improve preparedness for unforeseen life events which likely results in an improvement in financial satisfaction, which is a component of life satisfaction.

Moreover, consumers with primary education and lower secondary education, as well as those without formal education, had lower SWB compared with consumers with an upper secondary qualification. This is indicated by negative path coefficients that entered significantly at the 10% level for consumers without formal education and with lower secondary education, whereas the primary education path coefficient was statistically significant at the 1% level. However, compared with consumers with an upper secondary qualification, consumers with a post-secondary qualification had lower SWB as indicated by a negative path coefficient that entered significantly at the 1% level. The result was inconsistent with expectations since consumers with post-secondary education are associated with jobs with relatively higher remuneration and status, which is associated with higher SWB.

Also, married consumers were more likely to have higher SWB as indicated by the positive path coefficient (0.052) that entered significantly at the 1% level. This is because consumers

that are married tend to have affection and greater social support from their spouses which enhances their SWB, unlike consumers in other marital statuses. Further, relative to entrepreneurs, unemployed and formally employed consumers had lower life satisfaction as indicated by negative path coefficients that were statistically significant at the 10% level and 1% level, respectively.

Table 5.5: Path coefficients of PLS-PM estimations

from	to	Path coefficient	t-stat	from	to	Path coefficient	t-stat
QFIN	assets	0.381***	6.684	urban	swb	-0.068**	-2.219
		(0.057)				(0.030)	
assets	swb	0.071**	2.157	small urban	swb	-0.013	-0.387
		(0.032)				(0.027)	
QFIN	swb	0.053***	2.813	age	swb	0.022	1.011
		(0.019)				(0.023)	
gender	swb	-0.012	-0.616	post-secondary	swb	-0.045*	-1.980
		(0.019)				(0.022)	
religiosity	swb	0.064***	3.166	no formal education	swb	-0.028	-1.375
		(0.020)				(0.021)	
financial attitude	swb	0.054***	2.736	lower secondary	swb	-0.059***	-2.636
		(0.019)				(0.023)	
basic living costs	swb	-0.093***	-4.580	primary education	swb	-0.068***	-3.147
		(0.021)				(0.022)	
financial awareness	swb	0.011	0.419	unemployed	swb	-0.046*	-1.954
		(0.026)				(0.024)	
financial capability	swb	0.073***	2.908	formal employment	swb	-0.062***	-2.943
		(0.025)				(0.021)	
income	swb	0.092***	3.631	economically inactive	swb	-0.010	-0.370
		(0.025)				(0.025)	
lifestyle	swb	-0.076***	-3.205	married	swb	0.052**	2.347
		(0.024)				(0.022)	

Notes: The table shows the path coefficients of the interrelationship between QFIN, asset accumulation, and SWB using PLS-PM. ***p<0.01, **p<0.05, and *p<0.10. In parentheses are robust standard errors estimated using bootstrap with 1000 replications. t-stat denotes t-statistic.

5.7.3 Robustness check

As a robustness check, the study examined how different channels of financial inclusion from both formal and informal sectors could indirectly influence the SWB of consumers via asset accumulation. The rationale was to ascertain whether the results of the indirect and direct effects of QFIN on SWB would differ from narrower measures of financial inclusion from both formal and informal sectors. Similar to Equation 5.1, the empirical models in Equations 5.4a, 5.4b, 5.5a, 5.5b, 5.6a, and 5.6b were estimated simultaneously to determine the indirect impact of insurance, savings, and credit on SWB through asset ownership:

$$assets_i = a*insurance_i + \varepsilon_i \quad (5.4a)$$

$$swb_i = b*assets_i + c*insurance_i + \beta_i X_i + \varepsilon_i \quad (5.4b)$$

$$assets_i = a*savings_i + \varepsilon_i \quad (5.5a)$$

$$swb_i = b*assets_i + c*savings_i + \beta_i X_i + \varepsilon_i \quad (5.5b)$$

$$assets_i = a*credit_i + \varepsilon_i \quad (5.6a)$$

$$swb_i = b*assets_i + c*credit_i + \beta_i X_i + \varepsilon_i \quad (5.6b)$$

where $savings_i$ denote a binary variable that takes the value 1 if individual *i* saves and 0 otherwise; $insurance_i$ is a binary variable that took the value 1 if individual *i* was insured and 0 otherwise; and $credit_i$ is a binary variable that took the value 1 if individual *i* was borrowed and 0 otherwise. The other variables were defined in the explanations of Equations 5.1a and 5.1b.

Figures 5.3-5.7 below present the path coefficients of the interrelationship between various channels of financial inclusion, asset ownership, and SWB whilst controlling for covariates. Figure 5.3 below indicates that asset ownership was relatively higher among formal insurance holders, as indicated by a positive asset path coefficient of 0.405, which was statistically significant at the 1% level. As expected, the direct effect of formal insurance on SWB was positive and statistically significant at the 1% level, and asset ownership was positively related to SWB, as indicated by a positive path coefficient of 0.064, which was strongly significant at the 1% level. Table 5.6 below shows a positive indirect effect of formal insurance on SWB through asset ownership.

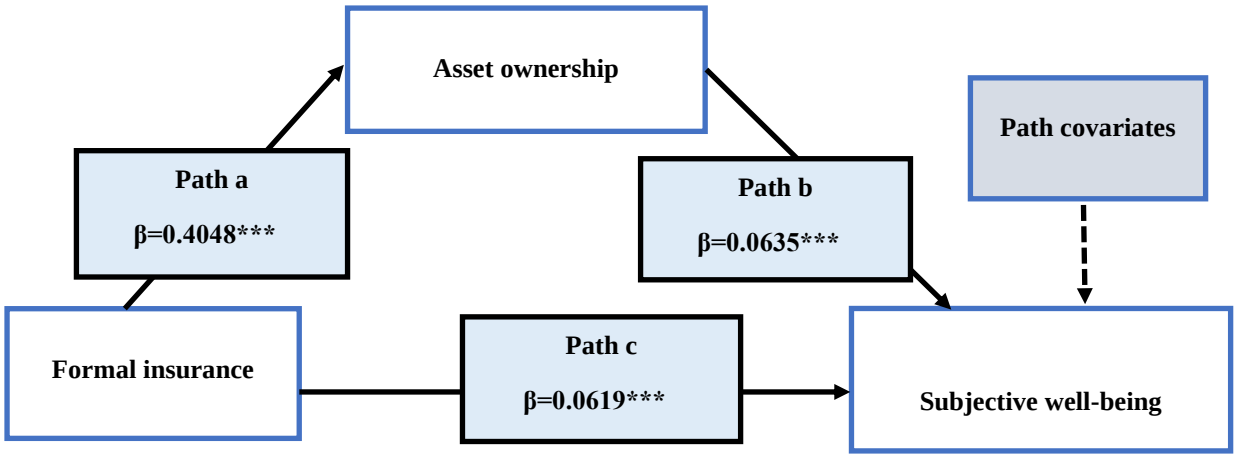


Figure 5.3: Interrelationship between asset ownership, formal insurance, and SWB

Figure 5.4 below displays the results that suggested that formal credit led to higher asset holding compared with non-formal credit users as indicated by the positive path coefficient of 0.418 which was statistically significant at the 1% level. Moreover, consumers with higher asset holding had a higher subjective life evaluation as shown by a positive path coefficient of 0.068 which was statistically significant at the 1% level. However, the use of formal credit did not have a direct effect on SWB given that the positive path coefficient of 0.019 was statistically insignificant at conventional levels. Instead, formal credit had an indirect effect on SWB since the positive indirect path coefficient of 0.028 shown in Table 5.6 below was statistically significant at the 1% level. Thus, there was evidence that formal credit could only increase SWB via its positive impact on asset holding. Nonetheless, the VAF value of 0.610 was less than the threshold level of 0.80 implying that there was partial mediation and that the indirect effect of formal credit via asset holding contributed little to the total effect on SWB.

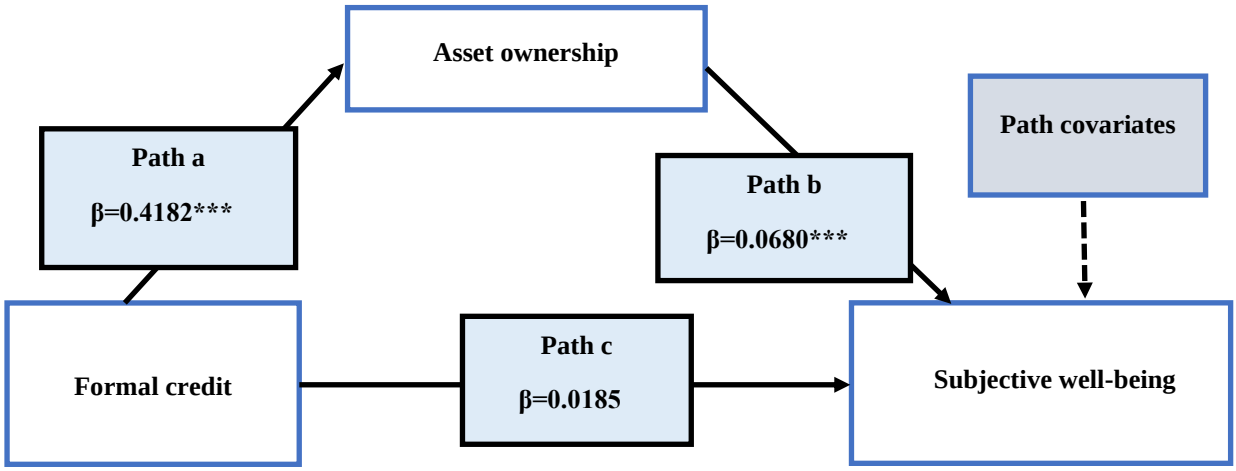


Figure 5.4: Interrelationship between asset ownership, formal credit, and SWB

Figure 5.5 below indicates that consumers with formal savings had higher asset ownership than non-formal savers as indicated by a positive path coefficient of 0.264, which was statistically significant at the 1% level. Moreover, asset ownership increased SWB as indicated by a positive path coefficient of 0.068, which was statistically significant at the 1% level. Also, formal savings increased SWB as indicated by a path coefficient of 0.038, which was statistically significant at the 5% level. As expected, Table 5.6 below reveals that formal savings had a positive indirect effect on SWB, as indicated by an indirect coefficient of 0.018 that entered significantly at the 1% level. As a result, there was a complementary partial mediation of asset ownership on the formal savings-SWB relationship since both the direct and indirect effects were statistically significant and pointed in the same direction.

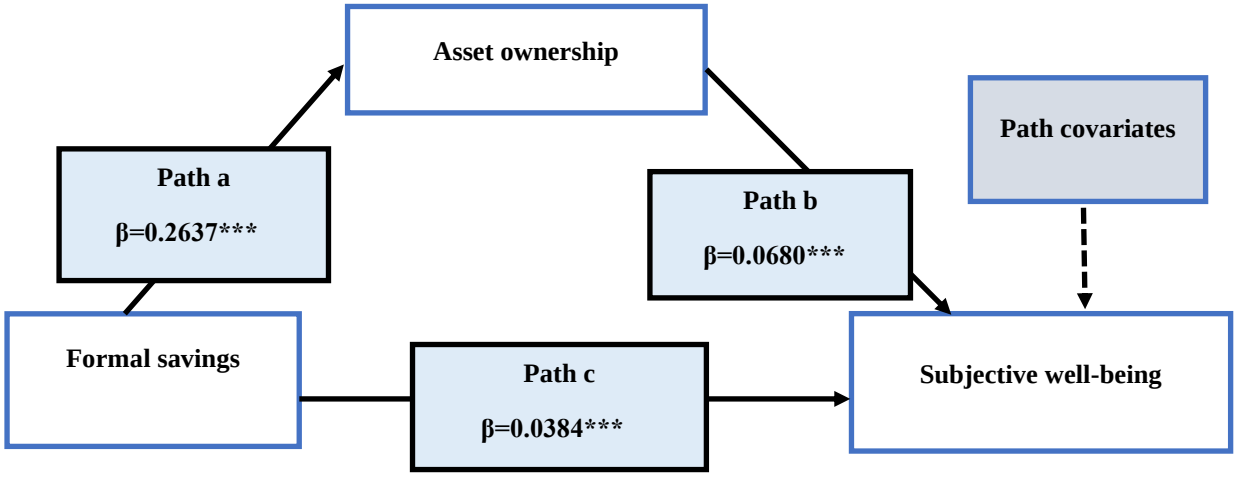


Figure 5.5: Interrelationship between asset ownership, formal savings, and SWB

Figure 5.6 below shows that asset ownership was lower amongst consumers with informal insurance, as indicated by a negative statistically significant path coefficient (-0.129) at the 1% level. In addition, SWB was positively correlated with asset ownership as indicated by a positive path coefficient of 0.069, which was statistically significant at the 1% level. However, there was no direct impact of informal insurance on SWB since the positive path coefficient (0.016) was statistically insignificant at all conventional levels. As shown in Table 5.6 below, the indirect effect coefficient was negative (-0.009) and entered significantly at the 1% level, yet the direct effect of informal insurance on SWB was statistically insignificant. Given that the VAF score was -1.232, it confirms competitive mediation of asset ownership in the informal insurance-SWB relationship implying that the direct effect was overshadowed by the dampening effect of indirect effects.

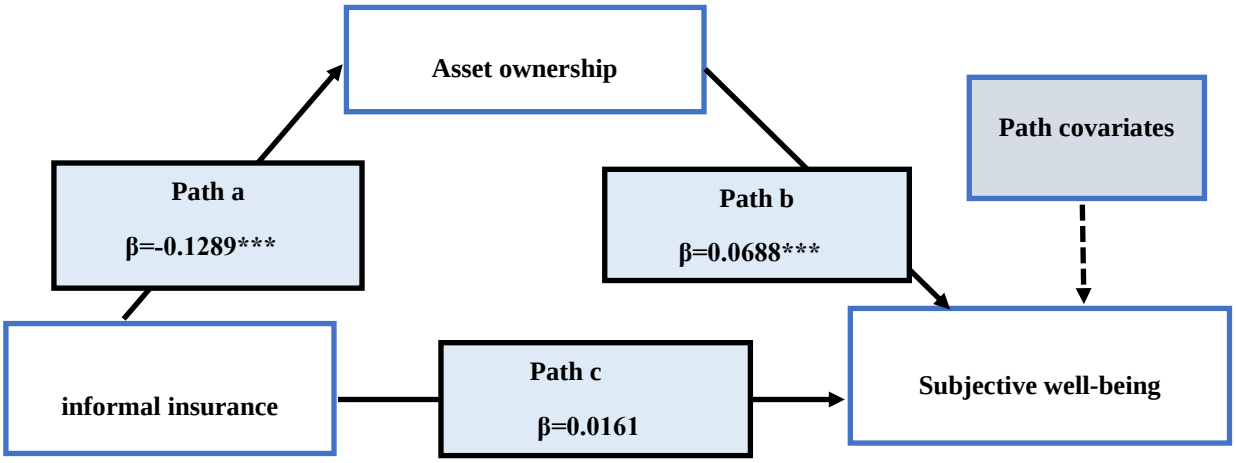


Figure 5.6: Interrelationship between asset ownership, informal insurance, and SWB

Figure 5.7 below shows that informal savings were positively related to asset ownership as indicated by a path coefficient of 0.044 that was statistically significant at the 1% level, although the magnitude was lower than the effect of formal savings on asset ownership. Moreover, informal savings was associated with lower SWB, as indicated by a statistically significant path coefficient of -0.038. As expected, asset ownership increased SWB as indicated by a positive path coefficient of 0.064 which was statistically significant at the 1% level. Despite informal savers having lower SWB, Table 5.6 below shows that the indirect effect of the informal savings-asset-SWB relationship was positive (0.003) and statistically significant at the 5% level. Hence, the partial mediation of asset holding in the informal-SWB relationship was competitive since the direct and indirect had opposite path coefficient signs. Moreover, the negative VAF value of -0.082 confirms the competitive mediation of asset ownership in the informal savings-SWB relationship.

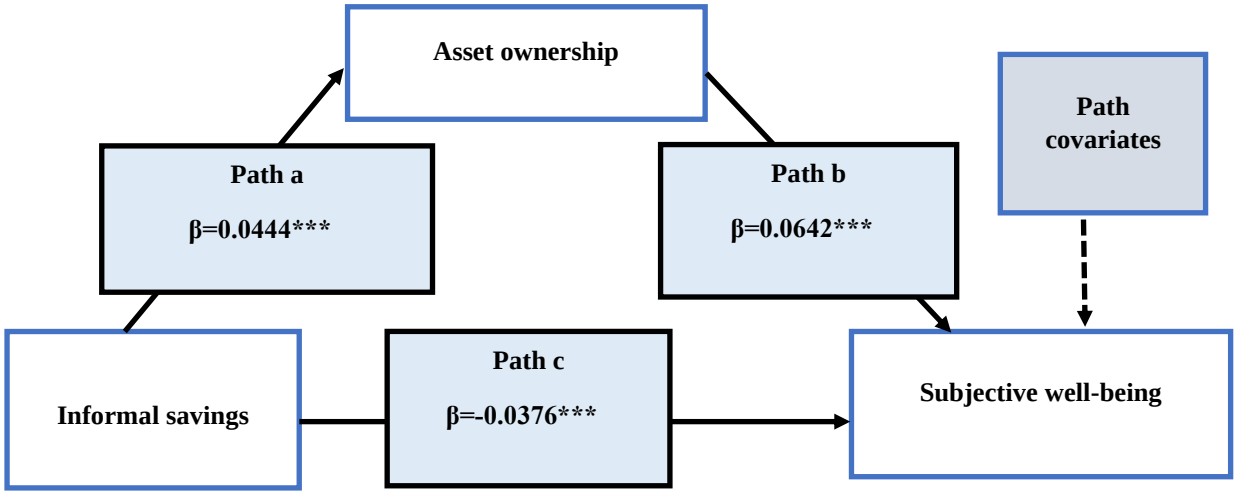


Figure 5.7: Interrelationship between asset ownership, informal savings, and SWB

Table 5.6 below shows the indirect and direct effects of different channels of financial inclusion on SWB. The robustness check indicated that the magnitude of the indirect effect of QFIN on SWB via asset accumulation was lower as compared to formal insurance and formal credit channels. By contrast, the magnitude of the indirect effect of QFIN on SWB via asset accumulation was higher relative to formal saving, informal insurance, and informal saving. Table 5.6 also shows that models 1 to 5 had no challenges of multicollinearity as indicated by a mean VIF that ranged between 1.617 and 1.656 which was below the threshold of 4. However, the adjusted r-squared across the models was slightly above 0.07 which implies that the model had a relatively weak predictive ability of the interrelationship between the variables.

The path coefficients associated with the estimations summarised in Table 5.6 are tabulated in Appendix 5F but were not discussed since this was not the study's focus. There were similarities in the path coefficient signs indicating the association between socio-demographic variables and SWB in models tabulated in Table 5.5 and Appendix 5F. However, gender and age could not explain differences in SWB in the model estimated using the QFIN index. In contrast, the path coefficients of gender and age were statistically significant in the models estimated with narrower measures of financial inclusion as shown in Appendix 5F.

Table 5.6: The indirect and direct effects of various channels of financial inclusion on subjective well-being via asset holding

	Formal insurance	**Formal Credit**	**Formal saving**	**Informal insurance**	**Informal saving**
Indirect effect	0.026	0.028	0.018	-0.009	0.003
Standard error	(0.009)	(0.001)	(0.006)	(0.003)	(0.001)
t-statistic	2.777	2.918	2.798	-2.922	2.050
Direct effect	0.062	0.018	0.038	0.016	-0.038
Standard error	(0.018)	(0.020)	(0.016)	(0.014)	(0.015)
t-statistic	3.415	0.928	2.366	1.424	-2.507
VAF	0.293	0.606	0.318	-1.241	-0.083
Adj. r-squared	0.077	0.076	0.077	0.077	0.078
Mean VIF	1.639	1.656	1.632	1.617	1.620

Notes: The table shows the direct and indirect effects of formal and informal financial services on SWB via asset accumulation. The estimations are based on PLS-PM. Adj. r-squared denotes adjusted r-squared. *** and ** denote $p<0.01$ and $p<0.05$, respectively. In parentheses are robust standard errors estimated using bootstrap with 1000 replications.

5.8. Discussion

The results presented in Section 5.7 above are discussed in this section and they are compared with previous results. Consistent with the study's hypothesis, an increase in QFIN resulted in higher asset holding which, in turn, positively influenced consumers' SWB. These findings are consistent with the study's hypothesis which was based on a combination of the theory of institutional saving, social insurance theory, asset effects theory, and the hierarchy of needs theory as shown in Figure 5.1. However, a robustness check showed that the magnitude of the indirect effect of QFIN on SWB via asset accumulation was lower than the channels of formal credit and formal insurance. Implicitly, asset-building programs that are anchored on formal insurance and formal credit might have a more pronounced indirect effect on SWB.

As discussed above, there was a robustness check to examine how different channels of financial inclusion would influence SWB via asset accumulation as shown in Table 5.6. The result that insurance improved asset holding validates Chetty and Looney's (2006) social insurance model which suggests that insurance contributes to the protection of consumers' assets as they will be unlikely to resort to selling their assets as a coping mechanism when faced with adverse shocks. Moreover, the finding was consistent with previous studies conducted by Janzen and Carter (2019), Kamal and Rana (2019), and Latif and Magazi (2021). However, unlike previous studies, the current study disaggregated insurance into formal and informal channels. Moreover, the results suggested that asset-building programs that encompass formal insurance could be more effective since the study revealed that formal insurance had a higher impact on asset accumulation compared with informal sector insurance.

The result that formal savings increased asset holding is consistent with Sherraden's (1991) institutional theory of saving which suggests that institutionalised savings might help consumers to overcome barriers to saving, thereby enabling them to accumulate assets. Also, the findings echoed the results of studies conducted by Ibrahim (2020), Tita and Aziakpono (2017), and Akotey and Adjasi (2014). However, the positive impact of informal savings on asset ownership was less pronounced compared with formal savings in the study. This suggests that consumers ought to save via formal channels, as this might have a higher impact on asset accumulation.

Moreover, the results of the current study revealed that formal credit increased asset holding, which corroborated the studies conducted by Tadesse and Zewdie (2019), Doss et al. (2020), and Augsburg et al. (2018). This confirmed Quach's (2016) theoretical model on credit and

welfare which suggested that access to formal credit, such as credit cards or bank loans, could improve the welfare of consumers through asset accumulation. That is, consumers could access credit and invest in projects that might generate income which is channelled into purchasing assets.

Similar to Brulé et al. (2020), Cheng et al. (2020), and Zheng et al. (2020), the results of the current study suggested that asset ownership increases consumers' SWB. This corroborates the asset effects theory which suggests that individuals with a higher asset endowment are held in high esteem, which is associated with higher SWB. In addition, the study found that formal savings were positively related to consumers' SWB. This lends support to findings by Crocker and Padilla (2016), Jayasinghe et al. (2020), and Ruberton et al. (2016) who showed that liquidity in the form of savings could increase consumers' life satisfaction. Also, this is consistent with Maslow's (1987) hierarchy of needs theory which implies that savings could satiate financial security needs resulting in lower uncertainty about the future and increasing one's SWB.

Apart from the QFIN of consumers, other covariates of SWB were accounted for in the PLS-PM as shown in Table 5.5. It was evidenced that higher income increased SWB as indicated by the positive income path coefficient. This is because consumers with higher incomes are likely to afford better housing quality and lifestyle, for example, which would contribute to higher SWB (Brulé et al., 2020; Charles et al., 2019; Zhang & Zhang, 2019). However, Easterlin's (2001) paradox posits that absolute income will increase individuals' SWB up to a certain threshold level before an increase in relative income has more influence on an individual's SWB. Therefore, it is unclear whether the increase in absolute income amongst South African consumers might sustainably increase SWB.

Moreover, consumers that were employed had higher SWB compared with the unemployed. This corroborates previous results which suggested that employment increases disposable income and thus would contribute to the maintenance of the standard of living associated with higher SWB (see, for example, Crocker & Padilla, 2016; Kuroki, 2019; Ren et al., 2018). Echoing the results of the studies conducted by Brown and Gray (2016), Zhang and Zhang (2019), and Kuroki (2019), married consumers were reported to have higher SWB compared with unmarried ones. This confirms the argument that married consumers are likely to have more affection and a greater sense of belonging, which would contribute to higher SWB.

Furthermore, the results show that being religious was positively related to SWB. This is consistent with the terror management theory and the life stress paradigm of religion which posit that religiosity might act as a cushion in the face of adversities and induce a positive perspective about life, thereby increasing one's life satisfaction (Greenberg et al., 1986; Schnittker, 2001). Moreover, it was evidenced that improvement in lifestyle, as indicated by the ability to engage in social activities, increased the SWB of consumers and *vice versa*. This confirmed the activity theory which posits that participation in recreational activities is associated with greater life satisfaction (Lemon et al., 1972; Rodríguez et al., 2008). This suggests that consumers' satisfaction with participation in recreational activities would increase their overall life satisfaction (Ragheb & Tate, 1993; Spiers & Walker, 2008).

Echoing previous studies conducted by Kim and Chatterjee (2019) and Sabri et al. (2021), the inability to meet basic living costs (expenditure vulnerability) was found in the study to reduce SWB. This is consistent with the hedonic view of SWB, which suggests that the inability to meet rudimentary living costs, such as food, shelter, and energy might lower consumers' psychological stress resulting in higher SWB (Diener, 2000; Nanda & Banerjee, 2021).

As expected, financial capability and a positive financial attitude increased the SWB of consumers, as posited by Limbu and Sato (2019) and Xiao and Porto (2017). This is because financially literate consumers who have a positive financial attitude are more likely to demonstrate financial resilience-building financial behaviour that likely increases their financial satisfaction, which is a component of life satisfaction.

Contrary to previous studies that found a gender-life satisfaction relationship in favour of males (Lai et al., 2021; Zumbro, 2014), the current study did not find an association between gender and SWB based on the results shown in Table 5.5. However, the results shown in Appendix 5F using disaggregated measures of financial inclusion suggest that there is a weak association between gender and SWB. Therefore, it is reasonable to argue that the gender-SWB link was sensitive to the model estimation in the current study.

5.9 Conclusion

Income transfer alone might not adequately reduce poverty and improve the welfare of consumers. Therefore, governments have been evaluating the potential benefits of asset-building policies as a pathway to improve consumers' welfare, particularly amongst low-

income households. In addition, savings, credit, and insurance have been included in asset-building policies as this might contribute to asset accumulation.

Several studies have confirmed that savings, credit, and insurance could increase asset holding. However, there has been no inquiry into whether asset accumulation through savings, credit, and insurance could enhance consumers' SWB. To fill this knowledge gap, contributed to the literature by testing a hypothesis that an increase in the quality of financial inclusion among consumers would increase asset accumulation and, in turn, increase their SWB. Given that no single theory can explain this complex relationship, this hypothesis was based on a combination of social insurance theory, institutionalised saving theory, asset effects theory, and hierarchy of needs theory. The study leveraged the FinScope 2015 consumer survey of South Africa to examine the interrelationship between QFIN, asset ownership, and SWB.

Using PLS-PM, the results confirmed the study's hypothesis that an increase in QFIN increased asset ownership which, in turn, enhanced the SWB of consumers. Moreover, there was complementary partial mediation in the interrelationship between QFIN, asset accumulation, and SWB. Although the result was consistent with expectations, a robustness check showed that the magnitude of the indirect effect of formal credit and formal insurance on SWB via asset accumulation was greater as compared to QFIN.

Several lessons can be drawn from these results. Firstly, as high SWB increases productivity, healthy habits, longevity, and innovativeness (Neve et al., 2013; Oswald et al., 2015), policymakers should formulate asset-building programs with the aforesaid macroeconomic implications in mind. Secondly, policymakers in South Africa ought to encourage inclusive asset-building programs anchored in formal insurance and formal credit since the study reported that these channels have a more pronounced positive effect on consumers' SWB.

Despite the positive practical and policy implications, a follow-up study could consider whether culture could moderate the interrelationship between QFIN, asset ownership, and SWB using a cross-country dataset. This is because Brulé et al. (2020) and Diener et al. (1999) argue that cultural norms could mediate the relationship between material wealth and SWB since some societies are more materialistic than others.

APPENDICES

Appendix 5A: Description of asset index indicators and coding

	Item	Yes	No
1	Tap water in your house or your property	1	0
2	Hot running water from a geyser	1	0
3	Flush toilet inside or outside	1	0
4	Built-in kitchen sink	1	0
5	Ordinary telephone	1	0
6	Cell phone	1	0
7	More than 1 radio (excluding car radio)	1	0
8	Swimming pool	1	0
9	Television set	1	0
10	Air conditioner (not just a fan)	1	0
11	Any kind of DVD or Blu-Ray player	1	0
12	Home theatre system	1	0
13	Personal computer	1	0
14	Fridge (including combined fridge or freezer)	1	0
15	Deep freezer (free standing)	1	0
16	Electric stove	1	0
17	Microwave oven	1	0
18	Floor polisher or vacuum cleaner	1	0
19	Washing machine	1	0
20	Tumble dryer	1	0
21	Dishwashing machine	1	0
22	Motor car	1	0

Notes: The question on asset ownership was framed as follows “Please tell me which of these, if any, are presently in your household or apply to your household”. The table provides a summary of the asset indicators which constituted the asset index computed using MCA.

Appendix 5B: Squared correlations between the asset index and the indicator variables

Item	Coding	Coord. sqcorr	sqcorr	contr.	Item	Coding	Coord. sqcorr	sqcorr	contr.
Tap water on your property	1	0.291	0.830	0.004	Personal computer	1	2.230	0.927	0.050
	0	-2.458	0.830	0.030		0	-0.598	0.927	0.013
Hot running water from a geyser	1	1.576	0.930	0.052	Fridge	1	0.285	0.752	0.003
	0	-1.254	0.930	0.042		0	-2.318	0.752	0.028
Flush toilet inside or outside	1	0.703	0.871	0.017	Deep freezer	1	1.694	0.951	0.035
	0	-1.992	0.871	0.049		0	-0.575	0.951	0.012
Built-in kitchen sink	1	1.091	0.920	0.034	Electric stove	1	0.242	0.744	0.003
	0	-1.594	0.920	0.049		0	-2.586	0.744	0.027
Ordinary telephone	1	2.278	0.949	0.016	Microwave oven	1	0.804	0.912	0.021
	0	-0.162	0.949	0.001		0	-1.833	0.912	0.049
More than 1 radio	1	0.770	0.901	0.005	Floor polisher or vacuum cleaner	1	2.258	0.908	0.048
	0	-0.182	0.901	0.001		0	-0.554	0.908	0.012
Swimming pool	1	3.104	0.802	0.021	Washing machine	1	1.478	0.942	0.048
	0	-0.146	0.802	0.001		0	-1.258	0.942	0.041
Television set	1	0.165	0.669	0.001	Tumble dryer	1	2.603	0.887	0.041
	0	-2.640	0.669	0.020		0	-0.377	0.887	0.006
Air conditioner	1	2.910	0.855	0.035	Dishwashing machine	1	3.236	0.809	0.030
	0	-0.276	0.855	0.003		0	-0.209	0.809	0.002
Any kind of DVD player	1	0.580	0.949	0.010	Motor car	1	1.895	0.930	0.057
	0	-0.994	0.949	0.017		0	-0.949	0.930	0.029
Home theatre system	1	1.009	0.994	0.021					
	0	-0.750	0.994	0.015					

Notes: The table shows squared correlations between the asset index and the indicator variables. Contribution, coordinates squared correlation, and squared correlation is denoted by contr, coord sqcorr, and sqcorr, respectively.

Appendix 5C: Covariates of subjective well-being

Description	Coding
Lifestyle index	
Eaten out at a branded family restaurant such as Spur and Saddles	(0-Yes, 1-No)
Attended a live performance at the theatre	(0-Yes, 1-No)
Attended a social event such as a gala dinner	(0-Yes, 1-No)
Eaten out at an exclusive restaurant	(0-Yes, 1-No)
Member of a boat club or yacht club	(0-Yes, 1-No)
Basic living costs index	
Gone without enough food to eat because you did not have enough money to buy food	(4-Often; 3-Sometimes; 2-Rarely; 1-Never)
Gone without medicine or medical treatment that was needed	(4-Often; 3-Sometimes; 2-Rarely; 1-Never)
Gone without energy to heat your home or cook food except for blackouts or load shedding	(4-Often; 3-Sometimes; 2-Rarely; 1-Never)
Financial awareness index	
You understand the difference between banking products offered	(1-Yes; 0-No)
You understand the difference between banks	(1-Yes; 0-No)
You are sure which bank account is the best one for you	(1-Yes; 0-No)
You have heard of a village or cooperative bank	(2-Yes; 1-Sometimes; 0-No)
You have heard of the ombudsman	(2-Yes; 1-Sometimes; 0-No)
Financial capability index	
When buying a product or service, you ensure that the features of the product or service are explained to you	(2-Yes; 1-Sometimes; 0-No)
Before buying a product or service, you get alternative quotes from other providers	(2-Yes; 1-Sometimes; 0-No)
You understand how long your loans would take to pay back	(2-Yes; 1-Sometimes; 0-No)
You know how much you need to spend on your premiums	(2-Yes; 1-Sometimes; 0-No)
You have written up a plan or budget for your spending and earnings to make sure they balance	(2-Yes; 1-Sometimes; 0-No)
You keep track of the money that you get and spend	(2-Yes; 1-Sometimes; 0-No)

Note: The table shows the framing of the questions related to the indicators of the lifestyle index, basic living cost index, and financial capability index.

Appendix 5E: Comparison between consumer survey data from the National Income Dynamics Study 2017 and FinScope 2015

Category	Variable	NIDS 2017	FinScope 2015
Control variables	Gender	Yes	Yes
	Employment status	Yes	Yes
	Income	Yes	Yes
	Social grants	Yes	Yes
	Education	Yes	Yes
	Life satisfaction	Yes	Yes
	Religiosity	Yes	Yes
	Financial knowledge	Yes	No
	Financial capability	No	Yes
	Financial attitude	No	Yes
	Financial awareness	No	Yes
	Recreational activities	No	Yes
	Basic living costs	No	Yes
Asset ownership	Assets	Yes	Yes
Financial product use	Formal insurance	Life insurance and medical aid	Insurance on the following: household possessions, vehicle, property, agricultural equipment, medical, dreaded disease insurance, life, loan protection, legal fees, salary/income
	Informal saving	Saving clubs and stokvel	Stokvel, saving club, home saving, village bank saving, money with family
	Formal credit	Yes	Yes
	Informal credit	Yes	Yes
	Informal insurance	No	Funeral cover with an undertaker; funeral cover through the church; funeral cover through the funeral home; burial society
	Formal saving	No	Savings book at a bank, savings account, money market account, post office savings account, fixed/notice 32 deposit account
	Indicators of quality financial inclusion	No	Yes

Appendix 5F: Path coefficients of subjective well-being from the PLS-PM estimations using various channels of financial inclusion

Path coefficients		Formal Insurance		Formal Credit		Formal saving		Informal insurance		Informal savings	
from	**to**	**Bootstrap Mean**	**T Stat.**	**Bootstrap Mean**	**T Stat.**	**Bootstrap Mean**	**T Stat.**	**Bootstrap Mean**	**T Stat.**	**Bootstrap Mean**	**T Stat.**
financial inclusion	assets	0.405*** (0.012)	34.231	0.418*** (0.012)	34.066	0.264*** (0.014)	19.467	-0.129*** (0.013)	-9.907	0.044*** (0.014)	3.270
assets	swb	0.063 (0.023)	2.791	0.068*** (0.023)	2.940	0.068*** (0.024)	2.826	0.069*** (0.023)	3.034	0.064*** (0.023)	2.815
financial inclusion	swb	0.062*** (0.018)	3.415	0.018 (0.020)	0.928	0.038** (0.016)	2.366	0.016 (0.014)	1.424	-0.038** (0.015)	-2.507
gender	swb	-0.023* (0.014)	-1.670	-0.025* (0.014)	-1.784	-0.025* (0.014)	-1.747	-0.023* (0.014)	-1.660	-0.026* (0.014)	-1.935
religiosity	swb	0.046*** (0.014)	3.309	0.045*** (0.014)	3.151	0.046*** (0.014)	3.245	0.046*** (0.014)	3.260	0.044*** (0.014)	3.164
financial attitude	swb	0.049*** (0.014)	3.564	0.051*** (0.013)	3.789	0.050*** (0.014)	3.627	0.051*** (0.014)	3.666	0.050*** (0.014)	3.608
basic living costs	swb	0.100*** (0.015)	6.781	0.100*** (0.015)	6.674	0.100*** (0.016)	6.426	0.101*** (0.015)	6.642	0.097*** (0.015)	6.493
financial awareness	swb	-0.001 (0.020)	-0.018	0.001 (0.020)	0.032	-0.003 (0.021)	-0.153	-0.001 (0.020)	-0.030	0.001 (0.020)	0.023
financial capability	swb	0.041** (0.020)	2.091	0.051*** (0.019)	2.675	0.048** (0.019)	2.528	0.049** (0.019)	2.549	0.057*** (0.019)	3.029
income	swb	0.038** (0.018)	2.127	0.040** (0.018)	2.299	0.039** (0.018)	2.206	0.039** (0.017)	2.314	0.040** (0.018)	2.256

Notes: The estimations are based on the PLS-PM estimated using bootstrapping at 1000 replications. ***p<0.01, **p<0.05, p<0.10. In parentheses are robust standard errors. T-stat represents t-statistic.

Path coefficients		Formal Insurance		Formal Credit		Formal saving		Informal insurance		Informal savings	
	to	Bootstrap Mean	T Stat.	Bootstrap Mean	T Stat.	Bootstrap Mean	T Stat.	Bootstrap Mean	T Stat.	Bootstrap Mean	T Stat.
urban	swb	-0.037*	-1.736	-0.040*	-1.771	-0.040*	-1.754	-0.037*	-1.751	-0.040*	-1.792
		(0.022)		(0.022)		(0.023)		(0.022)		(0.022)	
small urban	swb	-0.020	-0.979	-0.022	-1.067	-0.023	-1.031	-0.019	-1.010	-0.024	-1.103
		(0.021)		(0.020)		(0.021)		(0.020)		(0.021)	
age	swb	-0.031*	-1.890	-0.027*	-1.665	-0.028*	-1.728	-0.030*	-1.868	-0.027	-1.611
		(0.016)		(0.016)		(0.016)		(0.016)		(0.016)	
post-secondary	swb	-0.058***	-3.221	-0.054***	-3.017	-0.056***	-3.226	-0.055***	-3.128	-0.056***	-3.154
		(0.018)		(0.018)		(0.017)		(0.018)		(0.018)	
no formal education	swb	-0.024*	-1.802	-0.026*	-1.798	-0.024*	-1.833	-0.025*	-1.821	-0.025*	-1.911
		(0.013)		(0.014)		(0.013)		(0.014)		(0.014)	
lower secondary	swb	-0.028	-1.637	-0.031*	-1.832	-0.028	-1.636	-0.031*	-1.796	-0.031*	-1.938
		(0.017)		(0.017)		(0.018)		(0.017)		(0.017)	
primary education	swb	-0.050***	-3.100	-0.051***	-3.353	-0.049***	-3.118	-0.051***	-3.265	-0.050***	-3.280
		(0.016)		(0.015)		(0.016)		(0.016)		(0.016)	
unemployed	swb	-0.049***	-2.890	-0.055***	-3.069	-0.049***	-2.771	-0.052***	-2.999	-0.056***	-3.285
		(0.017)		(0.018)		(0.018)		(0.017)		(0.017)	
formal employment	swb	-0.046***	-3.041	-0.049***	-3.132	-0.047***	-3.173	-0.048***	-3.288	-0.047***	-3.179
		(0.015)		(0.016)		(0.015)		(0.015)		(0.015)	
economically inactive	swb	0.028	1.568	0.025	1.395	0.030*	1.688	0.028	1.552	0.025	1.514
		(0.018)		(0.018)		(0.018)		(0.018)		(0.017)	
married	swb	0.024	1.613	0.026*	1.650	0.026*	1.697	0.026*	1.665	0.025	1.641
		(0.015)		(0.015)		(0.015)		(0.015)		(0.015)	
lifestyle	swb	0.058***	3.006	0.062***	3.129	0.060***	3.181	0.061***	3.069	0.066***	3.295
		(0.019)		(0.020)		(0.019)		(0.020)		(0.020)	

CHAPTER SIX

CONCLUSION AND POLICY RECOMMENDATIONS

6.1 Introduction

Financial inclusion has been on the policy agenda for development finance institutions and several developing countries in recent decades (Beck, 2016). This is because financial inclusion has been identified as a pathway to enhance consumers' welfare as indicated by financial resilience, asset accumulation, and lower financial vulnerability (Latif & Magazi, 2021; Lyons et al., 2020). While 84% of South African adults own bank accounts, consumers remain mildly financially vulnerable and the life satisfaction of consumers remains low, especially when compared to OECD countries. Therefore, it becomes imperative for policymakers to go beyond the provision of basic financial products and consider a more comprehensive yardstick of quality financial inclusion (QFIN) to enhance consumers' welfare. On the other hand, the need to build financial resilience has been brought to the fore by the COVID-19 pandemic which negatively affected the livelihoods of consumers, particularly in developing countries. By building financial resilience and reducing their financial vulnerability, consumers are more likely to be satisfied with life, according to the hedonic view of subjective well-being (Diener, 2000; Nanda & Banerjee, 2021).

In light of the above, the first objective, addressed in Chapter 2, was to compute the QFIN index from a demand-side perspective using PPCA. This was an extension of previous studies that computed indices but had not captured quality indicators of affordability and appropriateness of financial products and services while some had not included indicators of flexible financial products.

The second objective, addressed in Chapter 3, investigated the impact of QFIN on consumers at various levels of financial vulnerability using methods of moments quantile regression. This study makes a methodological contribution by computing a multidimensional financial vulnerability index that jointly captured expenditure vulnerability, lifestyle vulnerability, and saving vulnerability. Saving vulnerability and lifestyle vulnerability is important in the measurement of financial vulnerability because lower vulnerability across these dimensions could also contribute to higher SWB, according to the hedonic view of SWB (Nanda & Barnejee, 2021). This is a departure from existing consumer financial vulnerability indices that

capture indicators of meeting basic living costs (expenditure vulnerability), ability to raise emergency funds, and indebtedness. Moreover, this study employed a multidimensional index of QFIN and examine its association with financial vulnerability, unlike previous studies which relied on narrower indices or single indicators.

The third objective, addressed in Chapter 4, contributed to the empirical literature by investigating whether various channels of financial inclusion could build financial resilience to the COVID-19-induced income shock. Unlike previous studies that focused on financial resilience to covariate shocks that were agricultural sector-specific and region-specific weather shocks, this study focused on financial resilience to a nationwide economic shock that negatively affected the incomes of most consumers.

The fourth objective, addressed in Chapter 5, investigated the interrelationship between QFIN, asset accumulation, and SWB. Previous studies had investigated the impact of the use of financial products on asset accumulation, but no study has investigated how this would, in turn, influence the SWB of consumers. Moreover, previous studies had examined asset accumulation using single indicators of saving, insurance, and credit. Therefore, the study used a composite index to examine whether an increase in quality financial inclusion could increase asset holding and, in turn, increase the SWB of consumers.

This chapter accomplishes three purposes. Firstly, it explains the summary of the results. Secondly, it highlights the contributions that emerged from the study, and thirdly, it explains the implications of the results. Lastly, the chapter outlines the limitations of each part of the empirical study, which could inform future research.

6.2 Summary of the results

6.2.1 Quality financial inclusion and its determinants in South Africa

The first part of the empirical research used the FinScope 2015 consumer survey dataset of South Africa to compute a composite index of QFIN using PPCA. To rank consumers, quintile analysis was used, and it was observed that consumers in higher quintiles had a broader suite of financial products and perceived the products to be affordable and appropriate. Conversely, consumers in lower quintiles used a relatively narrow array of financial products and perceived financial products to be inappropriate and unaffordable. Thereafter, a heteroscedastic-consistent OLS regression was estimated to examine the QFIN determinants. The results showed that females, entrepreneurs, urbanites, consumers 45 years old and above, those with a

higher income, more financially literate consumers, and those with higher education qualifications experienced higher QFIN. A robustness check using probit analysis showed that slope coefficient signs of the determinants of bank account ownership, saving account ownership, and QFIN were similar except for geographical location and bank distance.

6.2.2 Impact of quality financial inclusion on financial vulnerability in South Africa

Using the QFIN index developed in Chapter 2, the methods of moments quantile regression was applied to examine the impact of QFIN on consumers with various levels of financial vulnerability. This study leveraged the FinScope 2015 consumer survey data of South Africa to compute a composite financial vulnerability index that captured the dimensions of savings vulnerability, lifestyle vulnerability, and expenditure vulnerability using PPCA. The results revealed that financial vulnerability was lower among consumers with the highest QFIN (top 20%), but the effect was attenuated at higher levels of financial vulnerability. Moreover, being female and having higher financial literacy, income, and education qualification was associated with lower financial vulnerability, although this was heterogeneous across the financial vulnerability distribution.

For robustness, the financial vulnerability index was regressed against single indicators of bank account ownership, informal savings, and a narrower financial inclusion index that excluded the indicators of flexibility, affordability, and appropriateness. The results revealed that bank account owners at the right tail of financial vulnerability distribution were more vulnerable, whereas the magnitude of the decline in financial vulnerability was small using a narrower financial inclusion index that excluded quality indicators. This suggested that a broader suite of quality financial products that are affordable and appropriate has a more pronounced impact on reducing consumers' financial vulnerability.

6.2.3 The role of financial inclusion in building financial resilience to COVID-19-induced income shock in South Africa

The third part of the study examined the channels through which financial inclusion could build financial resilience to an adverse income shock induced by COVID-19. The reason for using disaggregated measures of financial inclusion was a lack of data related to the QFIN index in the FinScope 2021 consumer survey data from South Africa. Using the nearest neighbour matching and kernel matching, the results showed that consumers who saved, insured, and borrowed through formal channels did not have a statistically significant decline in

consumption after the income shock induced by COVID-19. However, users of mobile transfer services and informal financial services experienced a statistically significant decline in their ability to meet basic living costs following the income shock induced by the COVID-19 pandemic. Further analysis revealed that the inability to meet basic living costs after the COVID-19-induced income shock was more pronounced amongst indebted consumers who used informal financial services and mobile financial services. Thus, the obligation to reimburse creditors might have lowered liquidity after the shock and reduced the resilience-building effect of various channels of financial inclusion after the COVID-19-induced income shock.

6.2.4 Exploring the interrelationship between quality financial inclusion, asset accumulation, and subjective well-being in South Africa

The fourth part of the study investigated the interrelationship between QFIN, asset accumulation, and the SWB of consumers using the FinScope 2015 consumer survey data from South Africa. Consistent with expectations, QFIN was associated with an increase in asset ownership and, in turn, improvement in the SWB of consumers based on the partial least squares path model estimations. Given that the variance accounted for was between 0.2 and 0.8, it implied that there was competitive partial mediation in the interrelationship between QFIN, asset accumulation, and SWB. However, further analysis revealed that the channels of formal insurance and formal credit had a more pronounced indirect effect on SWB via asset accumulation *vis-à-vis* the QFIN indicator.

6.3 Contribution of the study

The study set out to contribute to the literature by examining the impact of QFIN on consumer welfare as indicated by financial vulnerability, financial resilience, and SWB. Key contributions of the study are presented as follows:

6.3.1 Methodological contribution

While financial inclusion has been at the forefront of policy, there is no consensus on how it is measured. From a demand-side perspective, previous attempts to compute indices of financial inclusion have excluded dimensions of appropriateness, flexibility, and affordability. As such, previous composite measures have not been adequate given that financial inclusion should be measured and analysed through multiple dimensions (Camara & Tuesta, 2018; Mialou et al., 2017). Moreover, Tram et al. (2021) contend that the computation of financial inclusion with

multiple indicators and dimensions will be helpful in the assessment of the impact of financial inclusion and enhance policy recommendations. Therefore, this study contributes to the literature by proposing a multi-dimensional index of QFIN from a demand-side perspective that captures the diversity, affordability, flexibility, and appropriateness of financial products.

Furthermore, there is no consensus on the measurement of consumer financial vulnerability. The composite indices in previous studies captured the inability to raise emergency funds, indebtedness, and inability to meet basic living costs (expenditure vulnerability) (see, for example, Arestis et al., 2021; Bruce et al., 2022; Fernández-López et al., 2022; Nemeth et al., 2020; Singh & Malik, 2022). However, existing composite indices of financial vulnerability have excluded dimensions of inability to engage in social activities (lifestyle vulnerability) and to save after meeting covering basic living costs (saving vulnerability). Though the Bureau of Market Research computes the consumer financial vulnerability index of South Africans, it is based on the perceptions of key informants in the industry which has the challenge of not capturing the consumers' perspective regarding their level of financial vulnerability.

Considering the above, the study makes a methodological contribution by computing a consumer financial vulnerability index that encapsulates lifestyle vulnerability, expenditure vulnerability, and saving vulnerability. Moreover, previous studies examining the link between financial inclusion and financial vulnerability had focused on single indicators of social activities and the ability to meet basic living costs, which differs from the current study that used a multi-dimensional index of financial vulnerability. A multi-dimensional index of financial vulnerability is required because focusing on single indicators or a few dimensions might underestimate the extent of consumers' financial vulnerability (O'Connor et al., 2019; Salignac et al., 2019). Moreover, focusing on multiple dimensions of financial vulnerability is important because it captures various facets that contribute to consumers' evaluation of life, according to the hedonic view of SWB (Nanda & Banerjee, 2021).

6.3.2 Theoretical contribution

Several studies have examined the effect of savings, insurance, and credit on asset accumulation (see, for example, Tita & Aziakpono, 2017; Latif & Magazi, 2021; Augsburg et al., 2018; Doss et al., 2020). However, these studies did not examine whether these different financial inclusion channels could increase asset ownership and, in turn, enhance consumers' SWB. Therefore, the study tested the hypothesis that QFIN increases asset accumulation and, in turn, increases consumers' SWB. This indirect hypothesis, however, cannot be explained by

one theory, but by several other theories. That is, the social insurance theory, institutional theory of saving and Quach's (2016) theoretical model suggest that insurance, saving, and credit use contribute to asset accumulation. In turn, the asset effects theory posits that a higher asset endowment will enhance consumers' SWB. Therefore, the study contributed to the theory by jointly testing these theories to examine whether QFIN increases asset accumulation and, in turn, increases consumers' SWB.

Furthermore, the risk-sharing theories, social insurance, and precautionary saving theory have been tested in several studies which examined the role of various channels of financial inclusion in building financial resilience to adverse shocks. However, these studies mostly focused on agriculture-sector-specific shocks, health shocks, and region-specific weather shocks (see, for example, Afawubo et al., 2020; Geng et al., 2018; Naito et al., 2021; Suri et al., 2021; Tabetando & Matsumoto, 2020). As such, these theories have not been tested under a nationwide adverse economic shock that negatively affected consumers' income. Against this backdrop, this study contributed to the literature by testing the risk-sharing theory, social insurance theory, and precautionary saving theory during the COVID-19 pandemic, a nationwide adverse economic shock that contributed to a decline in most consumers' income. This will also guide other developing African countries on how various channels of financial inclusion could build financial resilience to future adverse economic shocks.

Moreover, the debt intermediation theory, complementarity hypothesis, and social insurance theory explain how the welfare of consumers could be enhanced through using credit, saving, and purchasing insurance, respectively. Given that no single theory explains how QFIN can influence financial vulnerability, the study contributed to the theoretical literature by leveraging the complementary hypothesis, social insurance theory, and debt intermediation theory to examine the link between QFIN and the financial vulnerability of consumers. The study's findings confirmed the theories considering that consumers that used diverse quality financial products, captured in the QFIN index, were less financially vulnerable.

6.3.3 Policy contribution

The study is based on South African data, but it is relevant and contributes to policy in other developing African countries as well. South Africa's bank account ownership has grown to 84% among adults and exceeds the global average of 76% (Demirgüç-Kunt et al., 2022), but its consumers are regarded to be financially vulnerable (Bureau of Market Research, 2021). That is, the Bureau of Market Research (2021) suggests that most consumers in South Africa

still face difficulty in meeting basic living costs and do not have savings to meet their liquidity needs. Given that previous studies have narrowly measured financial inclusion, this study examined whether QFIN is associated with lower financial vulnerability among consumers. While the findings are based on South Africa's context, they inform policy in other developing countries on the extent to which improving the quality of financial inclusion could mitigate financial vulnerability among consumers.

In addition, the study uses the South African context to assess whether QFIN could influence asset accumulation and, in turn, influences the SWB of consumers. Noteworthy, 84% of South African adults have bank accounts but the life satisfaction score in South Africa is 4.7 compared with the OECD average of 6.7 on a scale of 0-10. This suggests that ownership of bank accounts may not guarantee an improvement in the life satisfaction of consumers. Therefore, other developing African countries can draw lessons from South Africa's case on how asset-building programs anchored on a broader set of quality financial products could improve the SWB of consumers. The enhancement of SWB via asset building becomes relevant considering that consumers with higher SWB are more productive and innovative, which has positive ramifications on economic growth (Neve et al., 2013; Oswald et al., 2015).

Furthermore, the study examined how various channels of financial inclusion contributed to building financial resilience to an income shock induced by the global COVID-19 pandemic in South Africa's context. It should be noted that South Africa was one of the worst affected by the COVID-19 pandemic considering that it had the largest decline in national income in Africa between 2020 and 2021 (Awoyemi et al., 2022), and accounted for 40% of the COVID-19 related deaths in Africa (World Health Organisation, 2022). Moreover, more than 2.2 million jobs were lost in the first quarter of 2020 despite regaining 40% of lost jobs by mid-2021 (World Bank, 2021). Consequently, most consumers experienced a decline in income due to the rise of unemployment. Against this backdrop, the study's findings based on South Africa's context inform other African developing countries on the extent to which increasing access to formal financial services could bolster financial resilience to future adverse economic shocks. This is timely and consistent with the World Bank's COVID-19 Crisis Response to Resilient Recovery which is considering strategies to build financial resilience to adverse economic shocks, particularly in developing countries that were mostly affected.

6.4 Recommendations

This section highlights the key implications of the study's findings. Firstly, the proposed index of QFIN could be used by researchers to analyse the welfare effects of improving the quality of financial inclusion. Secondly, considering that consumers with the highest QFIN (top 20%) had a statistically significant reduction in financial vulnerability, policymakers should strive to improve the quality of financial inclusion since it contributes to the mitigation of consumer financial vulnerability. Moreover, financial service providers are encouraged to engage in a bottom-up approach to designing quality financial products and services to enhance consumer welfare. Also, the empirical evidence suggested that only the top 40% of income earners were less financially vulnerable implying that efforts to reduce income inequality should complement QFIN as a policy lever to reduce financial vulnerability amongst consumers.

Thirdly, QFIN policy should be complemented with financial education programs targeting debt management to enable financially included consumers to become more financially resilient to nationwide covariate shocks of an economic nature. In addition, there should be increased access to formal financial products and financial education on the importance of using formal financial services to build financial resilience to future adverse shocks. This is because consumers who were financially included via informal channels experienced hardships in meeting basic living costs after the income shock induced by the COVID-19 pandemic.

Fourthly, the empirical results underscore the need for policymakers to enhance the quality of financial inclusion as this could indirectly enhance the SWB of consumers. The policies that ameliorate the SWB of consumers are pertinent because an increase in SWB is associated with higher innovation and productivity which, in turn, would have a positive trickle-down effect on the macroeconomy (Neve et al., 2013; Oswald et al., 2015). However, formal credit and formal savings need to be prioritised by social policymakers in initiating asset-building programs because they had a greater indirect effect on consumers' SWB via asset accumulation.

6.5 Limitations of the study and directions for future research

Notwithstanding the study's implications and contribution, it has some limitations that could be addressed in future research. In the first part of the study, owing to data limitations, the computation of the QFIN index was limited to South Africa and excluded the use of fintech

products. Therefore, the study could be extended by computing a broader QFIN index capturing the use of fintech products and using data collected from other countries in Sub-Saharan Africa.

The second part of the study relied on a cross-sectional dataset from South Africa and thus could not establish the impact of QFIN on financial vulnerability in both the long run and short run. Thus, when repeated cross-sectional data with relevant variables becomes available, pseudo-panel data techniques could be used to examine the causal dynamics of the long-run effect of QFIN on the financial vulnerability of consumers.

Similarly, in the third part of the study, a panel dataset could have permitted a dynamic analysis of the impact of various channels of financial inclusion on financial resilience to COVID-19-induced shock during the different waves of the pandemic. Also, a panel dataset could have provided more efficient estimates since it contains information on both the intertemporal dynamics and the individual entities (Hsiao, 2006).

Furthermore, the fourth part of the study could be extended by investigating how cultural differences could be a mediator in the interrelationship between QFIN, asset ownership, and SWB in a cross-country setup. This is because there might be heterogeneity in the effects of asset ownership on SWB since some cultures are more materialistic than others (Brulé et al., 2020; Diener et al., 1999).

REFERENCES

Abadie, A., & Imbens, G. W. (2006). Large sample properties of matching estimators for average treatment effects. *Econometrica*, *74*(1), 235–267.

Abel, S., Mutandwa, L., & Roux, P. L. (2018). A review of determinants of financial inclusion. *International Journal of Economics and Financial Issues*, *8*(3), 1–8.

Abimbola, A. O., Egbide, B. C., Adekunle, A., Damilola, E., Adebanjo, F. F., & Abiodun, A. S. (2020). Rotating and savings credit association (ROSCAs): A veritable tool for enhancing the performance of micro and small enterprises in Nigeria. *Asian Economic and Financial Review*, *10*(2), 189–199.

Abiona, O., & Koppensteiner, M. F. (2020). Financial inclusion, shocks, and poverty: Evidence from the expansion of mobile money in Tanzania. *Journal of Human Resources*, *1*, 1–63.

Afawubo, K., Couchoro, M. K., Agbaglah, M., & Gbandi, T. (2020). Mobile money adoption and households' vulnerability to shocks: Evidence from Togo. *Applied Economics*, *52*(10), 1141–1162.

AFI. (2016). *Indicators of the quality dimension of financial inclusion* (Alliance for Financial Inclusion Working Paper No. 22). https://www.afi-global.org/sites/default/files/publications/2016-08/Guideline%20Note-22%20FID-Quality.pdf

Ahmed, H., & Cowan, B. W. (2021). Mobile money and healthcare use: Evidence from East Africa. *World Development*, *141*, 1–13.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. SAGE.

Ajija, S. R., & Siddiqui, A. I. (2021). Impact of joining rotating savings and credit association (ROSCA) on household assets in Indonesia. *Journal of Developing Areas*, *55*(3), 205–216.

Akampumuza, P., & Matsuda, H. (2017). Weather shocks and urban livelihood strategies: The gender dimension of household vulnerability in the Kumi district of Uganda. *Journal of Development Studies*, *53*(6), 953–970.

Akileng, G., Lawino, G. M., & Nzibonera, E. (2018). Evaluation of determinants of financial inclusion in Uganda. *Journal of Applied Finance and Banking*, *8*(4), 47–66.

Akotey, J., & Adjasi, C. (2014). The Impact of Microinsurance on Household Asset Accumulation in Ghana: An Asset Index Approach. *The Geneva Papers on Risk and Insurance - Issues and Practice*, *39*(2), 304–321.

Akudugu, M. A. (2013). The determinants of financial inclusion in Western Africa: Insights from Ghana. *Research Journal of Finance and Accounting*, *4*(8), 1–10.

Ali, L., Khan, M. K. N., & Ahmad, H. (2020). Education of the head and financial vulnerability of households: Evidence from a household's survey data in Pakistan. *Social Indicators Research*, *147*(2), 439–463.

Allen, F., Demirguc-Kunt, A., Klapper, L., & Martinez Peria, M. S. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of Financial Intermediation*, *27*, 1–30.

Allonso-Villar, O., Del Rio, C., & Gradin, C. (2012). The extent of occupational segregation in the United States: Differences by race, ethnicity, and gender. *Journal of Economy and Society*, *51*, 179–212.

Amidzic, G., Massara, A., & Mialou, A. (2017). Assessing countries' financial inclusion standing—A new composite index. *Journal of Banking and Financial Economics*, *2017*(8), 105–126.

Ampudia, M., van Vlokhoven, H., & Żochowski, D. (2016). Financial fragility of Euro area households. *Journal of Financial Stability*, *27*(1), 250–262.

Anderloni, L., Bacchiocchi, E., & Vandone, D. (2012). Household financial vulnerability: An empirical analysis. *Research in Economics*, *66*(3), 284–296.

Andersson, C., Mekonnen, A., & Stage, J. (2011). Impacts of the productive safety net programme in Ethiopia on livestock and tree holdings of rural households. *Journal of Development Economics*, *94*(1), 119–126.

Ando, A., & Modigliani, F. (1963). The 'life cycle' hypothesis of saving: Aggregate implications and tests. *American Economic Review*, *53*(1), 55–84.

Arellano, A., Cámara, N., & Mejía, D. (2019). *Disentangling vulnerability through consumer behaviour: The role of financial health* (BBVA ResearchWorking Paper No. 19/11). https://www.fxstreet.com/education/disentangling-vulnerability-through-consumer-behavior-the-role-of-financial-health-201908301035

Arestis, P., Corrado, G., & Corrado, L. (2021). Shocks, financial constraints and households' consumption amid the great recession. *Panoeconomicus*, *68*(1), 1–33.

Aslan, G., Deléchat, C., Newiak, M., & Yang, F. (2017). *Inequality in financial inclusion and income inequality* (International Monetary Fund Working Paper No. 17/236). https://elibrary.imf.org/view/journals/001/2017/236/001.2017.issue-236-en.xml

Asselin, L., & Anh, V. T. (2008). Multidimensional poverty and multiple correspondence analysis. In N. Kakwani & J. Silber (Eds.), *Quantitative approaches to multidimensional poverty measurement* (pp. 80–103). Palgrave Macmillan UK.

Asuming, P. O., Osei-Agyei, L. G., & Mohammed, J. I. (2019). Financial inclusion in Sub-Saharan Africa: Recent trends and determinants. *Journal of African Business*, *20*(1), 112–134.

Aterido, R., Beck, T., & Iacovone, L. (2013). Access to finance in Sub-Saharan Africa: Is there a gender gap? *World Development*, *47*, 102–120.

Atkinson, A., & Messy, F. (2011). Assessing financial literacy in 12 countries: An OECD/INFE international pilot exercise. *Journal of Pension Economics and Finance*, *10*(4), 657–665.

Augsburg, B., Caeyers, B., Giunti, S., Malde, B., & Smets, S. (2018). *Labelled loans, credit constraints and sanitation investments* (World Bank Group Working Paper No. 8845). https://openknowledge.worldbank.org/bitstream/handle/10986/31670/WPS8845.pdf?sequence=4&isAllowed=y

Augsburg, B., De Haas, R., Harmgart, H., & Meghir, C. (2015). The impacts of microcredit: Evidence from Bosnia and Herzegovina. *American Economic Journal*, *7*(1), 183–203.

Austin, P. (2009). Balance diagnostics for comparing the distribution of baseline covariates between treatment groups in propensity-score matched samples. *Statistics in Medicine*, *28*, 3083–3107.

Awoyemi, T., Adenipekun, A., & Chima-Kalu, R. (2022). Covid-19 in Africa: An explorative cross-sectional analysis of twenty-one African countries from January to June 2020. *Cereus*, *14*(5), 1–17.

Ayilara, O. F., Zhang, L., Sajobi, T., Sawatzky, R., Bohm, E., & Lix, L. M. (2019). Impact of missing data on bias and precision when estimating change in patient-reported outcomes from a clinical registry. *Health and Quality of Life Outcomes*, *17*(1), 106. h

Bahre, E. (2007). *Money and violence: Financial self-help groups in a South African township*. Brill. https://doi.org/10.1163/ej.9789004157262.i-193

Banerjee, A., Karlan, D., & Zinman, J. (2015). Six randomized evaluations of microcredit: Introduction and further steps. *American Economic Journal*, *7*(1), 1–21.

Banerjee, A. V., & Newman, A. F. (1993). Occupational choice and the process of development. *Journal of Political Economy*, *101*(2), 274–298.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182.

Bartlett, M. S. (1950). Tests of significance in factor analysis. *British Journal of Psychology*, *3*(2), 77–85.

Baser, O. (2006). Too much ado about propensity score models? Comparing methods of propensity score matching. *Value in Health*, *9*(6), 377–385.

Beaman, L., Karlan, D., & Thuysbaert, B. (2014). *Saving for a (not so) rainy day: A randomized evaluation of savings groups in Mali* (National Bureau of Economic Research Working Paper No. 20600). https://www.nber.org/system/files/working_papers/w20600/w20600.pdf

Beck, T. (2016). *Financial Inclusion – measuring progress and progress in measuring* (International Monetary Fund Working Paper). https://www.imf.org/external/np/seminars/eng/2016/statsforum/pdf/beck_paper.pdf

Becker, J. M., Ringle, C. M., Sarstedt, M., & Volckner, F. (2015). *How collinearity affects mixture regression results*. *26*(4), 643–659.

Berg, G. D. (2011). An application of kernel-based versus one-to-one propensity score matching for a nonexperimental causal study: Example from a disease management programme evaluation. *Applied Economics Letters*, *18*(5), 439–447.

Berhane, G. (2014). Can social protection work in Africa? The impact of Ethiopia's productive safety net programme. *Economic Development and Cultural Change*, *63*(1), 1–26.

Besley, T. (1995). Nonmarket institutions for credit and risk sharing in low-income countries. *Journal of Economic Perspectives*, *9*(3), 115–127.

Bester, H., Gray, J., Hougaard, C., Saunders, D., & van der Linden, A. (2016). *Lost in the mail: Why bank account access is not translating into use* (MAP Global Insight Series No. 4). https://cenfri.org/wp-content/uploads/2017/02/MAP-global-insight-note-4_Lost-in-the-Mail_Cenfri-FinMark-Trust-UNCDF_2016.pdf

Bettocchi, A., Giarda, E., Moriconi, C., Orsini, F., & Romeo, R. (2018). Assessing and predicting financial vulnerability of Italian households: A micro-macro approach. *Empirica*, *45*(3), 587–605.

Beverly, S. G., & Sherraden, M. (2020). Institutional determinants of saving: Implications for low-income households and public policy. *Journal of Socio-Economics*, *28*(4), 457–473.

Bialowolski, P., & Weziak-Bialowolska, D. (2014). The index of household financial condition, combining subjective and objective indicators: An appraisal of Italian households. *Social Indicators Research*, *118*(1), 365–385.

Bialowolski, P., Weziak-Bialowolska, D., & McNeely, E. (2021). The role of financial fragility and financial control for well-being. *Social Indicators Research*, *155*(3), 1137–1157.

Bittmann, F. (2019). *Propensity score matching*. Stata Press.

Blaug, M. (1972). The correlation between education and earnings: What does it signify? *Higher Education*, *1*(1), 53–76.

Blumenstock, J. E., Eagle, N., & Fafchamps, M. (2016). Airtime transfers and mobile communications: Evidence in the aftermath of natural disasters. *Journal of Development Economics*, *120*, 157–181.

Breitwieser, A. (2016). *Escaping the poverty trap: Formal savings and asset accumulation in rural Malawi* [Master's thesis, Claremont McKenna College, California, US].

Bridgeman, G., Van der Berg, S., & Patel, L. (2020). *Hunger in South Africa during 2020: Results from Wave 2 of NIDS-CRAM* (Bureau of Economic Research Working Paper No. 25/2020). https://cramsurvey.org/wp-content/uploads/2021/02/10.-Van-der-Berg-S.-Patel-L.-Bridgman-G.-2021-Hunger-in-South-Africa-during-2020-Results-from-Wave-3-of-NIDS-CRAM-1.pdf

Brown, & Churchill, C. (1999). *Providing insurance to low-income households: A primer on insurance principles and products.* https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.131.2000&rep=rep1&type=pdf

Brown, D., & Gray, D. (2016). Household finances and well-being in Australia: An empirical analysis of comparison effects. *Journal of Economic Psychology*, *53*(1), 17–36.

Bruce, C., Gearing, M. E., DeMatteis, J., Levin, K., Mulcahy, T., Newsome, J., & Wivagg, J. (2022). Financial vulnerability and the impact of COVID-19 on American households. *Plos One*, 17(1), 1–11

Brulé, G., Ravazzini, L., & Suter, C. (2020). The rolling 50s (and more): Cars and life satisfaction amongst seniors across Europe. *Applied Research in Quality of Life*, 1–20.

Brune, L., Gine, X., Goldberg, J., & Yang, D. (2016). *Facilitating savings for agriculture: Field experimental evidence from Malawi* (National Bureau of Economic Research Working Paper No. 20946). https://www.nber.org/papers/w20946

Brune, L., Karlan, D., Kurdi, S., & Udry, C. (2022). Social protection amidst social upheaval: Examining the impact of a multi-faceted programme for ultra-poor households in Yemen. *Journal of Development Economics*, *155*, 1–12.

Brunetti, M., Giarda, E., & Torricelli, C. (2016). Is financial fragility a matter of illiquidity? An appraisal for Italian households. *Review of Income and Wealth*, *62*(4), 628–649.

Brunie, A., Rutherford, D., Keyes, E. B., & Field, S. (2017). Economic benefits of savings groups in rural Mozambique. *International Journal of Social Economics*, *44*(12), 1988–2001.

Burbidge, J. B., Magee, L., & Robb, A. L. (1988). Alternative transformations to handle extreme values of the dependent variable. *Journal of the American Statistical Association*, *83*(401), 123–127.

Bureau of Market Research. (2021). *Consumer financial vulnerability index: Q3 2021*. https://bmr.co.za/2021/10/26/consumer-financial-vulnerability-index-q3-2021/

Busso, M., DiNardo, J., & McCrary, J. (2014). New evidence on the finite sample properties of propensity score reweighting and matching estimators. *Review of Economics and Statistics*, *96*(5), 885–897.

Caliendo, M., & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of Economic Surveys*, *22*(1), 31–72.

Camara, N., & Tuesta, D. (2018). *Measuring financial inclusion: A multidimensional index* (BBVA Research Working Paper No. 14/26). https://ideas.repec.org/h/bis/bisifc/47-18.html

Carlson, S., Dabla-Norris, E., Saito, M., Shi, Y., Marston, D., & Velloso, R. (2015). *Household financial access and risk sharing in Nigeria* (International Monetary Fund Working Paper No.15/269). https://www.elibrary.imf.org/view/journals/001/2015/169/article-A001-en.xml

Carroll, C. D., & Kimball, M. S. (2001). *Liquidity constraints and precautionary saving* (National Bureau of Economic Research Working Paper No. 8496). https://www.nber.org/system/files/working_papers/w8496/w8496.pdf

Cattaneo, M. D. (2010). Efficient semiparametric estimation of multi-valued treatment effects under ignorability. *Journal of Econometrics*, *155*(2), 138–154.

Cavalletti, B., Lagazio, C., Lagomarsino, E., & Vandone, D. (2020). Consumer debt and financial fragility: Evidence from Italy. *Journal of Consumer Policy*, *43*(4), 747–765.

Chakrabarty, M., & Mukherjee, S. (2021). Financial inclusion and household welfare: An entropy-based consumption diversification approach. *European Journal of Development Research*, *1*, 1–36.

Chakravarty, S. R., & Pal, R. (2013). Financial inclusion in India: An axiomatic approach. *Journal of Policy Modeling*, *35*(5), 813–837.

Charles, A., Wu, D., & Wu, Z. (2019). Economic shocks on subjective well-being: Re-assessing the determinants of life-satisfaction after the 2008 financial crisis. *Journal of Happiness Studies*, *20*(4), 1041–1055.

Chhatwani, M., & Mishra, S. K. (2021). Does financial literacy reduce financial fragility during COVID-19? The moderation effect of psychological, economic and social factors. *International Journal of Bank Marketing*, 1, 1–20

Cheng, Z., King, S. P., Smyth, R., & Wang, H. (2016). Housing property rights and subjective well-being in urban China. *European Journal of Political Economy*, *45*, 160–174.

Cheng, Z., Prakash, K., Smyth, R., & Wang, H. (2020). Housing wealth and happiness in urban China. *Cities*, *96*, 1–10.

Chenhall, R. H., & Moers, F. (2007). Endogeneity: A reply to two different perspectives. *European Accounting Review*, *16*(1), 217–221.

Chernozhukov, V., & Hansen, C. (2008). Instrumental variable quantile regression: A robust inference approach. *Journal of Econometrics*, *142*(1), 379–398

Chetty, R., & Looney, A. (2006). Consumption smoothing and the welfare consequences of social insurance in developing economies. *Journal of Public Economics*, *90*(12), 2351–2356.

Chitimira, H., & Ncube, M. (2020). Legislative and other selected challenges affecting financial inclusion for the poor and low-income earners in South Africa. *Journal of African Law*, *64*(3), 337–355.

Christoph, B. (2010). The relation between life satisfaction and the material situation: A re-evaluation using alternative measures. *Social Indicators Research*, *98*(3), 475–499.

Churchill, S. A., & Marisetty, V. B. (2020). Financial inclusion and poverty: A tale of forty-five thousand households. *Applied Economics*, *52*(16), 1777–1788.

Civitci, N., & Civitci, A. (2015). Social comparison orientation, hardiness and life satisfaction in undergraduate students. *Social and Behavioral Sciences*, *205*, 516–523.

Clark, R. L., Lusardi, A., & Mitchell, O. S. (2020). Financial fragility during the Covid-19 pandemic (Working Paper No. 28207). National Bureau of Economic Research. https://www.aeaweb.org/articles?id=10.1257/pandp.20211000

Clifton, J., Fernández-Gutiérrez, M., & García-Olalla, M. (2017). Including vulnerable groups in financial services: Insights from consumer satisfaction. *Journal of Economic Policy Reform*, *20*(3), 214–237.

Coad, A., & Blinder, M. (2014). *Causal linkages between work and life satisfaction and their determinants in a structural VAR approach* (Working Paper No. 809). Levy Economics Institute of Bard College. https://www.levyinstitute.org/pubs/wp_809.pdf

Cole, S., Giné, X., & Vickery, J. (2017). How does risk management influence production decisions? Evidence from a field experiment. *The Review of Financial Studies*, *30*(6), 1935–1970.

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *American Psychological Association*, *78*(1), 98–104.

Coulibaly, A. (2017). *Essays on financial development and vulnerability in employment in developing countries* [Doctoral dissertation, University Clermont Auvergne, Clermont-Ferrand, France].

Crocker, T., & Padilla, Y. C. (2016). Living on the edge: Access to liquid assets as a determinant of unmarried urban mothers' life satisfaction. *Families in Society: The Journal of Contemporary Social Services*, *97*(2), 132–141.

Cucinelli, D., Lippi, A., & Soana, M. G. (2021). Per aspera ad astra: The big challenge of consumers' insurance literacy. *International Journal of Consumer Studies*, *45*(6), 1357–1372.

Cui, W., & Cho, I. (2019). Household's happiness and financial market participation. *Global Economic Review*, *48*(4), 396–418.

Dar, A.B., & Ahmed, F. (2021). Financial inclusion determinants and impediments in India: Insights from the global financial inclusion index. *Journal of Financial Economic Policy*, 13(3), 391–408.

Das, K. V., Jones-Harrell, C., Fan, Y., Ramaswami, A., Orlove, B., & Botchwey, N. (2020). Understanding subjective well-being: Perspectives from psychology and public health. *Public Health Reviews*, *41*(1), 25. https://publichealthreviews.biomedcentral.com/articles/10.1186/s40985-020-00142-5

Daud, S. N. M., Marzuki, A., Ahmad, N., & Kefeli, Z. (2018). Financial vulnerability and its determinants: Survey evidence from Malaysian households. *Emerging Markets Finance and Trade*, *55*(9), 1991–2003.

Davidson, R., & MacKinnon, J. G. (1999). Bootstrap testing in nonlinear models. *International Economic Review*, *40*(2), 487–508.

De Beckker, K., De Witte, K., & Van Campenhout, G. (2019). Identifying financially illiterate groups: An international comparison. *International Journal of Consumer Studies*, *43*(5), 490–501.

De Janvry, A., Ramirez, E. R., & Sadoulet, E. (2016). *Weather index insurance and shock coping: Evidence from Mexico's CADENA Program* (World Bank Working Paper No. 7715). https://openknowledge.worldbank.org/handle/10986/24632

Deaton, A. (1992). Saving and income smoothing in Cote D'lvoire. *Journal of African Economies*, *1*(1), 1–24.

Deci, E., & Ryan, R. M. (Eds.). (2002). *Handbook of self-determination research*. University of Rochester Press.

Demertzis, M., Domínguez-Jiménez, M., & Lusardi, A. (2020). The financial fragility of European households in the time of COVID-19. *Bruegel Policy Contribution*, 1, 1-15.

Demirgüç-Kunt, A., & Klapper, L. (2012). *Financial inclusion in Africa: An overview* (World Bank Working Paper No. 6028). https://openknowledge.worldbank.org/handle/10986/9335

Demirgüç-Kunt, A., Klapper, L., Singer, D., & Ansar, S. (2022). *Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19.* https://openknowledge.worldbank.org/bitstream/handle/10986/37578/978146481897.pdf

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). *The Global Findex database 2017: Measuring financial inclusion and the fintech revolution. https://openknowledge.worldbank.org/handle/10986/29510*

Department of Planning, Monitoring and Evaluation. (2018). *An update on the new payment system*. https://www.dpme.gov.za/news/Pages/SASSA--Update-on-the-new-payment-system.aspx

Dercon, S. (2003). *Insurance against poverty*. Oxford University Press.

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist*, *55*(1), 34–43.

Diener, E., & Fujita, F. (1997). Social comparisons and subjective well-being. In B. P. Buunk & F. X. Gibbons (Eds.). *Health, coping, and wellbeing: Perspectives from social comparison theory* (pp. 329–358). Erlbau.

Diener, E., & Suh, E. (1997). Measuring quality of life: Economic, social, and subjective indicators. *Social Indicators Research, 40*, 189–216.

Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin*, *125*(2), 276–302.

Dimova, R., & Adebowale, O. (2018). Does access to formal finance matter for welfare and inequality? Micro-level evidence from Nigeria. *The Journal of Development Studies*, *54*(9), 1534–1550.

Dong, Y., & Peng, C. J. (2013). Principled missing data methods for researchers. *SpringerPlus*, *2*(1), 222. https://springerplus.springeropen.com/articles/10.1186/2193-1801-2-222

Doss, C., Swaminathan, H., Deere, C. D., Suchitra, J. Y., Oduro, A. D., & Anglade, B. (2020). Women, assets, and formal savings: A comparative analysis of Ecuador, Ghana and India. *Development Policy Review*, *38*(2), 180–205.

Doss, Deere, C. D., Oduro, A. D., Swaminathan, H., Catanzarite, Z., & Suchitra, J. Y. (2019). Gendered paths to asset accumulation? Markets, savings, and credit in developing countries. *Feminist Economics*, *25*(2), 36–66.

Draper, N. R., & Smith, H. (1998). *Applied regression analysis*. John Wiley & Sons.

Dupas, P., & Robinson, J. (2013). Savings constraints and microenterprise development: Evidence from a field experiment in Kenya. *American Economics Association: Applied Economics*, *5*(1), 163–192.

Efobi, U., Beecroft, I., & Osabuohien, E. (2014). Access to and use of bank services in Nigeria: Micro-econometric evidence. *Review of Development Finance*, *4*(2), 104–114.

Ersado, L., Alderman, H., & Alwang, J. (2003). Changes in Consumption and Saving Behavior before and after Economic Shocks: Evidence from Zimbabwe. *Economic Development and Cultural Change*, *52*(1), 187–215.

Ezzrari, A., & Verme, P. (2013). *A multiple correspondence analysis approach to the measurement of multidimensional poverty in Morocco, 2001-2007* (World Bank Working Paper No. 6087). https://openknowledge.worldbank.org/handle/10986/9330?locale-attribute=es

Falk, R. F., & Miller, N. B. (1992). *A primer for soft modeling*. University of Akron Press.

Fan, L., & Babiarz, P. (2019). The determinants of subjective financial satisfaction and the moderating roles of gender and marital status. *Family and Consumer Sciences Research Journal*, *47*(3), 237–259.

Fang, Y. P., Rasul, C., & Wahid, S. M. (2016). Rural household vulnerability and strategies for improvement: An empirical analysis based on time series. *Habitat International*, *53*, 254–264.

Fayyaz, S., & Khan, A. (2021). Impact of microfinance on quality of life, personal empowerment and familial harmony of female borrowers in Pakistan. *Journal of Public Affairs*, *21*(3), 1–9.

Fernández-López, S., Álvarez-Espiño, M., Castro-González, S., & Rey-Ares, L. (2022). Financial capability and households' financial vulnerability: Evidence for the Spanish case. *Managerial Finance*, 1, 1–24.

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*(2), 117–140.

Fields, G. (2001). *Distribution and development: A new look at the developing world*. MIT Press.

Filmer, D., & Pritchett, L. H. (2001). Estimating wealth effects without expenditure data or tears: An application to educational enrolments in states of India. *Demography*, *38*(1), 115–132.

FinMark Trust. (2009). *The Mzansi bank account initiative in South Africa.* https://finmark.org.za/system/documents/files/000/000/316/original/MsanziBankAccInitiativeSA_2009.pdf?1614593520

FinScope. (2015). *FinScope South Africa 2015 consumer survey launch presentation*. https://www.finmark.org.za/system/documents/files/000/000/482/original/FSSA2015_Consumersurvey_Launch.pdf?1615199663

FinScope. (2019). *FinScope South Africa 2019 pocket guide*. https://finmark.org.za/system/documents/files/000/000/242/original/FinScope_SA_2019_Pocket_Guide_2020.pdf?1604679365

Friedline, T., & Song, H. (2013). Accumulating assets, debts in young adulthood: Children as potential future investors. *Children and Youth Services Review*, *35*(9), 1486–1502.

FSTC (Financial Sector Charter Council). (2016). *Annual report summary: Transformation of the South African sector.* https://fstc.org.za/Documents/counc998fb05d-1ed1-45d7-98e3-e0c1d2dab7ba2016-Annual-Report-Summary.pdf

Gabor, D., & Brooks, S. (2017). The digital revolution in financial inclusion: International development in the fintech era. *New Political Economy*, *22*(4), 423–436.

Geng, X., Janssens, W., Kramer, B., & van der List, M. (2018). Health insurance, a friend in need? Impacts of formal insurance and crowding out of informal insurance. *World Development*, *111*, 196–210.

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference 11.0 update* (4th ed.). Allyn & Bacon.

Gertler, P., & Gruber, J. (1997). *Insuring consumption against illness* (National Bureau of Economic Research Working Paper No. 6035). https://ideas.repec.org/p/nbr/nberwo/6035.html

Giacalone, D., & Jaeger, S. R. (2019). Perceived situational appropriateness as a predictor of consumers' food and beverage choices. *Frontiers in Psychology*, *10*, 1-21. https://www.frontiersin.org/articles/10.3389/fpsyg.2019.01743/full

Goel, S., & Sharma, R. (2017). Developing a financial inclusion index for India. *Procedia Computer Science*, *122*(2017), 949–956.

Gonçalves, V. N., Ponchio, M. C., & Basílio, R. G. (2021). Women's financial well-being: A systematic literature review and directions for future research. *International Journal of Consumer Studies*, *45*(4), 824–843.

Goodhart, C. (1975). Problems of monetary management. In *Inflation, Depression and Economic Policy in the West*. Marshall.

Goyal, K., & Kumar, S. (2021). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, *45*(1), 80–105.

Greenacre, M., & Pardo, R. (2006). Subset correspondence analysis: Visualizing relationships amongst a selected set of response categories from a questionnaire survey. *Sociological Methods & Research*, *35*(2), 193–218.

Greenberg, J., Pyszczynski, T., & Solomon, S. (1986). The causes and consequences of a need for self-esteem: A terror management theory. In R. F. Baumeister (Ed.). *Public self and private self* (pp. 189–212). Springer.

Grinstein-Weiss, M., Sherraden, M. W., Rohe, W., Gale, W. G., Schreiner, M. J., & Key, C. (2012). *Long-term follow-up of individual development accounts: Evidence from the ADD experiment* https://openscholarship.wustl.edu/cgi/viewcontent.cgi?article=1275&context=csd_research

Gupte, R., Venkataramani, B., & Gupta, D. (2012). Computation of financial inclusion index for India. *Procedia - Social and Behavioral Sciences*, *37*(2012), 133–149.

Gyasi, R. M., Adam, A. M., & Phillips, D. R. (2019). Financial inclusion, health-seeking behaviour, and health outcomes amongst older adults in Ghana. *Research on Aging*, *41*(8), 794–820.

Habyarimana, J., & Jack, W. (2018). *High hopes: Experimental evidence on saving and the transition to high school in Kenya* (Working Paper No. 4). https://repository.library.georgetown.edu/bitstream/handle/10822/1048254/WP004_Habyarimana.Jack_v3.pdf?sequence=8

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial least squares structural equation modeling (PLS-SEM) using R: A workbook*. Springer International Publishing.

Hair, J. F., Matthews, L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, *1*(2), 107–123.

Hair, J. F., Ringle, C. M., Gudergan, S. P., Fischer, A., Nitzl, C., & Menictas, C. (2019). Partial least squares structural equation modeling based discrete choice modeling: An illustration in modeling retailer choice. *Business Research*, *12*, 115–142.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2018). *Advanced issues in partial least squares equation modelling (PLS-SEM)*. SAGE.

Handouyahia, A., Haddad, T., & Eaton, F. (2013). Kernel matching versus inverse probability weighting: A comparative study. *International Journal of Mathematical and Computational Sciences*, *7*(8), 1218–1233.

Hansen, T., & Slagsvold, B. (2012). The age and subjective well-being paradox revisited: A multidimensional perspective. Norsk Epidemiologi, 22(2), 187–195.

Hasler, A., Lusardi, A., & Oggero, N. (2018). *Financial fragility in the US: evidence and implications* [Working Paper]. Global Financial Literacy Excellence Center, George Washington University Business School. https://gflec.org/wp-content/uploads/2018/04/Financial-Fragility-Research-Paper-04-16-2018-Final.pdf

Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millenium. *Communication Monographs*, *76*(4), 408–420.

Heckman, J. J., Ichimura, H., & Todd, P. (1998). Matching as an econometric evaluation estimator. *Review of Economic Studies*, 261–294.

Heckman, J. J., Lalonde, R. J., & Smith, J. A. (1999). The economics and econometrics of active labor market programmes. In O.C. Ashenfelter & D. Card (Eds.). *Handbook of labor economics* (Vol. 3) (pp. 1865–2097). Elsevier.

Henager, R., & Mauldin, T. (2015). Financial literacy: The relationship to saving behaviour in low- to moderate-income households. *Family and Consumer Sciences Research Journal*, *44*(1), 73–87.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing*, *20*, 277–320.

Henseler, J., & Sarstedt, M. (2013). Goodness-of-fit indices for partial least squares path modeling. *Computational Statistics*, *28*, 565–580.

Herbers, D. J., & Mulder, C. H. (2017). Housing and subjective well-being of older adults in Europe. *Journal of Housing and the Built Environment*, *32*(3), 533–558.

Herceg, I., & Nestić, D. (2014). A new cluster-based financial vulnerability indicator and its application to household stress testing in Croatia. *Emerging Markets Finance and Trade*, *50*(5), 60–77.

Herfeld, C. (2020). The diversity of rational choice theory: A review note. *Topoi*, *39*(2), 329–347.

Hochman, O., & Skopek, N. (2013). The impact of wealth on subjective well-being: A comparison of three welfare-state regimes. *Research in Social Stratification and Mobility*, *34*(1), 127–141.

Hong, S. L., & Han, C. K. (2014). Asset impacts on life satisfaction in an asset-rich country: Focusing on older adults in Singapore. *Social Indicators Research*, *118*(1), 125–140.

Howell, R. T., Kurai, M., & Tam, L. (2013). Money buys financial security and psychological need satisfaction: Testing needs theory in affluence. *Social Indicators Research*, *110*(1), 17–29.

Hsiao, C. (2006). *Panel data analysis – Advantages and challenges* (Working Paper No. 49). Institute of Economic Policy Research.

Hu, F. (2013). Homeownership and subjective well-being in urban China: Does owning a house make you happier? *Social Indicators Research*, *110*(3), 951–971.

Huang, J., Lombe, M., Putnam, M., Grinstein-Weiss, M., & Sherraden, M. (2016). Individual development accounts and homeownership amongst low-income adults with

disabilities: Evidence from a randomized experiment. *Journal of Applied Social Science*, *10*(1), 55–66.

Huang, J., Wu, S., & Deng, S. (2016). Relative income, relative assets, and happiness in urban China. *Social Indicators Research*, *126*(3), 971–985.

Hussain, B. A. H. M., Endut, N., Das, S., Chowdhury, M. T. A., Haque, N., Sultana, S., & Ahmed, K. J. (2019). Does financial inclusion increase financial resilience? Evidence from Bangladesh. *Development in Practice*, *29*(6), 798–807.

Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychological Association*, *60*(6), 581–592.

Iacobucci, D. (2012). Mediation analysis and categorical variables: The final frontier. *Journal of Consumer Psychology*, *22*(4), 582–594.

Ibrahim. H. (2020). Structured savings and asset ownership: The role of rotating savings and credit associations amongst African immigrants in the United States. *Journal of Sociology and Social Welfare*, *47*(2), 29–57.

Ibrahim, S. S., Ozdeser, H., & Cavusoglu, B. (2019). Financial inclusion as a pathway to welfare enhancement and income equality: Micro-level evidence from Nigeria. *Development Southern Africa*, *36*(3), 390–407.

Iddrisu, A. M., & Danquah, M. (2021). *The welfare effects of financial inclusion in Ghana: An exploration based on a multidimensional measure of financial inclusion* (UNU-WIDER Working Paper No. 2021/1461). https://www.wider.unu.edu/sites/default/files/Publications/Working-paper/PDF/wp2021-146-welfare-effects-financial-inclusion-Ghana.pdf

Imbens, G. O., & Wooldridge, J. (2009). Recent developments in the econometrics of programme evaluation. *Journal of Economic Literature*, 47(1), 5–86.

International Labour Organisation. (2020). *More than 60 per cent of the world's used population are in the informal economy*. https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_627189/lang--en/index.htm

International Monetary Fund. (2020). *Six charts explain South Africa's inequality*. https://www.imf.org/en/News/Articles/2020/01/29/na012820six-charts-on-south-africas-persistent-and-multi-faceted-inequality

Jack, W., & Suri, T. (2014). Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution. *American Economic Review*, *104*(1), 183–223.

James, D. (2018). Mediating indebtedness in South Africa. *Ethnos*, *83*(5), 814–831.

Janzen, S. A., & Carter, M. R. (2019). After the drought: The impact of microinsurance on consumption smoothing and asset protection. *American Journal of Agricultural Economics*, *101*(3), 651–671.

Jayasinghe, M., Selvanathan, E. A., & Selvanathan, S. (2020). The financial resilience and life satisfaction nexus of indigenous Australians. *Journal of Applied Economics & Policy*, *39*(4), 336–352.

Joshanloo, M., & Jovanović, V. (2020). The relationship between gender and life satisfaction: Analysis across demographic groups and global regions. *Archives of Women's Mental Health*, *23*(3), 331–338.

Kamal, M., & Rana, E. A. (2019). Do internal and international remittances affect households' expenditure and asset accumulation differently? Evidence from Bangladesh. *Journal of Developing Areas*, *53*(2), 139–153.

Karlan, D., Savonitto, B., Thuysbaert, B., & Udry, C. (2017). Impact of savings groups on the lives of the poor. *Proceedings of the National Academy of Sciences*, *114*(12), 3079–3084.

Kast, F., Meier, S., & Pomeranz, D. (2018). Saving more in groups: Field experimental evidence from Chile. *Journal of Development Economics*, *133*, 275–294.

Kessler, K., Ikdal, A., Naidoo, E., Portafaix, A., Hendickson, J., Boje, A., & Rabec, D. (2017). *Improving financial inclusion in South Africa*. Boston Consulting Group. https://www.bcg.com/publications/2017/globalization-improving-financial-inclusion-south-africa

Khera, P., Ng, S., Ogawa, S., & Sahay, R. (2021). *Measuring digital financial inclusion in emerging market and developing economies: A new index* (International Monetary Fund Working Paper No. 21/90). https://www.imf.org/-/media/Files/Publications/WP/2021/English/wpiea2021090-print-pdf.ashx

Kim, & Han, C. K. (2022). Asset effects on the life satisfaction of workers with disabilities in Korea: The mediating effects of self-esteem and job satisfaction. *Journal of Social Service Research*, *48*(1), 98–107.

Kim, J., & Chatterjee, S. (2019). Student loans, health, and life satisfaction of US households: Evidence from a panel study. *Journal of Family and Economic Issues*, *40*(1), 36–50.

Kim, Y. I., Kim, H. C., & Yoo, J. H. (2016). Household over-indebtedness and financial vulnerability in Korea: Evidence from credit bureau data. *KDI Journal of Economic Policy*, *38*(3), 53–77.

Kirsten, M. (2006). *Policy initiative to expand financial outreach in South Africa*. https://www.yumpu.com/en/document/read/45922905/policy-initiatives-to-expand-financial-outreach-in-south-africa

Klapper, L., Lusardi, A., & Panos, G. A. (2013). Financial literacy and its consequences: Evidence from Russia during the financial crisis. *Journal of Banking and Finance, 37*(10), 3904–3923.

Klapper, L., & Singer, D. (2017). *The role of demand-side data – measuring financial inclusion from the perspective of users of financial services* [Paper presentation]. ISI World Statistics Congress on "Financial Inclusion", Marakesh, Morocco.

Kling, G., Pesqué-Cela, V., Tian, L., & Luo, D. (2022). A theory of financial inclusion and income inequality. *The European Journal of Finance*, *28*(1), 137–157.

Koenker, R., & Bassett, G. (1978). Regression quantiles. *Econometrica*, *46*(1), 33–50.

Koenker, R., & Hallock, K. F. (2001). Quantile regression. *Journal of Economic Perspectives*, *15*(4), 143–156.

Kolenikov, S., & Angeles, G. (2009). Socioeconomic status measurement with discrete proxy variables: Is principal component analysis a reliable answer? *Review of Income and Wealth*, *55*(1), 128–165.

Koomson, I., Abdul-Mumuni, A., & Abbam, A. (2021). Effect of financial inclusion on out-of-pocket health expenditure: Empirics from Ghana. *European Journal of Health Economics*, *22*(9), 1411–1425.

Koomson, I., Bukari, C., & Villano, R. A. (2021). Mobile money adoption and response to idiosyncratic shocks: Empirics from five selected countries in Sub-Saharan Africa. *Technological Forecasting and Social Change*, *167*, 1–13.

Koomson, I., Villano, R. A., & Hadley, D. (2020). Effect of financial inclusion on poverty and vulnerability to poverty: Evidence using a multidimensional measure of financial inclusion. *Social Indicators Research*, *149*(2), 613–639.

Kostov, P., Arun, T., & Annim, S. (2015). Access to financial services: The case of the 'Mzansi' account in South Africa. *Review of Development Finance*, *5*(1), 34–42.

Kreps. (1979). A representation theorem for 'preference for flexibility'. *The Econometric Society*, *47*(3), 565–577.

Krishna, V., & Phillip, S. (2014). Dynamic preference for flexibility. *Econometrica*, *82*(2), 655–703.

Krishnakumar, J., & Nagar, A. L. (2008). On exact statistical properties of multidimensional indices based on principal components, factor analysis, MIMIC and structural equation models. *Social Indicators Research*, *86*(3), 481–496.

Ksoll, C., Lilleør, H. B., Lønborg, J. H., & Rasmussen, O. D. (2016). Impact of village savings and loan associations: Evidence from a cluster randomized trial. *Journal of Development Economics*, *120*(1), 70–85.

Kuroki, M. (2019). Are American homeowners more satisfied with their lives than renters? *International Journal of Consumer Studies*, *43*(6), 536–548.

Kwarteng-Amaning, T., & Sarfo-Mensah, P. (2019). The impact of savings groups on female agency: Insights from village savings and loans associations in northern Ghana. *Asian Journal of Agriculture and Rural Development*, *9*(2), 133–146.

Lai, J. T., Ye, M., & Zhang, H. (2021). Home ownership and life satisfaction of migrants in urban China. *Applied Economics Letters*, *28*(4), 287–293.

Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The source of four commonly reported cutoff criteria. *Organizational Research Methods*, *9*(2), 202–220.

Lanie, T. (2017). Demand-driven determinants and self-reported barriers to financial inclusion in the West African Economic and Monetary Union (WAEMU). *Journal of Economics and International Finance*, *9*(11), 120–130.

Latif, A. A., & Magazi, N. (2021). Microinsurance and household asset welfare in South Africa. *Geneva Papers on Risk and Insurance-Issues and Practice*, *46*(3), 358–382.

Lee, M. P., & Sabri, M. F. (2017). Review of financial vulnerability studies. *Archives of Business Research*, *5*(2), 127–134.

Lee, Scott, D., & Floyd, M. F. (2001). Structural inequalities in outdoor recreation participation: A multiple hierarchy stratification perspective. *Journal of Leisure Research*, *33*(4), 427–449.

Lee, Y. G., & Bhargava, V. (2004). Leisure time: Do married and single individuals spend it differently? *Family and Consumer Sciences Research Journal*, *32*(3), 254–274.

Lee, Y. S., Johnson, L., Ansong, D., Osei-Akoto, I., Masa, R., Chowa, G., & Sherraden, M. (2017). 'Taking the bank to the youth': Impacts on savings from the Ghana youth save experiment. *Journal of International Development*, *29*(7), 936–947.

Lemon, B. W., Bengston, V. L., & Peterson, J. A. (1972). An exploration of the activity theory of aging: Activity types and life satisfaction amongst in-movers to a retirement community. *Journal of Gerontology*, *27*(4), 511–523.

Lensink, R., Mersland, R., Vu, N. T. H., & Zamore, S. (2018). Do microfinance institutions benefit from integrating financial and nonfinancial services? *Applied Economics*, *50*(21), 2386–2401.

Lensink, R., Servin, R., & van den Berg, M. (2017). Do savings and credit institutions reduce vulnerability? New evidence from Mexico. *Review of Income and Wealth*, *63*(2), 335–352.

Lewis-Beck, M., Bryman, A. E., & Liao, T. E. (2003). *The Sage encyclopedia of social science research methods*. SAGE.

Li, S. A., Guan, X., & Wang, D. (2022). How do constrained car ownership and car use influence travel and life satisfaction? *Transportation Research Part A: Policy and Practice*, *155*, 202–218.

Limbu, Y. B., & Sato, S. (2019). Credit card literacy and financial well-being of college students: A moderated mediation model of self-efficacy and credit card number. *International Journal of Bank Marketing*, *37*(4), 991–1003.

Lombe, M., & Sherraden, M. (2008). Effects of participating in an asset-building intervention on social inclusion. *Journal of Poverty*, *12*(3), 284–305.

Lotto, J. (2018). Examination of the status of financial inclusion and its determinants in Tanzania. *Sustainability*, *10*(8), 1–15.

Louis, L., & Chartier, F. (2017). Financial inclusion in South Africa: An integrated framework for financially vulnerable communities in South Africa's regulatory system reform. *Journal of Comparative Urban Law and Policy*, *1*(1), 170–196.

Luo, J., & Li, B. (2022). Impact of digital financial inclusion on consumption inequality in China. *Social Indicators Research*, *1*, 1–25.

Lusardi, A., & Mitchell, O. S. (2014). *The economic importance of financial literacy: Theory and evidence* (National Bureau of Economic Research Working Paper No. 18952). https://www.nber.org/system/files/working_papers/w18952/w18952.pdf

Lusardi, A., Mitchell, O. S., & Curto, V. (2009). *Financial literacy and financial sophistication amongst older Americans* (National Bureau of Economic Research Working Paper No. 15469). https://www.nber.org/system/files/working_papers/w15469/w15469.pdf

Lyons, A. C., Kass-Hanna, J., Liu, F., Greenlee, A., & Zeng, L. (2020). *Building financial resilience through financial and digital literacy in South Asia and Sub-Saharan Africa* (Asian Development Bank Institute Working Paper No. 1098).

https://www.adb.org/publications/building-financial-resilience-through-financial-digital-literacy-south-asia-saharan-africa

Machado, J. A. F., & Silva, J. M. C. (2019). Quantiles via moments. Journal of Econometrics, 213(1), 145–173.

Mahalika, R., Matsebula, V., & Yu, D. (2021). Investigating the relationship between financial inclusion and poverty in South Africa. *Development Southern Africa*, *1*, 1–24.

Mahmud, M., & Riley, E. (2021). Household response to an extreme shock: Evidence on the immediate impact of the Covid-19 lockdown on economic outcomes and well-being in rural Uganda. *World Development*, *140*, 1–21.

Makuvaza, L., Gray, J., Hougaard, C., & Jourdan. (2018). *Means to an end: A conceptual framework for outcomes of financial service use*. https://cenfri.org/wp-content/uploads/2018/08/A-conceptual-framework-for-outcomes-of-financial-service-use_i2i_July-2018.pdf

Maslow, A. H. (1987). *Motivation and personality* (3rd ed.). Pearson Education.

Matsebula, V., & Yu, D. (2020). An analysis of financial inclusion in South Africa. *African Review of Economics & Finance*, *12*(1), 171–202.

Mawejje, J. (2019). Financial inclusion, shocks and coping strategies: Survey evidence from Uganda. *African Journal of Economic and Management Studies*, *10*(3), 286–298.

McKinnon, D., & Derickson, K. D. (2013). From resilience to resourcefulness: A critique of resilience policy and activism. *Progress in Human Geography*, *37*(2), 253–270.

McKinnon, R. I. (1973). *Money and capital in economic development*. Brookings Institution.

Meneses, J. P., Ventura, E. T., Elorreaga, O. A., Huarato, C., Aguilar, G. G., & Beteta, E. P. (2019). Improving well-being through mobile money: A replication study in Niger. *Journal of Development Effectiveness*, *11*(4), 327–341.

Meyer, B. D., & Sullivan, J. X. (2003). Measuring the well-being of the poor using income and consumption. *Journal of Human Resources*, *38*, 1180–1220.

Mialou, A., & Amidzic, G. (2017). Assessing countries' financial inclusion standing—A new composite index. *Journal of Banking and Financial Economics*, *2*(8), 105–126.

Mialou, A., Amidzic, G., & Massara, A. (2017). Assessing countries' financial inclusion standing-A new composite index. *Journal of Banking and Financial Economics*, *2017*(8), 105–126.

Michelangeli, V., & Rampazzi, C. (2016). *Indicators of financial vulnerability: A household level study* (Working Paper No. 369). Questioni di Economia e Finanza. http://www.ssrn.com/abstract=2934248

Mitchell, O. S., & Lusardi, A. (2021). *Financial literacy and financial behaviour at older ages* (Global Financial Literacy Excellence Center Working Paper No. 2021/3). https://www.annamarialusardi.com/wp-content/uploads/2021/08/Financial-Literacy-and-Financial-Behavior-at-Older-Ages.pdf

Morduch, J. (1995). Income smoothing and consumption smoothing. *Journal of Economic Perspectives*, *9*(3), 103–114.

Moser, C., & Felton, A. (2007). *The Construction of an Asset Index Measuring Asset Accumulation in Ecuador* (Chronic Poverty Research Centre Working Paper No. 87). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1646417

Munyegera, G. K., & Matsumoto, T. (2016). Mobile money, remittances, and household welfare: Panel evidence from rural Uganda. *World Development*, *79*, 127–137.

Murendo, C., & Mutsonziwa, K. (2017). Financial literacy and savings decisions by adult financial consumers in Zimbabwe. *International Journal of Consumer Studies*, *41*(1), 95–103.

Mutsonziwa, K., & Fanta, A. B. (2019). Over-indebtedness and its welfare effect on households: Evidence from the Southern African countries. *African Journal of Economic and Management Studies*, *10*(2), 185–197. 0105

Naito, H., Ismailov, A., & Kimaro, A. B. (2021). The effect of mobile money on borrowing and saving: Evidence from Tanzania. *World Development Perspectives*, *23*, 1–13.

Nakazato, N., Schimmack, U., & Oishi, S. (2011). Effect of changes in living conditions on well-being: A prospective top–down bottom–up model. *Social Indicators Research*, *100*(1), 115–135.

Nanda, A. P., & Banerjee, R. (2021). Consumer's subjective financial well-being: A systematic review and research agenda. *International Journal of Consumer Studies*, *45*(4), 750–776.

Nandru, P., Byram, A., & Rentala, S. (2016). Determinants of financial inclusion: Evidence from account ownership and use of banking service. *International Journal of Entrepreneurship and Development Studies*, *4*(2), 141–155.

Nanziri, L. E. (2016). *Financial literacy, use of finance and welfare in post-apartheid South Africa* [PhD dissertation, University of Cape Town, Cape Town, South Africa].

Nanziri, L. E. (2018). *The contribution of formal and non-formal finance to household welfare: Evidence from South Africa* (Centre for the Study of African Economies Working Paper No. 2018–06). http://www.csae.ox.ac.uk/materials/papers/csae-wps-2018-06.pdf

Ndlovu, G., & Toerien, F. (2020). The distributional impact of access to finance on poverty: Evidence from selected countries in Sub-Saharan Africa. *Research in International Business and Finance*, *52*, 1–21.

Nemeth, E., Zsoter, B., & Beres, D. (2020). Financial vulnerability of the Hungarian population. *Public Finance Quarterly*, *2*, 284–311.

N'dri, L. M., & Kakinaka, M. (2020). Financial inclusion, mobile money, and individual welfare: The case of Burkina Faso. *Telecommunications Policy, 44*(3), https://ideas.repec.org/a/eee/telpol/v44y2020i3s0308596120300185.html

Neve, J. E. D., Diener, E., Tay, L., & Xuereb, C. (2013). *The objective benefits of subjective well-being* (Centre for Economic Performance Working Paper No. 1236). http://eprints.lse.ac.uk/51669/1/dp1236.pdf

Ngamaba, K. H., Armitage, C., Panagioti, M., & Hodkinson, A. (2020). How closely related are financial satisfaction and subjective well-being? Systematic review and meta-analysis. *Journal of Behavioral and Experimental Economics*, *85*, 1–13.

Nitzl, C. (2016). The use of partial least squares structural equation modelling (PLS-SEM) in management accounting research: Directions for future theory development. *Journal of Accounting Literature*, *37*, 19–35.

Nitzl, C., Roldan, J. L., & Carrion, C. G. (2016). Mediation analysis in partial least squares path modelling. *Industrial Management and Data Systems*, *119*(9), 1849–1864.

Njong, A. M., & Ningaye, P. (2010). *Characterizing weights in the measurement of multidimensional poverty: An application of data-driven approaches to Cameroonian data* (Oxford Poverty and Human Development Initiative Working Paper No. 21). https://ophi.org.uk/wp-21/

Noerhidajati, S., Purwoko, A. B., Werdaningtyas, H., Kamil, .I, & Dartanto, T. (2021). Household financial vulnerability in Indonesia: Measurement and determinants. *Economic Modelling*, *96*, 433–444.

Nzie, M. J. R., Bidogeza, J. C., & Ngum, N. A. (2018). Mobile phone use, transaction costs, and price: Evidence from rural vegetable farmers in Cameroon. *Journal of African Business*, *19*(3), 323–342.

Obadha, M., Colbourn, T., & Seal, A. (2020). Mobile money use and social health insurance enrolment amongst rural dwellers outside the formal employment sector: Evidence from Kenya. *International Journal of Health Planning and Management*, *35*(1), 66–80.

O'Connor, G. E., Newmeyer, C. E., Wong, N. Y. C., Bayuk, J. B., Cook, L. A., Komarova, Y., Loibl, C., Lin Ong, L., & Warmath, D. (2019). Conceptualizing the multiple dimensions of consumer financial vulnerability. *Journal of Business Research*, *100*, 421-430.

OECD. (2011). *Framework for the development of financial literacy baseline surveys: A first international comparative analysis* (OECD Working Papers on Finance, Insurance and Private Pensions No. 1). https://www.oecd.org/finance/insurance/45153314.pdf

OECD. (2013). *OECD guidelines on measuring subjective well-being*. https://www.oecd.org/wise/oecd-guidelines-on-measuring-subjective-well-being-9789264191655-en.htm

OECD. (2020). *Life satisfaction*. https://www.oecdbetterlifeindex.org/topics/life-satisfaction/

Okulicz-Kozaryn, A., Nash, T., & Tursi, N. O. (2015). Luxury car owners are not happier than frugal car owners. *International Review of Economics, 62*(2), 121–141.

Oswald, A. J., Proto, E., & Sgroi, D. I. (2015). Happiness and productivity. *Journal of Labor Economics*, *33*(4), 789–822.

Ottaviani, C., & Vandone, D. (2018). Financial literacy, debt burden and impulsivity: A mediation analysis: financial literacy, debt burden and impulsivity. Economic Notes, 47(2–3), 439–454.

Ouma, S. A., Odongo, T. M., & Were, M. (2017). Mobile financial services and financial inclusion: Is it a boon for savings mobilization? *Review of Development Finance*, *7*(1), 29–35.

Oxford University. (2023). Policy responses to the Coronavirus Pandemic. Oxford University. https://ourworldindata.org/policy-responses-covid

Pallant, J. (2007). *SPSS: Survival manual* (3rd ed.). McGraw-Hill.

Park, C. Y., & Mercado Jr., R. V. (2018). *Financial inclusion: New measurement and cross-country impact assessment* (Asian Development Bank Working Paper No. 539). https://www.adb.org/publications/financial-inclusion-new-measurement-cross-country-impact-assessment

Parise, G., & Peijnenburg, K. (2019). Noncognitive abilities and financial distress: Evidence from a representative household panel. *The Review of Financial Studies*, *32*(10), 3884–3919.

Pena, X., Hoyo, C., & Tuesta, D. (2014). *Determinants of financial inclusion in Mexico based on the 2012 National Financial Inclusion Survey (ENIF)* (BBVA Research Working Paper No. 14/15). https://www.researchgate.net/publication/291356767_Determinants_of_financial_inclusion_in_Mexico_based_on_the_2012_National_Financial_Inclusion_Survey_ENIF

Peprah, J. A., Oteng, C., & Sebu, J. (2020). Mobile money, output and welfare amongst smallholder farmers in Ghana. *SAGE Open*, *10*(2), 1–12.

Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behaviour Research Methods Instruments, and Computers*, *36*(4), 717–731.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891.

Prina, S. (2015). Banking the poor via savings accounts: Evidence from a field experiment. *Journal of Development Economics*, *115*(1), 16–31.

Qi, S., Liu, H., Hua, F., Deng, X., & Zhou, Z. (2021). The impact of household assets on child well-being: Evidence from China. *Applied Research in Quality of Life*, *10*, 1–24.

Quach, M. H. (2016). Does access to finance improve household welfare? *Investment Management and Financial Innovations*, *13*(2), 76–86.

Ragheb, M., & Tate, R. (1993). A behavioural model of leisure participation, based on leisure attitude, motivation and satisfaction. *Leisure Studies*, *1*, 61–70.

Rajan, R., & Zingales, L. (1998). Financial dependence and growth. *American Economic Review*, *88*(3), 559–586.

Ratneshwar, S., & Shocker, A. D. (1991). Substitution in use and the role of use context in product category structures. *Journal of Marketing Research*, *28*(3), 281–295.

Ren, H., Folmer, H., & Van der Vlist, A. J. (2018). The impact of home ownership on life satisfaction in urban China: A propensity score matching analysis. *Journal of Happiness Studies*, *19*, 397–422.

Reyers, M. (2019). Financial capability and emergency savings amongst South Africans living above and below the poverty line. *International Journal of Consumer Studies*, *43*(4), 335–347.

Rigdon, E. E., Sarstedt, M., & Ringle, C. M. (2017). On comparing results from CB-SEM and PLS-SEM: Five perspectives and five recommendations. *Marketing ZFP*, *39*(3), 4–16.

Rim, H. B. (2012). *Maximising, satisficing and their impacts on decision-making behaviours* [Doctoral Thesis]. Ohio State University.

Riley, E. (2018). Mobile money and risk sharing against village shocks. *Journal of Development Economics*, *135*, 43–58.

Rinehart, K., Makuvaza, L., Gray, J., & Hougaard, C. (2018). *Why are financial services not used more?: A conceptual framework for drivers of financial service use*. https://cenfri.org/publications/why-are-financial-services-not-used-more/

Rodríguez, A., Látková, P., & Sun, Y. (2008). The relationship between leisure and life satisfaction: Application of activity and need theory. *Social Indicators Research*, *86*(1), 163–175.

Rohe, W. M., & Stegman, M. A. (1994). The effects of homeownership: On the self-esteem, perceived control and life satisfaction of low-income people. *Journal of the American Planning Association*, *60*(2), 173–184.

Roldan, J. L., & Sanchez-Franco, M. J. (2012). Variance-based structural equation modeling: Guidelines for using partial least squares in information systems research. *Research Methodologies, Innovations and Philosophies in Software Systems Engineering and Information Systems*, 193–221. https://www.researchgate.net/publication/249323258_Variance-Based_Structural_Equation_Modeling_Guidelines_for_Using_Partial_Least_Squares_in_Information_Systems_Research

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrica*, *70*(1), 41–55.

Rosenbaum, P. R., & Rubin, D. B. (1985). Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *American Statistician*, *39*(1), 33–38.

Ruberton, P. M., Gladstone, J., & Lyubomirsky, S. (2016). How your bank balance buys happiness: The importance of "cash on hand" to life satisfaction. *Emotion*, *16*(5), 575–580.

Rubin, D. R. (2001). Using propensity scores to help design observational studies: Application to the tobacco litigation. *Annals of Internal Medicine*, *127*, 757–763.

Sabri, M. F., Dass, T. M., Burhan, N. A. S., Wahab, H. A. R., Wijekoon, R., & Simanjuntak, M. (2021). Determinants of life satisfaction amongst female-headed households in Malaysia. *International Journal of Business & Society*, *22*(1), 276–295.

Sahay, R., Lahreche, A., Khera, P., Ogawa, S., Bazarbash, M., & Beaton, K. (2020). *The promise of fintech: Financial inclusion in the post COVID-19 era* (International Monetary Fund Working Paper No. 20/09). https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2020/06/29/The-Promise-of-Fintech-Financial-Inclusion-in-the-Post-COVID-19-Era-48623

Sahn, D. E., & Stifel, D. (2003). Exploring alternative measures of welfare in the absence of expenditure data. *Review of Income and Wealth*, *49*(4), 463–489.

Sakyi-Nyarko, C., Ahmad, A. H., & Green, C. J. (2020). *The gender-differential effect of financial inclusion on household financial resilience* (Centre for Global Finance Working Paper No. 6). https://www.tandfonline.com/doi/full/10.1080/00220388.2021.2013467

Sakyi-Nyarko, C., Ahmad, A. H., & Green, C. J. (2021). Investigating the well-being implications of mobile money access and use from a multidimensional perspective. *Review of Development Economics*, *1*, 1–25.

Sakyi-Nyarko, C., Ahmad, A. H., & Green, C. J. (2022). The gender-differential effect of financial inclusion on household financial resilience. *Journal of Development Studies*, *10*, 1–21.

Sarma, M. (2012). *Index of financial inclusion-A measure of financial sector inclusiveness* (Centre for International Trade and Development Working Paper No. 07/2012). https://finance-and-trade.htw-berlin.de/fileadmin/HTW/Forschung/Money_Finance_Trade_Development/working_paper_series/wp_07_2012_Sarma_Index-of-Financial-Inclusion.pdf

Sarma, M., & Pais, J. (2011). Financial inclusion and development. *Journal of International Development*, *23*(5), 613–628.

SASSA (South African Social Security Agency). (2019). *SASSA annual report*. https://www.sassa.gov.za/annual%20reports/Documents/SASSA%20Annual%20Report%202018-2019.pdf

Satumba, T., Bayat, A., & Mohamed, S. (2017). The impact of social grants on poverty reduction in South Africa. *Journal of Economics*, *8*(1), 33–49.

Schlesinger, H. (2012). The theory of insurance demand. In G. Dionne (Ed.). *Handbook of Insurance* (pp. 1–35). The University of Alabama.

Schmidt, N. (1996). Uses and abuses of coefficient alpha. *American Psychological Association*, *8*(4), 350–353.

Schnittker, J. (2001). When is faith enough? The effects of religious involvement on depression. *Journal for the Scientific Study of Religion*, *40*(3), 393–411.

Schrepp, M. (2020). On the usage of Cronbach's alpha to measure reliability of UX scales. *Journal of User Experience*, *15*(4), 247–248.

Sha'ban, M., Girardone, C., & Sarkisyan, A. (2020). Cross-country variation in financial inclusion: A global perspective. *European Journal of Finance*, *26*(4–5), 319–340.

Shaw, E. S. (1973). *Money and capital economic development*. NYU Press.

Sherraden, M. S. (2013). Building blocks of financial capability. In J. Birkenmaier, M. Sherraden, & J. Curley (Eds.). *Financial capability and asset development: Research, Education, Policy and Practice* (pp. 3–43). Oxford University Press.

Sherraden, M. (2018). Asset building as social investment. *Journal of Sociology & Social Welfare*, *45*(4), 35–54.

Sherraden, M. (1991). *Assets and the poor: A new American welfare policy.* M.E. Sharpe.

Sherraden, M., & Boshara, R. (2007). *Global savings, assets and financial inclusion: Lessons, challenges and directions.* https://community-wealth.org/sites/clone.community-wealth.org/files/downloads/report-zimmerman-et-al.pdfshrout

Sherraden, M., & Boshara, R. (2009). Learning from individual development accounts. In A. Lusardi (Ed.). *Overcoming the saving slump* (pp. 280–298). University of Chicago Press.

Sherraden, M. S., & McBride, A. M. (2010). *Striving to save: Creating policies for financial security of low-income families*. University of Michigan Press.

Shipalana, P. (2019). *Digitising financial services: A tool for financial inclusion in South Africa?* (South African Institute of International Affairs Working Paper No. 301). https://www.africaportal.org/publications/digitising-financial-services-tool-financial-inclusion-south-africa/

Shmueli, G., & Koppius, O. R. (2011). Predictive analytics in information systems research. *MIS Quarterly*, *35*(3), 553–572.

Shrout, P. E., & Bolger, N. (2002). Mediation in experimental and nonexperimental studies: New procedures and recommendations. *Psychological Methods*, *7*(4), 422–445.

Simon, H. A. (1955). A behavioral model of rational choice. *The Quarterly Journal of Economics*, *69*(1), 99–118.

Singh, K. N., & Malik, S. (2022). An empirical analysis on household financial vulnerability in India: Exploring the role of financial knowledge, impulsivity and money management skills. *Managerial Finance*, *1*, 1–22.

Skidelsky, R., & Skidelsky, E. (2012). *How much is enough? Money and good life*. Other Press LLC.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*, *13*, 290–312.

Song, Q., Li, J., Wu, Y., & Yin, Z. (2020). Accessibility of financial services and household consumption in China: Evidence from microdata. *North American Journal of Economics and Finance*, *53*, 1–12.

Soumaré, I., Tchana, F., & Kengne, T. M. (2016). Analysis of the determinants of financial inclusion in Central and West Africa. *Transnational Corporations Review*, *8*(4), 231–249.

South African Revenue Service. (2022). *Exploring South Africa's merchandise trade statistics*. South African Revenue Service. https://www.sars.gov.za/customs-and-excise/trade-statistics/

Southwick, S. M., & Charney, D. (2012). *Resilience: The science of mastering life's greatest challenges.* Cambridge University Press.

Spiers, A., & Walker, G. W. (2008). The effects of ethnicity and leisure satisfaction on happiness, peacefulness, and quality of life. *Leisure Sciences*, *31*(1), 84–99.

Staffa, S. J., Kohane, D. S., & Zurakowski, D. (2019). Quantile regression and its applications: A primer for anesthesiologists. *International Anesthesia Research Society*, *128*(4), 820–830.

Statistics South Africa. (2020). *Quarterly labour force survey: Quarter 2 2020*. http://www.statssa.gov.za/publications/P0211/P02112ndQuarter2020.pdf

Statistics South Africa. (2021). *National poverty lines 2021*. http://www.statssa.gov.za/publications/P03101/P031012021.pdf

Stefflre, V. (1971). *New products and new enterprises: A report on an experiment in applied social science*. The University of California.

Stiglitz, J. E. (1975). The theory of 'screening,' education, and the distribution of income. *American Economic Review*, *65*(3), 283–300.

Stiglitz, J. E., & Weiss, A. (1981). Credit rationing in markets with imperfect information. Economic Review, 71(3), 393–410.

Stoeffler, Q., Mills, B., & Premand, P. (2016). *Poor households' productive investments of cash transfers: Quasi-experimental evidence from Niger* (World Bank Group Working Paper No. 7839). https://openknowledge.worldbank.org/bitstream/handle/10986/25155/Poor0household00evidence0from0Niger.pdf?sequence=1&isAllowed=y

Stolper, O. A., & Walter, A. (2017). Financial literacy, financial advice, and financial behavior. *Journal of Business Economics*, *87*(5), 581–643.

Storchi, S. (2018). *Impact evaluation of savings groups and stokvels in South Africa: The economic and social value of group-based financial inclusion*. http://saveact.org.za/wp-content/uploads/2018/11/FMT_Stokvels-and-SGs-Report_10-October-2018_final.pdf

Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*, *25*(1), 1–21.

Subova, N., Mura, L., & Buleca, J. (2021). Determinants of household financial vulnerability: Evidence from selected EU countries. Economics & Management, 24(3), 186=207.

Suri, T., Bharadwaj, P., & Jack, W. (2021). Fintech and household resilience to shocks: Evidence from digital loans in Kenya. *Journal of Development Economics*, *153*, 1–20.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*, 1273–1296.

Tabetando, R., & Matsumoto, T. (2020). Mobile money, risk sharing, and educational investment: Panel evidence from rural Uganda. *Review of Development Economics*, *24*(1), 84–105.

Tadesse, G., & Zewdie, T. (2019). Grants vs. credits for improving the livelihoods of ultra-poor: Evidence from Ethiopia. *World Development*, *113*, 320–329.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55.

Terraneo, M. (2018). Households' financial vulnerability in southern Europe. *Journal of Economic Studies*, *45*(3), 521–542.

Tita, A. F., & Aziakpono, M. J. (2017). The relationship between financial inclusion and income inequality in sub-Saharan Africa: Evidence from disaggregated data. *African Review of Economics and Finance*, *9*(2), 30–65.

Townsend, R. M. (1994). Risk and insurance in village India. *Econometrica*, *62*(3), 539–591.

Tram, T. X. H., Lai, T. D., & Nguyen, T. T. H. (2021). Constructing a composite financial inclusion index for developing economies. *Quarterly Review of Economics and Finance*, 1–9.

Tversky, A., & Simonson, I. (1993). Context-dependent preferences. *Management Science*, *39*(10), 1179–1189.

UNDP (United Nations Development Programme). (2020). *COVID-19 in South Africa: Socio-economic impact assessment*. https://southafrica.un.org/sites/default/files/2020-12/UNDP%20Socioeconomic%20Impact%20Assessment%2520Socioeconomic%2520Impact%2520Assessment%25202020_FINAL.pdf

UNDP. (2021). *What are the Sustainable Development Goals?* https://www.undp.org/sustainable-development-goals

Urrea, M. A., & Maldonado, J. H. (2013). Vulnerability and risk management: The importance of financial inclusion for beneficiaries of conditional transfers in Colombia. *Canadian Journal of Development Studies*, *32*(4), 381–398.

Veenhoven, R. (1991). Is happiness relative? *Social Indicators Research*, *24*(1), 1–34.

Veenhoven, R. (2012). Happiness: Also known as "life satisfaction" and "subjective well-being". In K. C. Land, A. C. Michalos, & M. J. Sirgy (Eds.), *Handbook of Social Indicators and Quality of Life Research* (pp. 63–77). Springer Netherlands.

Veenhoven, R., & Ehrhardt, J. (1995). The cross-national pattern of happiness: Test of predictions implied in three theories of happiness. *Social Indicators Research*, *34*(1), 33–68.

Verhoef, G. (2001). Informal financial service institutions for survival: African women and stokvels in urban South Africa, 1930–1998. *Enterprise and Society*, *2*(2), 259–296.

Wang, M., & Wong, M. C. S. (2014). Happiness and leisure across countries: Evidence from international survey data. *Journal of Happiness Studies*, *15*(1), 85–118.

Wardhono, A., Qori'Ah, C. G., & Indrawati, Y. (2016). The determinants of financial inclusion: Evidence from Indonesian districts. *International Journal of Economic Perspectives*, *10*(4), 472–483.

WBG (World Bank Group). (2020). *The global economic outlook during the COVID-19 pandemic: A changed world*.

https://www.worldbank.org/en/news/feature/2020/06/08/the-global-economic-outlook-during-the-covid-19-pandemic-a-changed-world

World Bank Group. (2021). *Food security in the face of COVID-19: Evidence from Africa*. https://blogs.worldbank.org/opendata/food-security-face-covid-19-evidence-africa

World Bank Group. (2022). *Financial inclusion*. https://www.worldbank.org/en/topic/financialinclusion/overview

World Bank Group. (2022). *From COVID-19 Crisis Response to Resilient Recovery—Saving Lives and Livelihoods while Supporting Green, Resilient and Inclusive Development (GRID)*. https://www.devcommittee.org/sites/dc/files/download/Documents/2021-03/DC2021-0004%20Green%20Resilient%20final.pdf

Wentzel, J. P., Diatha, K. S., & Yadavalli, V. S. S. (2016). An investigation into factors impacting financial exclusion at the bottom of the pyramid in South Africa. *Development Southern Africa*, *33*(2), 203–214.

Wiersma, J., Alessie, R. J. M., Kalwij, A., Lusardi, A., & van Rooij, M. (2020). *Skating on thin ice: New evidence on financial fragility* (DeNerderlandscheBank Working Paper No. 70). https://ideas.repec.org/p/dnb/dnbwpp/670.html

Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Journal of Emergency Primary Health Care*, *8*(3), 1–13.

Wissmann, M., Shalabh, S., & Toutenburg, H. (2009). Role of categorical variables in multicollinearity in linear regression model. *Journal of Applied Statistical Science*, *19*(1), 99–113.

Wonder, N., Wilhelm, W., & Fewings, D. (2008). The financial rationality of consumer loan choices: Revealed preferences concerning interest rates, down payments, contract length, and rebates. *Journal of Consumer Affairs*, *42*(2), 243–270.

World Bank. (2021). *Unemployment, total (% of labour force) (modeled ILO estimate)—South Africa*. https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?locations=ZA

World Bank. (2021). *World development indicators: Exports of goods and services (current LCU)*. World Bank. https://data.worldbank.org/indicator/NE.EXP.GNFS.CN.

World Health Organisation. (2022). *WHO Coronavirus (COVID-19) dashboard*. World Health Organisation. https://covid19.who.int/

Worthington, A. C. (2006). Debt as a source of financial stress in Australian households. *International Journal of Consumer Studies*, *30*(1), 2–15.

Wu, W., Stephens, M., Du, M., & Wang, B. (2019). Homeownership, family composition and subjective wellbeing. *Cities*, *84*, 46–55.

Wu, F., Zhao, S., Yu, B., Chen, Y., Wang, Y., Song, Z., Hu, Y. et al. (2020). A new coronavirus associated with human respiratory disease in China. *Nature*, *579*(7798), 265–269

Xiao, J. J., & Noring, F. E. (1994). Perceived saving motives and hierarchical financial needs. *Financial Counseling and Planning*, *5*, 25–45.

Xiao, J. J., & Porto, N. (2017). Financial education and financial satisfaction: Financial literacy, behavior, and capability as mediators. *International Journal of Bank Marketing*, *35*(5), 805–817.

Xu, Y., Briley, .A, Brown, J. F., & Roberts, B. W. (2017). Genetic and environmental influences on household financial distress. *Journal of Economic Behavior & Organization*, *142*, 404–424.

Yong, A. G., & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94.

Yorulmaz, R. (2016). *Essays on global financial inclusion* [PhD dissertation, University of Sheffield, Sheffield, UK].

Zhang, & Posso, A. (2019). Thinking inside the box: A closer look at financial inclusion and household income. *Journal of Development Studies*, *55*(7), 1616–1631.

Zhang, & Zhang, F. (2019). Effects of housing wealth on subjective well-being in urban China. *Journal of Housing and the Built Environment*, *34*(4), 965–985.

Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, *37*(3), 197–206.

Zheng, X., Yuan, Z., & Zhang, X. (2020). Does happiness dwell in an owner-occupied house? Homeownership and subjective well-being in urban China. *Cities*, *96*, 1–11.

Zins, A., & Weill, L. (2016). The determinants of financial inclusion in Africa. *Review of Development Finance*, *6*(1), 46–57.

Zumbro, T. (2014). The relationship between homeownership and life satisfaction in Germany. *Housing Studies*, *29*(3), 319–338.

APPENDIX: DECLARATION OF OTHER AUTHORS OR CONTRIBUTORS

Declaration by the candidate:

Concerning [*Chapter 2 and Chapter 3*], the scope of my contribution was as follows:

Nature of contribution	**Contribution (%)**
Conceptualised the idea of each chapter. Wrote the introduction, theoretical literature, empirical literature, methodology, results, discussion, and conclusion of each chapter.	85%

The following co-authors have contributed to [specify chapter or part of a chapter and page numbers in the dissertation]:

Name	**e-mail address**	**Nature of contribution**	**Contribution**
Prof. Ashenafi B. Fanta	ashenafi@sun.ac.za	Provided direction on the macro and micro structure; commented on the presentation of the results and discussions.	15%

Signature of candidate: *Declaration with signature in possession of candidate and supervisor*

Date: 20/09/2022

Declaration by co-authors: the undersigned hereby confirm that

1. the declaration above accurately reflects the nature and extent of the contributions of the candidate and the co-authors to [specify chapter or part of a chapter and page numbers in the dissertation],
2. no other authors contributed to [specify chapter and page numbers in the dissertation] besides those specified above, and
3. potential conflicts of interest have been revealed to all interested parties and the necessary arrangements have been made to use the material in [specify chapter or part of a chapter and page numbers in the dissertation] of this dissertation.

Signature	**Institutional affiliation**	**Date**
Declaration with signature in possession of candidate and supervisor	Stellenbosch University	20/09/2022