PERCEPTIONS AND FACTORS INFLUENCING THE WILLINGNESS TO PAY FOR MICRO CYBER-RISK INSURANCE: A LOGISTIC REGRESSION APPROACH

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OPEN ACCESS

How to cite this paper: Osifodunrin, E. A., & Lopes, J. D. (2023). Perceptions and factors influencing the willingness to pay for micro cyber-risk insurance: A logistic regression approach. *Risk Governance and Control: Financial Markets & Institutions, 13*(4), 40–57.
https://doi.org/10.22495/rgcv13i4p4

ISSN Online: 2077-4303
ISSN Print: 2077-429X

Received: 13.09.2023
Accepted: 06.12.2023

JEL Classification: G280, G210, G220, O17, L860
DOI: 10.22495/rgcv13i4p4

Abstract

This study aims at (re)focusing research attention on the improvement of welfare, achieving sustainable micro cyber-risk management, and the reduction of persistent insurance exclusion among retail e-payment agents (REAs) or branchless banking agents operating globally and in Lagos slums. With the active collaboration of REAs and micro-insurers, we designed and introduced the first hypothetical POS-related micro cyber-risk insurance (PRMCRI) to sustainably manage identified cyber-risks of REAs. Using a contingent valuation survey and logistic regression, this study also investigates REAs' perceptions and factors having statistically significant effects on their willingness to pay (WTP) for PRMCRI. Our findings revealed that WTP for PRMCRI is only slightly sensitive to premium price. REAs' perceptions of inflation, interest rates, deployment/administration of PRMCRI on mobile-technology platforms, and the effectiveness of regulatory consumer protection all positively affected their WTP for PRMCRI. Age, marital status, education, religion, and gender had no statistically significant effect on the WTP for PRMCRI. The practical value and actionable implication of the PRMCRI were further evinced, as 65.93 percent of the 455 surveyed REAs affirmed their WTP for the product. Ultimately, we hope that the introduced PRMCRI and its associated empirical/policy dynamics will champion a novel and seminal path for global micro cyber-insurance markets, future studies, and policies.

Keywords: Micro Cyber-Risk Insurance (MCRI), Demand Determinants, Low-Income Groups, Branchless Banking Agents, Urban Slums, POS-Related Cyber-Risks (PRCRs), Neobanks, Participatory Governance

Authors' individual contribution: Conceptualization — E.A.O.; Methodology — E.A.O.; Resources — E.A.O. and J.D.L.; Writing — Original Draft — E.A.O.; Writing — Review & Editing — E.A.O. and J.D.L.; Supervision — J.D.L.; Funding Acquisition — J.D.L.

Declaration of conflicting interests: The Authors declare that there is no conflict of interest.

Acknowledgements: The Authors wish to gratefully acknowledge the seamless research cooperation of all members of the REA Working Group, REA respondents, and the financial support from FCT — Foundation for Science and Technology (Portugal), national funding through a research grant (UIDB/04521/2020).

1. INTRODUCTION

The demand side of formal microinsurance in many developing countries continues to experience low awareness, penetration, and outreach (Platteau et al., 2017). This study emphasizes that this low microinsurance demand and other related sub-optimalities have largely persisted because of market ineffectiveness, inefficiencies, imperfections, frictions, and failures (MIIFFs) on the supply-, subsidy-, and regulatory- (SSR) sides of microinsurance. The major exogenous factors indicted for this low demand in the literature reviews of Osifodunrin (2023), Platteau et al. (2017), and Eling et al. (2014) mostly emanate from these SSR-sides. These factors include inefficient subsidy allocation, regulatory ineffectiveness (even in consumer protection), and various other MIIFFs that contribute significantly (directly or indirectly) to the demand debacle. Other factors include supply-side deficiencies in premium pricing, product information, trust, contract design, and service quality. Bashir and Wiedmaier-Pfister's (2019) industry report revealed that some supply-side stakeholders (or micro-insurers) do not fully appreciate the nuances, rationale, and peculiarities of the potential or actual consumers of microinsurance products, as over 80 percent of the proposed products submitted for regulatory approval were rejected for not being suitable for low-income groups and for other pertinent reasons. Other instances of MIIFFs on the regulatory side of microinsurance were documented as inter-agency challenges, where microinsurance regulators and other stakeholders (including telco regulators and telecommunication companies whose networks or platforms could provide more efficient and effective microinsurance delivery channels) collaborated sub-optimally, exhibited unhealthy rivalry, and were entangled in needless bureaucracy, corruption, and other imbroglios (Bashir & Wiedmaier-Pfister, 2019). In the worst scenarios, some insurance-excluded low-income groups do not even know about formal microinsurance. Hence, we assert that the collective responsibilities of stakeholders on the SSR side to provide the necessary insurance enlightenment, succor, market development, and governance may have suffered some setbacks over time.

This study proposes and ultimately validates that one of the holistic and effective solution approaches to this persistent demand challenge is to categorize insurance-excluded low-income populations into groups and make genuine efforts to serve each of these groups with viable and sustainable microinsurance products, suitably customized to their specific needs. In addition, stakeholders on the SSR side are challenged to effectively synergize, innovate, and expend the necessary resources and efforts to achieve this. As detailed in Section 3, this study exemplifies this synergy by constituting a unique working group of potential microinsurance consumers and micro-insurers with the willingness to actively participate in customized microinsurance product design and lays the foundation for the future governance of the novel product in focus. As issues concerning regulatory representation in the working group were not resolved in the scheduled time, the project improvised for government intervention by integrating three demand-focused government intervention mechanisms of "group microinsurance", "insurance literacy and simplification", and an "established mobile distribution channel" (as outlined in Yan and Faure, 2021). The mechanism of subsidization (whether sponsored by government or non-governmental sources) was intentionally excluded from the design to mitigate moral hazard, and adverse selection, and to boost the future sustainability of the product. Some supply-focused interventions by the government are also emphasized in Section 5.

According to the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the International Finance Corporation (IFC), some of the groups largely excluded from formal microinsurance are micro-enterprises, with many more nano-enterprises even far more excluded because of various MIIFFs (GIZ, 2019; IFC, 2017). Specifically, this study investigates five possible factors with statistically significant effects on the demand for micro cyber-risk insurance (MCRI) among retail electronic payment agents (REAs) operating in the urban slums of Lagos, Nigeria, with useful empirical outcomes and lessons for similar micro- and nano-enterprises (MINAEs) and other stakeholders across developing countries. As indicated in Lyman et al. (2006), Ledgerwood et al. (2013), and Ashraf (2022), MINAEs similar to REAs have served in agent-assisted branchless banking operational in Brazil, India, South Africa, the Philippines, Kenya, and other jurisdictions.

This study presents the following main justifications for embarking on this empirical endeavor:

First, this study reaffirms the solution that SSR stakeholders (as well as (sub)national governments) in developing countries must collaborate to categorize insurance-excluded low-income populations into groups and make genuine efforts to serve each of them with viable and sustainable microinsurance products suitably customized to their specific needs. This approach is echoed and validated in this study as a workable insurance inclusion strategy.

Second, in the specific instance of Nigeria, despite the enormous efforts and resources already expended on promoting insurance inclusion, it is quite disheartening that the self-declared target of achieving 40 percent insurance inclusion among adult Nigerians (Central Bank of Nigeria [CBN], 2018) has remained a mirage, as current insurance inclusion is still less than 3 percent of the adult population. Unfortunately, this illustrated insurance exclusion in Nigeria is also a harsh reality in many other developing nations. This study intends to re-sensitize governments, researchers, SSR stakeholders, and others in developing countries to the factors and perceptions that need to be managed better in order to improve the demand for MCRI among the numerous REAs in Nigeria and similar MINAEs in other jurisdictions. This could further reduce the insurance exclusion currently plaguing these nations. According to GIZ (2019), the efforts and minimal successes of a few micro-insurers (in championing other microinsurance products for MINAEs) were noted in Peru, the Philippines, Kenya, and Pakistan, however, many other developing countries including Nigeria are still lagging behind; hence, the objective of this study is to re-sensitize relevant stakeholders to take necessary actions.

Third, the research respondents in this study are REAs, or branchless banking agents, that already enjoy some level of financial inclusion and play very critical roles in effectively sustaining the financial inclusion status of other MINAEs and low-income individuals, globally. Although some do not directly open bank accounts for their clients, their roles are to encourage the opening of bank accounts with deposit money banks (DMBs) or neobanks, to facilitate savings and withdrawals, payment of bills, and effect electronic cash transfers, mainly consummated via their point of sale (POS) devices. However, REAs still suffer chronic insurance exclusion, as 96.26 percent of the surveyed Nigerian REAs in this study had never enjoyed any personal insurance policy and also lacked MINAE-targeted insurance policies; hence, this study evinces the "determinant vs microinsurance demand" perspectives of these respondents with partial financial exclusion status. As REAs are already stakeholders in the financial inclusion ecosystem, their informed perspectives unveiled hitherto unknown intricacies about policy challenges and the concept of insurance exclusion, especially concerning MINAEs. Again, as these REAs also operate in some other developing countries, the empirical, theoretical, and policy implications derivable from this study could also be cautiously applied to other developing countries.

Fourth, as the main focus of this study is on providing MCRI policy to protect REAs from possible incidences of POS-related cyber-risks (PRCRs) in the course of their technology-based operations, we crucially note the recent interest of scholars, relevant academic journals, Organisation for Economic Co-operation and Development (OECD), and industry experts on the subject of cyber-risks insurance. In this regard, the works of Eling and Schnell (2016), Boyer (2020), OECD (2017), and the "calls for related articles" from journals buttressed the significance of this study. Furthermore, the focus of extant studies has been solely on using formal/conventional insurance to manage cyber-risks, with no focus, whatsoever, on MCRI. The practitioners' viewpoint is also in support of innovating, designing, and providing adequate risk management products for cyber-risks. According to the Centre for the Study of Financial Innovation and PricewaterhouseCoopers (CSFI & PwC, 2021), cyber-risks are now considered among the most critical risks facing insurance clientele and the insurers themselves.

Additionally, MINAEs are globally regarded as the engine room of the economy (particularly in developing countries), and MCRI and other microinsurance products are potential lifelines. In fact, the significance and social welfare benefits of cyber-risk insurance and other microinsurance products were affirmed in the works of Kuru and Bayraktar (2017) and Elabed and Carter (2015), and it was determined that the lack of insurance is often correlated with suboptimal decision-making. Therefore, identifying and validating factors that could impede/foster MCRI cannot be regarded as trivial in policymaking, practice, and academic realms.

Although some scholars (in 2023) might still understandably consider MCRI as predating its time, the surveyed REAs and members of the REA Working Group (including the anonymous micro-insurers mentioned in Section 3) overwhelmingly welcomed the innovative idea of sustainably protecting REAs from the inherent PRCRs. The value of the MCRI is further validated, as 300 REAs (or 65.93 percent) of surveyed REAs affirmed their willingness to pay for the MCRI. Following the 2013 implementation of the Agent Banking Policy (ABP) of the Central Bank of Nigeria (CBN), the emergence of the REAs was formally heralded to serve as agents of licensed DMBs, neobanks, mobile money operators (MMOs), payment service providers (PSPs) and other designated non-bank operators to extend basic financial services to all willing Nigerian adults (CBN, 2013). Also, as cashless financial transactions in Nigeria become ubiquitous, coupled with the aftermath of COVID-19 and other driving forces encouraging electronic payments, occurrences of fraud and related digital vulnerabilities have skyrocketed in Nigeria. Therefore, the unified responses of Mukherjee (2004), Mansuri and Rao (2013), and Osifodunrin and Lopes (2021) to scholars doubting REAs' readiness for MCRI is that the insights and solution propositions of those who suffer development or socioeconomic challenges are quite different, revealing, and even sometimes superior to the insights of politicians, academics, policy makers, and even other low-income groups who do not suffer such challenges.

Furthermore, some demand-impacting endogenous factors (such as the level of individual risk aversion, religious beliefs, age, and income with individual peculiarity) may not be easily amenable to policy efforts. As noted in Osifodunrin (2023), extensive literature attention has already been focused on them; this study mainly focuses on the perceptions of REAs regarding various exogenous factors with the implication that when they are identified/validated and better managed by policymakers, the effort(s) can positively modify the perceptions of these REAs, which can in turn improve their microinsurance demand. This study also provides the crucial foundation for an emerging socio-economic model of the "determinants of MCRI-demand arising from MINAEs." This could make room for improved MCRI-demand observations, clearer theoretical insights, and useful policy-oriented predictions of related economic behaviors or variables. In essence, this study contributes to the institutional theory of saving as microinsurance is indeed a form of saving, and various socioeconomic institutions and governments are responsible for the critical exogenous variables investigated in this study in relation to the REAs' perceptions. Lastly, it must be pertinently noted that this study is majorly inspired by the various gaps identified in the structured literature reviews of Osifodunrin (2023), Platteau et al. (2017), and Eling et al. (2014), and they are only reiterated in Section 2 for emphasis.

Specifically, the study investigates the following determinants:

1. The MCRI premium price.
2. REAs' perceptions of regulatory consumer protection.
3. REAs' perceptions of supply-side innovation (i.e., the REAs' perceptions of the hypothetical use of mobile technology as a channel of distribution and administration for MCRI).
4. REAs' perceptions of interest rate realities.
5. REAs' perceptions of inflationary realities (as indicated in the extant studies of Kapoor and

Kar, 2023; Ichiue and Nishiguchi, 2015; and Springer 1977, inflation perception/expectation often influence the economic decisions or behavior of individuals and other economic actors vis-à-vis their investments, spending, and even the willingness to pay for insurance).

The above determinants hypothesized to influence REAs' willingness to pay (WTP) for MCRI were investigated using a contingent valuation survey (CVS) and the logistic regression method, which is most suitable for investigating factors impacting a dichotomous outcome. As described by Hosmer et al. (1997), logistic regression is a statistical method suitable for investigating the possibilities of some explanatory or independent variables influencing a dependent variable (with dichotomous or binary outcomes), in which there are only two possible outcomes (i.e., either 1 or 0; "yes" or "no"; "true" or "false", etc.). According to Field's (2013) submission, this methodology ideally requires adequate samples, with a minimum of 50 cases or respondents per investigated explanatory variable, while Leblanc and Fitzgerald (2000) recommend a minimum of 30 samples per predictor, as subsequently applied in this study.

The remainder of the paper is organized as follows. Section 2 outlines a summary of the extant literature and delineates the PRCRs. Section 3 describes the data and methodology, and Section 4 presents the results. Finally, Section 5 concludes the paper and discusses the study's limitations and policy-related recommendations.

2. LITERATURE REVIEW

MINAEs, as a unique subgroup of the low-income group, have largely suffered neglect from researchers, micro-insurers, and policymakers. This neglect may be partly due to the informality and structurelessness plaguing most of these MINAEs, as they often lack well-defined business objectives and group homogeneity to muster the critical mass required to attract supply-side attention. In addition, there are no defined rules or roles and promoters are difficult to separate from these entities. In other words, it is quite uncommon to perceive or identify MINAEs as judicial entities that are clearly distinct from the low-income individuals who promote them. In fact, these MINAEs were not mentioned in the earlier works of Platteau et al. (2017) and Eling et al. (2014), which reviewed the extant literature focusing on the determinants of microinsurance demand. While rural dwellers (farmers/pastoralists, etc.) have mostly caught the attention of scholars as research respondents or subjects, MINAEs (especially those in non-agricultural sectors) have received little or no research attention in this academic sub-domain. However, a recent review by Osifodunrin (2023) highlighted this omission to draw the crucial and transformative attention of future studies.

Many empirically validated endogenous factors have been identified as impeding or enhancing microinsurance demand among low-income groups. Some of these factors are insurance (il)literacy, religious beliefs, level of risk aversion, geographic distance from micro-insurers, level of (dis)trust in micro-insurers, and network effects (i.e., the encouraging or discouraging influence of family or friends who have already used microinsurance products) (Osifodunrin, 2023; Eling et al., 2014). Income, liquidity status, social/ employment status, formal education level, family size, age, and other demographic variables have also been empirically validated as endogenous factors affecting the demand for microinsurance. However, other relevant factors are exogenous to low-income groups. These are factors emanating from SSR- and other socio-economic stakeholders, which we assert have largely faltered in sustainably harnessing and managing the above-stated factors to stimulate widespread microinsurance demand. Although some microinsurance demand improvement has been noted (2006 to 2023), the SSR stakeholders still have much to do in expanding demand. This is especially true in the areas of improving regulatory effectiveness (especially in enhancing effective consumer protection), championing effective/optimal supply innovation, fostering meticulously crafted collaboration among SSR stakeholders and other policymakers, encouraging sterling market/client intelligence, and consciously moderating related fiscal and monetary policies for insurance inclusion (Osifodunrin & Lopes, 2022). Meanwhile, as revealed in Osifodunrin (2023), it is quite surprising to note that (so far in the literature), innovation and technology are the only factors exogenous to the demand side that have been investigated as being capable of influencing formal microinsurance demand.

Despite the fact that most extant peer-reviewed studies focus on Asia/Africa, none has so far focused, absolutely, on low-income groups, households, individuals, or MINAEs in Nigeria, one of the most populous countries in the world, still grappling with one of the worst insurance exclusion rates (over 97%), and the poverty capital of the world (The World Data Lab, n.d.).

Excluding the works of Chen et al. (2019), Uddin (2017), and Bonan et al. (2017), the remaining 49 relevant articles systematically reviewed by Osifodunrin (2023) focused entirely on the rural areas of developing countries, largely overlooking the (equally vulnerable) urban low-income groups of these countries.

In the academic domain of microinsurance demand, relatively few studies have investigated the perception(s) of low-income groups as a predictor of microinsurance demand. Dong et al. (2009) conducted one of the earliest studies in this domain; they explored the perceptions of Burkinabe households regarding "the quality of medical services they receive" as a crucial determinant in respect of "micro health insurance renewal." In addition, Rayamajhee et al. (2022) investigated the climate change perception of Nepalese farmers as the sole determinant of the WTP for a hypothetical weather-index microinsurance product. Other studies include those by Jehu-Appiah et al. (2012) and Dror et al. (2018).

A sizable number of articles in the extant literature focused on weather, disaster, or index insurance related specifically to agriculture, while others focused on micro health insurance, and micro-life insurance, and the rest focused on a varied combination of the foregoing insurance policies.

Remarkably, and due to the current dearth of practice and research attention on cyber-risks, none of the studies reviewed sought to identify or validate the determinants of the demand for MCRI. In fact, in the current global insurance market, even conventional cyber-insurance still suffers from a lack of due attention, much less MCRI.

Overall, these outlined gaps, and other rationales already provided in Section 1, collectively inspired this study with the hope that it serves as a seminal reference and charts a new theoretical and empirical path.

As regards the PRCRs, this section of the study deems it fit to properly delineate their characteristics and the specific Nigerian context(s) in which they manifest. As noted by Adepetun (2022) and Cards International (CI, 2009), Nigeria has a significant share of cyber-risks, with a notorious global reputation for cyber-propagated financial fraud. In this study, PRCRs are delineated as vulnerabilities/threats that are strictly characterized as follows:

1. They emanate from the POS-operations of REAs.

2. They often involve malicious incidents (such as electronically conducted identity theft, data breaches, denial of service, and malware attacks), resulting in financial loss or business disruption for REAs only.

3. Vulnerabilities may also occur from non-malicious failure of the POS.

4. Overall, these risks can affect the confidentiality, availability, and integrity of POS devices, their networks, servers, and other POS-related infrastructures, to the detriment of REAs.

In other words, the PRCR must be electronic in nature, related to the POS or financial accounts of REAs, and must result in REAs' financial loss or business disruption. It must be noted that every POS device is linked to a financial account of an REA. Conceptually, and even operationally, this study's delineation of PRCR is in tandem with the three conditions outlined in Biener et al. (2015) to appropriately designate a "risk set" as cyber-risks. The POS terminal clearly represents a "critical asset" of interest; the REAs, their customers, and POS cyber-criminals represent the "relevant actors"; and the recorded losses/failures, business disruptions, and other vulnerabilities represent the "relevant outcomes." More cogent examples of PRCRs include the following:

1. Delivery of fake SMS credit alert (via an unscrupulous app or other malicious tools) to the mobile telephone number linked to the financial account of an unsuspecting REA without the funds actually crediting the financial account of the REA. The REA is deceived into parting with physical cash without receiving a real exchange because the SMS alert (ideally meant to serve as official electronic transaction proof) is fake.

2. Various malicious POS virus attacks (using viruses such as HydraPoS, AbaddonPoS, Ploutus, RawPoS, and Prilex) cause all forms of business disruptions and financial losses for REAs. Other forms or typologies of POS attacks, threats, and risks are documented in Gomzin (2014).

3. Hackers also often access/breach the POS or financial accounts of REAs, electronically dispossessing them of their funds. These hackers usually capitalize on existing and unfixed vulnerabilities in POS operating systems and other POS-based applications, or hardware/network infrastructure. It must be noted that these vulnerabilities are device-, network- and manufacturer-specific, hence technologically-savvy REAs are aware of the sensitivities and PRCRs associated with careless disclosure of their POS-specific information.

4. Cybercriminals in Nigeria have now attained unprecedented levels of sophistication, with easy access to malware, malware deployment services, stolen financial credentials, ransomware-as-a-service, and other cybercrime toolkits, including those used to avoid detection (Adepetun, 2022). Consequently, many REAs have complained about how their financial accounts have been debited without corresponding credit to the accounts of their intended customers, indicating possible digital breaches in which these operations may have been maliciously intercepted. In a worst-case scenario, a few of these malicious breaches remain undetectable, even by licensed DMBs, neobanks, etc.

5. Some non-malicious (scheduled/unscheduled) downtimes on the providers' network, server/software maintenance, and other challenges (including force majeure) may electronically disrupt the POS operations of REAs.

As earlier observed by Bailey (2014), the United States Department of Homeland Security (USDHS, 2012), and OECD (2020), the paucity or lack of accurate data on the details of cyber-risks (including frequency and magnitude) is still evident in 2022/2023, even in Nigeria. Although no formal dataset could be regarded as definitive in the official documentation of these PRCRs, various policy responses have been directed towards these risks (Adepetun, 2022; CBN, 2020, 2013; CI, 2009; Ujah, 2011), providing some form of concrete evidence regarding the severity/significance of these risks. Perhaps this severity is most evident in the letters and spirit of the relevant Nigerian cyber law, as excerpted from the Federal Government of Nigeria (FGN, 2015): "Any person who manipulates an ATM machine or point of sales (POS) terminals with the intention to defraud shall be guilty of an offence and upon conviction sentenced to five years imprisonment or NGN5,000,000.00 fine or both".

In fact, the regulator/supervisor of the payments system in Nigeria (the CBN) has, over time, attempted to identify, and continuously alert REAs and the Nigerian public, monitor or control, and institutionalize the overall management of these risks. Notwithstanding the aforementioned (mainly preventive) measures and efforts, a huge risk management gap still exists for these PRCRs, which has partly necessitated this study's initiation and focus on MCRI, seeking to provide better protection and indemnity for vulnerable REAs. Consequently, the POS-related micro cyber-risk insurance (PRMCRI) is envisioned to be competitively provided by interested micro-insurers and specifically customized for REAs. It is meant to operate on the basic principles of insurance, ultimately funded by premiums, and covers the financial losses arising from any of the PRCRs stated above, up to the value of the total sum insured per annum. Moreover,

the PRMCRI (as captured in Table 1) pays a predetermined compensation (equivalent to three times the value of the annual premium paid) for every POS business disruption that persists for more than a week, provided the disruption is no fault of the REA, and with some other agreed terms and conditions to guarantee the sustainability of the PRMCRI policy. It is also pertinent to state that the PRMCRI only insures an REA's first-party losses and excludes any third-party cover for the REA's clientele, as agreed upon by the REA Working Group, in order to moderate the premium price. In the other deliberations of the REA Working Group (created to foster active REA participation in PRMCRI design/governance and detailed in Section 3), the following premium and total sum insured, together with other details, were unanimously agreed upon by the working group:

Table 1. Rate sheet for the PRMCRI as unanimously agreed upon by members of the REA Working Group

S/N	*Annual premium (Nigerian naira, NGN)*	*Pre-determined compensation for REAs' business disruption enduring for more than 7 consecutive days (a one-time compensation per annum in Nigerian naira, NGN)*	*Total sum insured (Nigerian naira, NGN)*
1.	2,000.00	6,000.00	35,000.00
2.	3,000.00	9,000.00	50,000.00
3.	6,000.00	18,000.00	110,000.00
4.	9,000.00	27,000.00	155,000.00
5.	12,000.00	36,000.00	215,000.00
6.	15,000.00	45,000.00	300,000.00

Note: US$1.00 = ~NGN 414.72 as at 30/06/2022. The PRMCRI has an average coverage value of about 18%, as estimated by the formula (Premium / Total sum insured) provided in Elango et al. (2019).

3. DATA AND METHODOLOGY

This section follows the "hypothetical microinsurance product model and methodologies" of Meze-Hausken et al. (2009), Brouwer and Akter (2010), and Gaurav and Chaudhary (2020) in envisioning and designing the hypothetical PRMCRI product for REAs in the urban slums of Lagos. According to Davis (2006), the dynamic interplay of various socioeconomic factors (poverty, lax law enforcement, peer pressure, and personality maladjustment) in urban slums creates conducive breeding grounds for criminal activities. These urban slums were specifically chosen because their location in urban areas are theoretically assumed to expose REAs to higher PRCRs, while the focus on the slums still guarantees the ability to target bottom-of-the-pyramid nano-enterprises, who are likely unfamiliar with the general idea/mechanism of cyber-risks, risk management, and insurance. It must be noted that the REAs surveyed in this study are solely into this agency and do not commingle their operations with other businesses, this is to (as much as possible) ensure that their income is solely from their REA operations.

Specifically, a 5-step methodological process was adopted.

1. In line with the "participatory development" works of Mukherjee (2004), Mansuri and Rao (2013) and, most importantly, Osifodunrin and Lopes (2021), we placed great value in the rare insights that could be evinced by actively involving the REAs from the very early stages of envisioning and designing the PRMCRI product to capture their specific needs. An REA Working Group of randomly selected REAs (from 3 of the 42 urban slums in Lagos) and a few anonymous micro-insurers was formed, ab initio, to: 1) notionally assume the role of government by thoroughly educating these REAs about the formal definition and dynamics of cyber-risks (beyond the informal orientation these REAs previously had) and about the notion and practice of formal microinsurance; 2) review and document the entire operations of the REAs and (as stipulated in Biener et al., 2015) classify all their inherent operational risks into PRCRs and other unrelated risks; 3) meticulously capture REA-specific and self-generated POS-related cyber microinsurance needs[1]; 4) assume another government role (i.e., price control) by co-determining a range of optimal premiums and PRMCRI payouts (or the total sum insured) that would be beneficial/sustainable for the REAs and the eventual providers of PRMCRI[2]. All REAs that participated in the working group were excluded from the cognitive, pilot, and main surveys to avoid unintended sensitization. The proceedings of some active (but informal) REA groups, conveniently and efficiently hosted and administered on electronic platforms or social media, and where critical REA operational issues were aired and resolved, were also reviewed. The REAs' unique insights were also useful in prequalifying an array of literature-inspired and inadvertently overlooked independent variables or perceptions capable of influencing the REAs' WTP for the hypothetical PRMCRI product.

2. In order to properly guide the eventual REA-interview process, a structured questionnaire (tested, corrected and validated in the course of the cognitive/pilot studies) was developed to document and measure the shortlisted independent variables and the dichotomous dependent variable. Finally, the questions in the questionnaire were used

[1] These needs and risks were systematically evaluated for insurability and regulatory/legal compliance using the set of criteria introduced in Berliner (1982), the Nigerian 2018 microinsurance regulatory guidelines (National Insurance Commission [NAICOM], 2018), and other relevant policies. The REAs (relying on their knowledge of themselves, their economic/sociopsychological attitudes, and other prevailing conditions) also suggested useful approaches to mitigate all forms of moral hazards, adverse selection, and unique approaches to effectively enforce group- and insurance-specific rules. Ultimately, the REAs in the Working Group and eventually in the main study were enlightened on the need to understand that the sustainability of the PRMCRI must be well balanced with the derivable utility or welfare of REAs and must be built on the premise that future providers must take in enough premiums and spread risks across enough policyholders so that they will have no challenges whatsoever in paying out claims. Consequently, group-based mechanisms must be implemented to ensure that unscrupulous or unexpectedly large (and frequent) losses do not occur.

[2] The range of optimal premiums (i.e., NGN2,000.00, NGN3,000.00, NGN6,000.00, NGN9,000.00, NGN12,000.00, and NGN15,000.00; US$1.00 = ~NGN 414.72 as of 30/06/2022) eventually served as the hypothetical range of premiums (or hypothetical bids) in the CVS that followed. Crucially, this range of optimal premiums and their corresponding "pay-out amounts" (as shown in Table 1) are also in tandem with what is currently obtainable (and regulator-approved) in the Nigerian microinsurance market, as captured in Enhancing Financial Innovation & Access All (EFInA, 2018a, 2018b). It must be noted that the CVS (as affirmed in Lindberg et al., 1997) is often deployed for non-market valuation of goods, consequently, each of the validly surveyed 455 REAs was hypothetically offered the PRMCRI at a premium randomly picked from the six bids captured in Table 1.

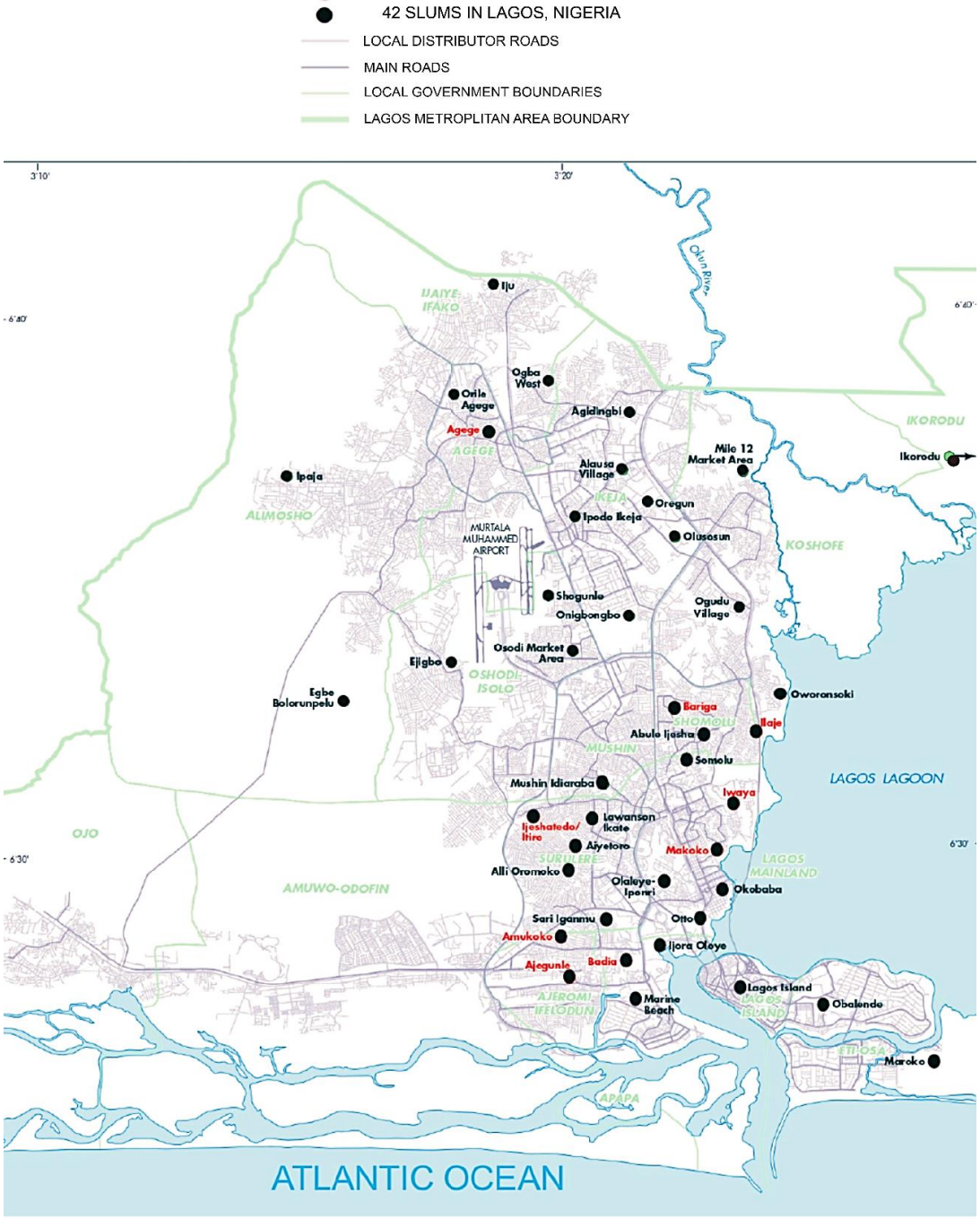
by pre-trained enumerators to guide the interview process, as previously adopted by Qasim et al. (2011). Naturally, the dichotomous dependent variable requires a binary-type response from each REA (i.e., "willingness to pay the randomly-selected bid amount for the PRMCRI policy" or "unwillingness to pay"). The five pre-qualified independent variables are: 1) PRMCRI premium price, 2) REAs' perceptions of regulatory consumer protection, 3) supply-side innovation (proxied with the hypothetical use of mobile technology as a channel of distribution/ administration for PRMCRI, 4) REAs' perceptions of inflationary realities, 5) REAs' perceptions of interest rate realities. It must be noted that the basis of socioeconomic perceptions often arises from "risk assessment", "information presentation and processing", "wide-ranging socio-economic expectations", "socio-economic influences", "behavioral biases", and many others. Notwithstanding the listed bases and the fact that perceptions do not always align with objective reality, many socioeconomic decisions are made (even by low-income groups) based solely on these perceptions. As many studies in literature focus the independent variables in their models on the perceptions of these low-income groups, some scholars may criticize the apparent incompleteness of their models. However, in Koutsoyiannis' (1977) submission with respect to economic reality, it was noted that it is almost impossible to list all the possible determinants of a variable/construct in a model, as many unobserved factors may have remote and immediate effects on a dependent variable, while other unconsidered factors may also unexpectedly affect the variable more closely. Furthermore, the significance of these overlooked factors or variables may be so much that econometricians often improvise and denote their existence and effects with the random error variable "μ" or "ε" (Wulandari et al., 2022). Overall, the articles reviewed by Osifodunrin (2023), Platteau et al. (2017), and Eling et al. (2014) on the determinants of microinsurance demand rarely model more than four independent variables; hence, this study focuses on the five factors listed above. In fact, the only extant study introducing a hypothetical microinsurance product and with a similar methodology (Rayamajhee et al., 2022) only had "the ex-ante/ex-post perceptions of Nepalese farmers on climate change" as the only independent variable in its model.

3. The cognitive/pilot study (conducted on a relatively limited scale) was to ascertain the overall survey-focused cognitive abilities of REAs, instrument accuracy, coherence, and the reliability/validity of the questionnaire, with subsequent remedial adjustments made as appropriate before the main study. Following the approach of Cummings and Taylor (1999), and in due cognizance of the hypothetical nature of the PRMCRI product, the enumerators were duly instructed to deploy the cheap talk method to strictly encourage the REAs to provide only objective responses to all survey items (during the cognitive, pilot, and main studies), compulsorily backed by real scenario-based (qualitative) remarks, serving as additional validation and triangulation. Also, uncooperative respondents were graciously extricated from the study, so as not to make them feel awkward or obligated to respond, which reduced protest responses. Also, anonymity, confidentiality, willingness, and other ethical research requirements were upheld for the respondents and other research participants, with required ethical approval duly obtained.

4. According to the Nigeria Inter-bank Settlement System (NIBSS), there are 167,000 active POSs in all 37 subnational entities in Nigeria (including Lagos State, Abuja, and 35 other states), of which non-REA POS holders and other merchants account for over half (NIBSS, 2021). Currently, there are no aggregated official records of all active REAs in Nigeria, however, based on data from NIBSS (2021), we estimated approximately 83,500 REAs in the country. This gives an estimated average of ~2256 REAs for each of the 37 subnational entities in Nigeria; although, Lagos, being the commercial capital of Nigeria, should ordinarily have more REAs. Meanwhile, the 42 slums identified by the World Bank (2014), guided our survey, with members of the study's REA Working Group randomly selected from 3 randomly pre-selected slums. These 3 slums were eventually excluded from the ensuing surveys (cognitive, pilot, and main), with 39 slums remaining. As we considered it not feasible to survey. REAs in all these 39 slums, we randomly selected 21 slums from these 39 to scale down our survey scope. Also, as the REAs are not evenly distributed, we randomly pre-register between 36 to 50 REAs from each of these 21 slums, and aggregated 1003 REAs as our sampling frame. The REAs that participated in the cognitive and pilot studies were randomly selected from these 1003 REAs, without replacement. For the main study, at least 17 (and at most 24) REAs were randomly selected from each of the 21 slums (i.e., still from the 1003 REAs.). These 21 Lagos slums are Agege, Agidingbi, Ajegunle, Amukoko, Bariga, Ejigbo, Iju, Ikorodu, Ilaje, Ipaja, Iwaya, Makoko, Mile 12 Market Area, Mushin-Idiaraba, Obalende, Okobaba, Olusosun, Orile Agege, Oworonsoki, Shogunle, and Somolu. It must be emphasized that for the study, uncooperative respondents (especially during the rigorous interview sessions) were simply extricated, so as not to make them feel obligated to respond. The unmentioned WBG-identified slums, together with the ones mentioned, are shown in Figure 1.

5. The completed questionnaires (using the interview responses of REAs) were collected for subsequent data analysis using the Statistical Package for the Social Sciences (SPSS).

Figure 1. The WBG-identified 42 slums of Lagos, Nigeria



4. RESULTS

We adopted a 5-pronged approach (listed below) for the results and findings of this study:

1. To provide a helicopter view of the survey data hinged on simple interpretation, descriptive statistics were extracted (as shown in Table 2, Table 3, and Table 4).

2. The results from the logistic regression (i.e., the estimated parameters of the logistic model) provided the main empirical outcomes of the research.

3. The study's results or findings were also significantly reinforced by the qualitative scenario-based illustrations and remarks of the REA respondents, which further illuminated, expounded, and validated their Likert-scale responses, as these remarks provided a more in-depth understanding of the REAs' perceptions, affinities, and socioeconomic behaviors.

4. Relevant industry reports were carefully explored and integrated (where necessary) to further triangulate the findings.

5. Insights into how the findings (in)validate extant theories and empirical literature were noted.

Table 2. Descriptive statistics for the predictor measuring REAs' perceptions of regulatory consumer protection (PRCP)

% of REA respondents for each Likert point								
S/N	***Sub-items of PRCP***	***Strongly agree (5 points)***	***Agree (4 points)***	***Neutral (3 points)***	***Strongly disagree (2 points)***	***Disagree (1 point)***	***Total (455 REA respondents)***	***Std dev.***
1.	The PRMCRI product will effectively/functionally cover all stated/indicated PRCRs for the REAs.	44.62%	22.86%	10.33%	8.57%	13.62%	100.00%	1.44
2.	The PRMCRI provided all necessary product information and enlightenment to the REAs.	65.71%	12.75%	12.75%	8.35%	0.44%	100.00%	1.02
3.	NAICOM's Complaint Bureau Unit (NCBU) will effectively entertain possible future complaints against the PRMCRI and its provider(s).	59.12%	18.02%	0.00%	5.71%	17.15%	100.00%	1.54
4.	NAICOM's Complaint Bureau Unit (NCBU) will effectively resolve/redress possible future complaints against PRMCRI and its provider(s).	44.39%	27.47%	2.64%	7.03%	18.47%	100.00%	1.53

Note: NAICOM is the regulator/supervisor of the Nigerian microinsurance sector, and the NCBU is the official channel through which complaints from consumers and other stakeholders are received and processed for possible resolution (The aggregation of sub-items 1 to 4 is denoted as AGGREGATED_ITEM_CP).

Table 3. Descriptive statistics for the REAs' perceptions of inflation, interest rates, and supply-side innovation proxied as the use of mobile technology as a delivery channel

% of REA respondents for each Likert point								
S/N	***Sub-items***	***Strongly agree (5 points)***	***Agree (4 points)***	***Neutral (3 points)***	***Strongly disagree (2 points)***	***Disagree (1 point)***	***Total (455 REA respondents)***	***Std dev.***
1.	How likely are you to take a PRMCRI policy considering the inflationary realities in Nigeria? (Denoted as *ITEM_INF*).	44.39%	28.57%	3.96%	13.63%	9.45%	100.00%	1.36
2.	How likely are you to take a PRMCRI policy considering the interest rate realities in Nigeria? (Denoted as *ITEM_INT_R*).	53.85%	18.68%	6.81%	5.93%	14.73%	100.00%	1.47
3.	How likely are you to take a PRMCRI policy that is completely delivered and managed via the channel(s) of mobile technology? (Denoted as *ITEM_M_TECH*).	52.97%	25.49%	1.32%	6.81%	13.41%	100.00%	1.42

Table 4. Analysis of random premium prices and WTP for PRMCRI

S/N	***RANDOM_PREMIUM (NGN)***	***WTP_FOR_PRMCRI***		***Total***
		Total REAs with "Yes" = 1	***Total REAs with "No" = 0***	
1.	2,000.00	87	Nil	87
2.	3,000.00	70	Nil	70
3.	6,000.00	90	16	106
4.	9,000.00	36	35	71
5.	12,000.00	17	68	85
6.	15,000.00	Nil	36	36
	Total	**300**	**155**	**455**

Note: This item enquires whether an REA is willing (or not willing) to pay (the pre-determined and randomly assigned yearly premium) for the PRMCRI policy. The premium could be any of the prices listed in the second column of this table. This item is denoted by RANDOM_PREMIUM.

First, the demographic characteristics of the 455 surveyed REAs in the CVS were suitably integrated into the logistic model as control variables to consider or eliminate possible alternative explanations. Of the 455 REAs that willingly participated in the CVS and provided all required information, 279 (61.32%) were male, 176 (38.68%) were female, 226 (49.67%) were Muslim, 229 (50.32%) were Christian, 104 (22.86%) were married, and 351 (77.14%) were single. In addition, 16 (3.52%) had elementary school certificates or lower, 223 (49.01%) had high school certificates or lower, 34 (7.47%) had an Ordinary National Diploma (OND), and 182 (40.00%) had university degrees. Age, religion, marital status, gender, and formal education (listed here as control variables) indicated no statistical significance, as their p-values (all greater than 0.05) were 0.133, 0.661, 0.471, 0.406, and 0.488, respectively. Additionally, the individual effects on the eventual logistic model (or the five original independent variables) were marginal. In literature reviews by Osifodunrin (2023), Platteau et al. (2017),

and Eling et al. (2014), no study investigated the empirical relationship between marital status and insurance demand. However, the works of Bendig and Arun (2016) and Chummun (2017) corroborate our findings that the empirical link between formal education and microinsurance demand has no statistical significance, while the works of Uddin (2017) and Patt et al. (2010) contradict them by reporting the positive statistical significance this demographic variable has on microinsurance demand. For age, our findings aligned with Cole et al. (2013), whereas Bendig and Arun (2016) affirmed its positive statistical significance for microinsurance demand. In the case of religion, Brouwer and Akter (2010) reported a negative statistical significance for microinsurance demand, for which Cole et al. (2013) found counterevidence. As Eling et al. (2014) described the "religion versus microinsurance demand nexus" as a fruitful future research area, our results contribute to this academic discourse. The findings of Thornton et al. (2010) are similar to ours, as the empirical link between gender and microinsurance demand was determined to have no statistical significance. Akter et al. (2016), Nguyen and Knowles (2010), and Chankova et al. (2008) affirmed the positive statistical significance of gender in microinsurance demand, whereas Bonan et al. (2012) and De Allegri et al. (2006) found counter empirical evidence.

The four sub-items employed to investigate the REAs' perception of the current/snapshot state of regulatory consumer protection were duly inspired by the tenets and rights of consumers to not lack "sufficient product information" and "derivable utility or welfare" from their product of interest (Herrmann, 1974; Swann, 1979; Mayer, 1989; FGN, 2018). Effective consumer protection (ECP), as emphasized in Bauchet et al. (2017), is deemed to resonate with the notion and practice of regulatory effectiveness in microinsurance, as pioneered in Osifodunrin and Lopes (2022), which in turn guarantees and enforces microinsurance providers' promptness or responsiveness (in payment of valid claims and other responsibilities) as outlined in Minani et al. (2018), Matul et al. (2011), and Cohen and Sebstad (2005). Although the various elements of "insurance literacy" were clearly recorded as the most dominant determinants on the demand side of formal microinsurance (Osifodunrin, 2023), they are also embedded here (in sub-item 2 as shown in Table 2) as a sub-construct of ECP, as effective PRMCRI-enlightenment is functionally seen to better protect REAs' interests. In Nigeria and some similar jurisdictions, the regulatory and legal provisions for microinsurance consumers to benefit from the effective reparatory actions of relevant institutions (whenever necessary) are also reflected in these sub-items (International Association of Insurance Supervisors [IAIS] & Consultative Group to Assist the Poor [CGAP], 2007; NAICOM, 2018; FGN, 2018; Osifodunrin & Lopes, 2022). These items were measured on a 5-point Likert scale, and their impact on the WTP for the PRMCRI (along with the impact of four other determinants) was then empirically evaluated. As shown in Table 2, the majority of the REAs (at least 67.48 percent (i.e., 44.62% + 22.86%)) agreed or strongly agreed with these four sub-items. In fact, the second sub-item in Table 2 recorded the highest level of agreement from the REAs at 78.46 percent (i.e., 65.71% + 12.75%), a testament to the perceived quality and sufficiency of information provided on the PRMCRI in the course of the survey; and this was further corroborated by the REAs' qualitative remarks. Specifically, the regulator's template of required product information to be mandatorily given to all prospective insurance buyers in Nigeria was provided to the REAs (early in the survey); hence, they judged the received PRMCRI information based on this template. The modus operandi of NAICOM's Complaint Bureau Unit was (*ab initio*) shared and deliberated with the REAs to broaden their consumer rights and protection understanding. The sub-item 4 recorded the highest level of REA disagreement at 25.5 percent (i.e., 7.03% + 18.47%); however, contrary to the level of distrust that (micro)insurers and some government institutions suffer among the insurance-excluded population in developing countries (as affirmed in Akter et al., 2016; Cai et al., 2009), the majority of the REA respondents in this study were, surprisingly, quite hopeful and trusting in the capacities of microinsurance regulators to protect them from all forms of possible deviant behaviors of future PRMCRI providers. However, Bashir and Wiedmaier-Pfister's (2019) industry report clearly indicated that many of the complaints of policyholders submitted to NAICOM's Complaint Bureau Unit on unsettled claims were largely unresolved. An intra-survey enquiry indicated that most of the REAs were well aware of the regulator's limitations in protecting them (similar to other persistent failures of government), however, their optimism (quite similar to the optimism of Nepalese villagers investigated in Dror et al., 2014) was based on the perceived level of future transparency that could be derived from the possibility of systematically involving the REAs in the governance of PRMCRI, especially as they were aware that their input was mission-critical, even in the design of the product. Some of their qualitative remarks suggest that they intend to support the regulator (via channels of active participation in product governance) to enhance regulatory consumer protection. In Speer (2012), participatory governance significantly enhanced the effectiveness of public institutions. As practical evidence of this intention, a few of the REAs curiously and proactively inquired about how future providers of PRMCRI would incentivize or reward the deliberate preventive behavior of any REA who consistently obstructs/avoids the materialization of PRCRs in their operations. Undoubtedly, this preventive behavioral pattern, if sustained and well-aligned with consumer activism, could be incentivized by lower-priced premiums and other valuable incentives, which could further enhance the interest and welfare of PRMCRI consumers. Ultimately, the logistic regression results affirmed that for every one unit increase when these four items are aggregated (as denoted by *AGGREGATED_ITEM_CP*), the WTP for PRMCRI (denoted by *WTP_FOR_PRMCRI*) increases by a factor of 6.12 (as shown in Table 5, under the "Exp(B)" column). In other words, for every one-unit increase in the REA's perception of "effective consumer protection", there is a corresponding increase of 6.12 units in the willingness of the REA to purchase the PRMCRI.

For sub-item 1 in Table 2, Dror et al. (2018) corroborates our results as rural Indians' perceptions of the quality and effectiveness of community-based micro health insurance were revealed to be significant in driving more demand for the product. Similarly, focusing on sub-item 2 in Table 2, our result is relatable and in tandem with the empirical outcomes in Platteau and Ontiveros (2021), Bonan et al. (2017), and Takahashi et al. (2016), where effective supply-side product information was statistically significant for microinsurance demand. Overall, according to Osifodunrin and Lopes (2022), Biener et al. (2014), and IAIS and CGAP (2007), only the level of effectiveness of regulatory actions (consumer protection, prudential issues, market development, etc.) determines whether a regulatory action fosters or impedes formal microinsurance development, which encapsulates optimal/widespread microinsurance demand.

Table 5. Variables in the equation

Variable	*B*	*S.E.*	*Wald*	*df*	*Sig.*	*Exp(B)*	*Lower*	*Upper*
RANDOM_PREMIUM	-0.001	0.000	16.314	1	0.000	0.999	0.999	1.000
ITEM_INF	1.339	0.340	15.484	1	0.000	3.82	1.958	7.431
ITEM_INT_R	1.605	0.407	15.548	1	0.000	4.98	2.241	11.046
ITEM_M_TECH	1.421	0.412	11.915	1	0.001	4.14	1.848	9.282
AGGREGATED_ITEM_CP	1.812	0.431	17.662	1	0.000	6.12	2.629	14.245
AGE	1.292	0.859	2.258	1	0.133	3.64	0.675	19.609
RELIGION	0.353	0.803	0.193	1	0.661	1.42	0.295	6.873
MARITAL	-0.693	0.961	0.520	1	0.471	0.50	0.076	3.289
GENDER	0.836	1.005	0.691	1	0.406	2.31	0.322	16.536
EDUCATION	0.302	0.436	0.480	1	0.488	1.35	0.575	3.182
Constant	-20.608	5.103	16.306	1	0.000	0.00		

Note: This is a system table automatically generated from SPSS.

As COVID-19-induced supply chain disruptions persisted between 2020 and 2021, inflationary pressures increased globally, with an attendant impact on the economies of both developed and developing countries. The widespread introduction of monetary/fiscal stimuli to moderate the impact of the 2020–2021 pandemic, the expression of previously pent-up demand associated with global economic recovery, and the disruptions (energy/food crisis) occasioned by the Russo-Ukrainian war worsened these inflationary pressures around the world. In monetary reaction to this multi-faceted crisis, many central banks aggressively increased their benchmark interest rates with the hope of moderating inflation via the reduction of money supply. For Nigeria and other developing countries, issues concerning exchange rate pressures, overdependence on imported products/services, dwindling capital inflows, and other legacy structural problems further impacted the general increase in the prices of goods and services. The Nigerian situation has been further exacerbated by the rapid increase in food inflation, as flooding and insecurity (kidnapping, banditry, and cattle rustling) in rural Nigeria have largely constrained agricultural production. Consequently, the Nigerian monthly headline inflation rose from 15.60 percent in January 2022 to 21.34 in December 2022, while food inflation rose to 23.75 percent in December 2022, from the 17.13 percent recorded in January 2022. In a bid to cut inflation via the reduction of money supply, the CBN increased its benchmark interest rates four times in 2022: from 11.5 to 13.0 percent in May 2022; from 13.0 to 14.0 percent in July 2022; from 14.0 to 15.5 percent in September 2022, and from 15.5 to 16.5 percent in November 2022 (CBN, 2023). Consequently, banking lending rates for all-purpose and general economic activities were mostly as high as 42 percent for 2022 (CBN, 2023). Regarding the REAs' perceptions of inflationary and interest rate realities (especially while the survey lasted between July and October 2022) vis-à-vis their WTP for PRMCRI, 72.96% (i.e., 44.39% + 28.57%) and 72.53% (i.e., 53.85% + 18.68%), as shown in Table 3, affirmed their likelihood to buy the succour-providing PRMCRI, despite the galloping levels of inflation and interest rates, respectively. This popular decision of the respondents largely resonates with the idea of "inflation insurance" proposed by Bodie (1990), who envisioned an insurance policy that protects its subscribers from the scourge of inflation tax. The logistic regression results empirically re-affirmed the foregoing in that for every one unit increase in the REAs' inflationary perception (denoted by *ITEM_INF*), the WTP for PRMCRI increases by a factor of 3.815 (as shown in Table 5, under the "Exp(B)" column). In addition, for every unit increase in the REAs' interest rate perception (as denoted by *ITEM_INT_R*), their WTP for PRMCRI increases by a factor of 4.975. As no peer-reviewed extant literature (to the best of the authors' knowledge) has ever investigated the relationship between "inflation or interest rate perceptions of nano-enterprises or low-income groups" and "microinsurance demand", we explored related literature for formal/conventional insurance. The empirical verdict of Cheng and Yu (2015) supports the findings of this study in that inflation positively affects the demand for conventional non-life insurance. However, Petkovski and Jordan (2014) contradict the foregoing by affirming that inflation impedes the demand for non-life insurance.

As shown in Table 3, 78.46% (i.e., 52.97% + 25.49%), 20.22% (i.e., 6.81% + 13.41%), and 1.32% of the surveyed REAs agreed, disagreed, and were neutral, respectively, regarding their WTP for PRMCRI if the microinsurance product was completely operated and administered via mobile technology platforms. A review of the REAs' qualitative remarks revealed a widespread opinion that, based on the extremely competitive nature of their business, excellent punctuality is mission-critical to avoid losing customer(s) to the ever-available competition. As such, REAs would hardly have spare time to visit the physical or traditional offices of future PRMCRI providers to subscribe to the microinsurance product. The REAs also voiced their reservations regarding dealing with future PRMCRI agents

(who could visit them to consummate their PRMCRI transactions), especially the risky act of paying premiums to such agents. In addition, many REAs reiterated their relative competence and aptitude vis-à-vis mobile technologies, including the POS-devices at the center of their operations. In the following logistic regression, it was further revealed that for every one-unit increase in "the perceptions of the surveyed REAs on the use of mobile technology as a PRMCRI delivery/administration channel" (denoted by *ITEM_M_TECH*), the WTP for PRMCRI increases by a factor of 4.142. Van Asseldonk et al.'s (2020) study is the only available extant study on the nexus between mobile technology and microinsurance demand and it supports the findings of this study. However, some of the surveyed REAs voiced their reservations about using mobile technology as a channel for PRMCRI delivery as they preferred a more personal relationship with future providers, especially in the initial stages.

As stated in Section 3, in the course of implementing the CVS, a range of possible premium prices (as captured in Table 1, column 2) were determined in collaboration with the REA Working Group and in cognizance of the prevailing microinsurance premium price realities in Nigeria. For every surveyed REA, one of the six premium prices was randomly chosen and presented as a non-negotiable premium price for the PRMCRI. As shown in Table 4, the random premium price appears to be critical in influencing the REAs' decision to pay for the PRMCRI or not; however, the revelation from the logistic regression (based on the magnitude of the coefficient for *RANDOM_PREMIUM* at 0.99) seems contrary. As shown in Table 4, 100 percent of REAs presented with the NGN2,000.00 or NGN3,000.00 premium prices decided to buy the PRMCRI, notwithstanding their perceptions of the other exogenous factors, while 100 percent of those presented with the NGN15,000.00 price chose not to buy the PRMCRI. Ultimately, as evinced in the logistic regression results, for every one-unit increase in the premium price (denoted by *RANDOM_PREMIUM*), the WTP for the PRMCRI decreases by a factor of 0.999. This classical price-sensitivity of consumers is in tandem with the empirical findings of Bonan et al. (2017) and Takahashi et al. (2016). Based on the coefficients' magnitudes for the five determinants indicated in Table 5, and as empirically validated in Budhathoki et al. (2019) and Cai et al. (2009), the four non-price factors empirically influenced WTP for the PRMCRI (or microinsurance demand), even more than price.

The logistic regression results from SPSS are presented as follows:

1. As the p-value shown in Table 6 (i.e., under the "Sig." column and in the model row) is less than 0.05 (i.e., p-value = 0.0), our survey has a significant model that should be further interpreted.

2. As the p-value shown in Table 7 (under the "Sig." column) is greater than 0.05 (i.e., p-value = 0.992), our model fits the data and should be further interpreted.

3. Additionally, as shown in Table 8 (under the "Percentage correct" column and in the "Overall percentage" row), we note that the total accuracy of the model (i.e., 97.6 percent) is duly greater than the expected minimum of 80 percent.

4. Lastly, as shown in Table 5, the five investigated variables are significant as the interpreted p-value for each of them is less than 0.05, with the empirical interpretations reiterated as follows:

- for every one-unit increase in *AGGREGATED_ITEM_CP*, *WTP_FOR_PRMCRI* increases by a factor of 6.120;
- for every one-unit increase in *ITEM_INF, WTP_FOR_PRMCRI* increases by a factor of 3.815;
- for every one-unit increase in *ITEM_INT_R, WTP_FOR_PRMCRI* increases by a factor of 4.975;
- for every one-unit increase in *ITEM_M_TECH, WTP_FOR_PRMCRI* increases by a factor of 4.142;
- for every one-unit increase in *RANDOM_PREMIUM, WTP_FOR_PRMCRI* decreases by a factor of 0.999.

The equation form of this logistic regression model is as follows:

$$WTP\_FOR\_PRMCRI = -20.608 + 1.812\,(AGGREGATED\_ITEM\_CP) + 1.339\,(ITEM\_INF) + 1.605\,(ITEM\_INT\_R) + 1.421\,(ITEM\_M\_TECH) - 0.001\,(RANDOM\_PREMIUM) \quad (1)$$

Table 6. Omnibus tests of model coefficients

		Chi-square	*df*	*Sig.*
Step 1	Step	533.824	10	0.000
	Block	533.824	10	0.000
	Model	533.824	10	0.000

Note: This is a system table automatically generated from SPSS.

Table 7. Hosmer–Lemeshow test

Step 1	*Chi-square*	*df*	*Sig.*
	1.046	8	0.998

Note: This is a system table automatically generated from SPSS.

Table 8. Classification table

Observed			*Predicted*		
			WTP_FOR_PRMCRI		*Percentage correct*
			0.0	*1.0*	
Step 1	WTP_FOR_PRMCRI	0.0	148	7	95.5
		1.0	4	296	98.7
Overall percentage					97.6

Note: This is a system table automatically generated from SPSS.

5. CONCLUSION

The demand- and SSR-sides of formal microinsurance are clearly inundated with various MIIFFs, and this study has challenged stakeholders on the SSR-sides to live up to expectations, collaborate optimally, and strive to drastically mitigate or resolve these MIIFFs, especially the persistent low-demand challenge bedeviling formal microinsurance. The foregoing is especially crucial as low-income groups largely do not have the wherewithal for self-help in the formal microinsurance domain. This study also reiterates the crucial categorization of various insurance-excluded low-income populations into groups, with meticulous envisioning and design of customized microinsurance products to serve the specific needs of each group. The hypothetical PRMCRI was envisioned and designed for REAs and similar MINAEs in developing countries. In order to expose some of the possible strengths or MIIFFs that could foster or debilitate effective REA demand for this novel product, this study investigated some factors using the CVS and the logistic regression methodologies pioneered in this academic sub-domain by Patt et al. (2010). Surprisingly, we noted the REAs' perceptions of the PRMCRI as a succor-providing investment against galloping inflation and interest rates. As evinced in their qualitative remarks, many REAs saw the PRMCRI as inflation insurance, an investment, and a preferred economic bet over and above the interest they might earn from saving the amount to be paid as a premium, especially if a PRCR materializes. Others argued that accessing exorbitantly priced microcredit to replace PRCR-induced losses seems far worse than merely paying the affordable PRMCRI premiums. Notwithstanding this unique "inflation perception vs PRMCRI demand" or "interest rate perception vs PRMCRI demand" nexus and outcome, policy makers must still strive to moderate these monetary phenomena, in order to shield these low-income groups from inflation taxes and high-interest rates.

This study also revealed that reliability (punctuality and availability) is extremely vital to REAs' operations, as there was a near consensus on the need for them to be present in their business location at all times so as not to lose possible commission or income to the ever-available competition. Based on the foregoing, many of them favored the proposed deployment and administration of PRMCRI via mobile technology channels rather than dealing with future PRMCRI agents or visiting traditional offices of future PRMCRI providers. In fact, many REAs remarked that they prefer virtual group meetings (whenever possible) over non-virtual or physical engagements which may hamper their punctuality and availability. It must be noted that this preferred option is at the core of Insurtech, in which mobile technology is the basis upon which other technologies (such as artificial intelligence and data analytics) are deployed to enhance consumer experiences and personalized services.

Notwithstanding the level of MIIFFs associated with regulatory consumer protection in the Nigerian microinsurance sector, the REAs were largely hopeful that their intended active participation in the governance of the PRMCRI could enhance transparency, accountability, regulatory protection of their interests, and the possible success of the PRMCRI. However, considering alternative behavioral economic viewpoints, we pondered the possibility of the REAs being overly optimistic (or at worst delusional), especially regarding their intent/mindset, that their active participation in product governance and/or consumer activism could positively influence the regulatory protection of their interests. In support of the foregoing, Dror et al.'s (2014) empirical results revealed that the active participation of local insurance subscribers in the design and governance of a microinsurance scheme exuded similar optimism and eventually enhanced the success and scalability of the scheme.

Despite the apparent popularity of the hypothetical PRMCRI among the surveyed REAs and their perceptions and socio-psychological dispositions or affinity for other determinants, those that were offered the PRMCRI at the randomly-determined annual premium of NGN15,000.00 (the highest premium on offer in the CVS) all rejected the purchase of the product, affirming the price sensitivity of this product. Meanwhile, the mean WTP value for the PRMCRI was NGN4,840.00, and NGN11,400.00 was estimated as the mean price presented to those who eventually rejected the PRMCRI. Moreover, some REAs that indicated their unwillingness to pay the non-negotiable premium expressed a direct caveat (in their qualitative remarks) that they could reconsider their decisions if the premium were reduced. This should interest and guide micro-insurers who are sufficiently motivated to serve as future providers of the PRMCRI.

This study has some limitations concerning the sole focus on Nigeria rather than selecting developing countries around the world, especially as MINAEs similar to the REAs operate in agent-assisted branchless banking in similar nations/regions. In addition, the sample size could have been larger and could have included REAs operating outside the slums of Lagos for clearer intra-city empirical comparisons. A second PRMCRI product (covering or protecting REAs and their clients) could have been included in the model and analyze to robustly explore the demand behavior of REAs; however, this approach was not popular in the REA Working Group, as it was deemed capable of increasing the premium price and compounding the moral hazard and adverse selection debacle, especially with respect to the REAs' clientele. In theory, income is expected to influence WTP for the PRMCRI; however, as the focus of this study is solely on REAs' perceptions of some exogenous variables, the study opted to extricate income as an independent variable. In addition, it would have been ideal to have representatives of the government and the microinsurance regulator in Nigeria as members of the REA Working Group; however, only a few anonymous micro-insurers agreed to participate in the project, and ultimately, the group was well guided by relevant regulatory policy documents from the Nigerian microinsurance sector.

Overall, notwithstanding the effects of the five investigated factors, this study was instructive in demonstrating that a properly researched and well-customized microinsurance product could resolve the microinsurance demand challenges of the low-income group it targets.

At this juncture, and beyond the lure of empirical findings, the study also priotizes implications for microinsurance policies across developing countries. First, the surveyed REAs were largely insurance-excluded; however, with the relative quality of their intra-survey interactions and possibly due to their urban exposure (even in the slums), they were certainly not completely ignorant of the idea and mechanism of insurance, which largely eases the explanatory and interview efforts of the enumerators. It is also safe to infer that the dearth of well-researched and customized microinsurance products may be responsible for the insurance exclusion of the surveyed REAs. Consequently, SSR stakeholders must combine resources and efforts to appropriately develop more customized microinsurance products suitable for the risk management needs of other insurance-excluded subgroups. It might seem easy to lure these low-income groups with promises of a novel microinsurance product; however, the real challenge is to continuously sustain their trust and patronage via the prompt payment of genuine/fair claims and consistently encourage their active participation in the governance of the scheme. Furthermore, REAs and other first-time insurance subscribers must be regularly counselled to be patient and learn from the insights of Matul et al. (2011) that microinsurance products can only mature over time and that increasing maturity also correlates with more efficiency and increased value to stakeholders.

Second, a large number of the surveyed REAs suggested that their operations in the slums of Lagos may have exposed their businesses to more PRCRs, especially for those that occasionally alternate their REA operations between the slums and other areas of the city. In some of their remarks, operating in usually overpopulated slums (where residents primarily rely on REAs for banking services) has advantages in terms of the high frequency of commissions earned, but these advantages may easily be eroded with increased exposure to uninsured PRCRs. Public institutions and other stakeholders responsible for cybercrime detection and resolution may wish to intensify their efforts in urban slums. The need to constantly update relevant cybercrime policies and laws (CBN, 2020; FGN, 2015) in line with the latest technologies and trends is considered mission-critical for mitigating these risks and crimes. Also, the apparent homogeneity in the needs, conditions, and worldview of the surveyed MINAEs gave credence to the notion that their partial financial exclusion status, risk management gaps, and other socio-economic challenges could be largely tackled, mitigated, or managed as a group. It must be stated that this homogeneity required for aptly customized microinsurance products is sometimes lacking among low-income populations.

Third, to continually improve the sustainability of the PRMCRI, all e-payment providers and stakeholders (REAs, regulators, licensed DMBs, neobanks, MMOs, PSPs, and other designated non-bank operators in this domain) must work assiduously to control and mitigate the various PRCRs in their individual purview/control and then allow the PRMCRI to manage only minimal residual risks. For instance, REAs must continue to eschew negligence, moral hazard, and adverse selection and take adequate caution (including keeping and updating know-your-customer records) in their operations. Biener and Eling (2011) corroborate that offering group policies (such as the PRMCRI to REAs) improves efficiency and mitigates transaction costs, adverse selection, and moral hazard problems. Similarly, e-payment providers must eliminate or mitigate the existing vulnerabilities in their infrastructure. Regulators must also update their rules and guidelines, and strictly enforce them as technologies and trends evolve. A good example is the regulatory initiative (captured in Ujah, 2011) that was instituted, among other reasons, to control the influx of sub-standard, obsolete, and potentially vulnerable POS-devices into the country; however, with the recent influx and proliferation of all types of POS-devices, as observed in the course of the survey, the regulator might need to reactivate or fine-tune the initiative. POS-device manufacturers should also tirelessly release patches and software updates for their devices to counter new vulnerabilities, and e-payment providers should always implement these required device updates on their networks.

Fourth, according to Biener and Eling (2011), limited data availability is one of the most pronounced barriers to the development of formal microinsurance. Furthermore, Bailey (2014) and USDHS (2012) support the argument that the lack of accurate data on the details of cyber-risks largely constrains the sustainable development of suitable cyber-insurance products. In the Nigerian context and in many other nations/regions, the challenge of maintaining accurate, reliable, and vast datasets on the magnitude, frequency, and other areas of cyber-risks is still real. Therefore, government and policymakers must continue to encourage stakeholders to report all encountered cyber-risks and vulnerabilities and make adequate provisions to update relevant databases accurately and effectively.

Fifth, the microinsurance market has various inherent MIIFFs that require government intervention (Yan & Faure, 2021), but as the government intervenes in the market, other MIIFFs often emerge, creating a vicious cycle. In this study, cautious attempts were made to exclude the mechanism of subsidization to avoid possible vicious cycles of MIIFFs in moral hazard and adverse selection and to specifically highlight that subsidy-free PRMCRI could thrive amongst the REAs. However, in line with Yan and Faure (2021), this study assimilated three other demand-focused mechanisms of government intervention "simplifying the design and governance of PRMCRI for the REAs", "enabling and encouraging group-focused implementation for PRMCRI" and "its distribution via mobile technology". Additionally, the conditions of active REAs' participation in product design/governance and consumer activism were noted as possibly driving and enhancing the effectiveness of regulatory protection for consumer (or REAs') interests and welfare. In other words, to enhance the effectiveness of regulatory consumer protection, microinsurance consumers must be adequately enlightened about the essence of insurance and must be continuously encouraged (by regulators) to embrace consumer activism. Overall, governments, policymakers, and micro-insurers in all jurisdictions must note these conditions and the unique design of the PRMCRI (especially its participatory mechanism) when planning future insurance inclusion products and policies. Other supply-focused government interventions such as tax incentives for PRMCRI-

promoting micro-insurers should be encouraged. In microinsurance market innovation (such as the PRMCRI), stakeholders generally agree that a regulator should strive to be a progressive institution, regarding itself as an enabling agency, rather than an entity that perpetually impedes or dictates how market actors should organize themselves. These regulators should generally embrace a "test and learn" regulatory philosophy to allow innovation to thrive in the market.

Lastly, as the digitalization and adoption of global micro-financial services become more pervasive, stakeholders must note that PRCRs and other micro cyber-risks are also expected to surge. Our PRMCRI and the participatory approach to its design/governance provide not just a means to sustainably manage such risks for low-income groups, but also a seminal guide for future micro-cyber insurance products, policy, and research.

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