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Original Article

Algorithmic Inclusion Paradox Access Expansion, Capability Erosion, and Financial Precarity in Digital Banking Environments: A Capability-Governance Framework

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Abstract. The rapid diffusion of algorithmic decision systems in retail banking has significantly expanded access to formal financial services, particularly among previously underserved populations. However, emerging empirical evidence suggests that expanded access does not uniformly translate into improved financial outcomes. This study advances the concept of the Algorithmic Inclusion Paradox, which captures the counterintuitive dynamic in which algorithmic banking systems simultaneously enhance financial access while undermining users' capabilities and exacerbating conditions of financial precarity. Drawing on the capability approach and contemporary scholarship on algorithmic governance, the study develops a Capability-Governance Framework to explain how automated credit assessment, opaque scoring mechanisms, and weak institutional safeguards interact to erode financial capability despite increased inclusion. The framework theorizes that access expansion operates through distinct structural pathways—mediated by borrower capability and moderated by governance quality—that shape household vulnerability, risk exposure, and resilience within digital banking environments. By integrating human capability considerations with institutional governance mechanisms, this study contributes a theory-building perspective that extends existing financial inclusion and fintech literature beyond access-centric models. The proposed framework offers a basis for empirical testing. It provides policy-relevant insights for regulators and financial institutions seeking to design responsible, human-centered algorithmic banking systems that promote sustainable inclusion rather than financial precarity.

Keywords: *Algorithmic inclusion paradox; Digital banking; Algorithmic governance; Financial capability; Financial precarity; Financial inclusion; Artificial intelligence in banking; Institutional safeguards.*

The rapid integration of algorithmic decision systems into retail and digital banking has fundamentally transformed the architecture of financial inclusion. Automated credit scoring, machine-learning-based risk assessment, and data-driven customer profiling have enabled banks and financial technology institutions to extend services to populations previously excluded from formal financial systems. In many jurisdictions, digital banking environments have been promoted as efficiency-enhancing and inclusion-expanding mechanisms that

can overcome traditional barriers related to geography, documentation, and cost. Recent studies report substantial growth in account ownership, digital loan uptake, and transaction volume attributable to algorithmic banking innovations (Ozili, 2020; Frost et al., 2019).

Despite these advances, a growing body of evidence suggests that expanded access through algorithmic banking does not consistently translate into improved financial outcomes for users. While numerical indicators of inclusion have improved, parallel increases in borrower stress, repayment instability, and vulnerability have been documented, particularly among low-income and digitally marginalized groups (Gabor & Brooks, 2019; Bazarbash & Beaton, 2020). Empirical research has shown that automated lending environments may intensify behavioral risks, accelerate debt cycling, and obscure financial decision-making processes for consumers who lack adequate financial and digital capability (Liu et al., 2022). These findings challenge the prevailing assumption within financial inclusion discourse that access expansion is inherently welfare-enhancing.

Recent scholarship increasingly emphasizes that algorithmic systems are not neutral technical tools but institutional mechanisms embedded with assumptions about rationality, data availability, and user behavior (Yeung, 2020). Algorithmic banking systems often rely on opaque scoring models, dynamic pricing, and automated approval processes that limit borrower understanding and contestability. As demonstrated by Berg et al. (2020), algorithmic credit models may outperform traditional models in predictive accuracy while simultaneously reducing transparency and borrower agency. In such contexts, individuals may gain access to financial products without acquiring the capability to evaluate risks, manage obligations, or navigate adverse outcomes, thereby increasing their exposure to financial precarity.

The concept of Financial Capability, rooted in the capability approach advanced by Sen and further operationalized in financial behavior research, underscores the importance of skills, knowledge, and agency in achieving positive financial functioning. Contemporary studies argue that financial inclusion strategies that prioritize access without corresponding investments in capability formation may inadvertently deepen inequality and vulnerability (Xiao, 2022; Kempson & Poppe, 2018). Within digital banking environments, this risk is amplified by technological complexity and asymmetric information, particularly when algorithmic decisions are poorly explained or weakly governed.

In parallel with concerns about capability, the governance of algorithmic systems has emerged as a critical issue in financial regulation. International financial institutions and central banks have highlighted the need for algorithmic accountability, auditability, and consumer protection mechanisms to mitigate risks associated with automated decision-making (Bank for International Settlements, 2023; Financial Stability Board, 2022). However, empirical evidence indicates that governance frameworks often lag behind technological adoption, especially in emerging economies where regulatory capacity and enforcement remain uneven (Auer et al., 2021). Weak institutional safeguards may allow algorithmic practices that exacerbate borrower risk while remaining formally compliant with access-oriented inclusion metrics.

Taken together, these developments point to an unresolved contradiction in the contemporary digital banking landscape: algorithmic systems expand access to financial services while simultaneously undermining the conditions necessary for sustainable financial participation. This tension is conceptualized in this study as the Algorithmic Inclusion Paradox—a structural condition in which access expansion coexists with capability erosion and rising financial precarity. While existing studies have examined algorithmic bias, fintech risk, and digital financial literacy as separate phenomena, there remains a notable gap in the literature concerning how algorithmic banking practices, user capability, and institutional governance interact to shape financial vulnerability outcomes. Specifically, there is limited integrative theorization that explains why inclusion gains may generate adverse welfare effects under certain institutional and capability conditions.

This study addresses this gap by advancing a Capability-Governance Framework that integrates insights from financial capability theory and algorithmic governance scholarship to explain the paradoxical outcomes of algorithmic inclusion in digital banking environments. Rather than treating access as an endpoint, the framework conceptualizes access expansion as an intermediate condition whose effects on financial precarity are mediated by user capability and moderated by institutional governance quality. By doing so, the study moves beyond access-centric models of financial inclusion and offers a more nuanced, structurally grounded explanation of algorithmic banking outcomes.

The purpose of this study is to develop and theoretically articulate the Capability-Governance Framework to examine how algorithmic banking systems influence financial capability erosion and financial precarity. The significance of the study lies in its contribution to the financial inclusion, fintech, and governance literature by introducing a theory-driven model that reconciles access expansion with adverse welfare outcomes. The framework provides a foundation for empirical testing. It offers policy-relevant insights for regulators, financial institutions, and development stakeholders seeking to design algorithmic banking systems that promote sustainable inclusion rather than financial precarity.

Recent empirical evidence suggests that while algorithmic and digital banking systems have substantially expanded access to financial services, their welfare implications remain uneven and context-dependent. Studies document that increased reliance on automated credit scoring and algorithmic decision-making may coincide with rising household vulnerability, particularly among users with limited financial and digital capability (Berg et al., 2020; Liu et al., 2022; World Bank, 2022). At the same time, regulatory and governance frameworks governing algorithmic systems vary considerably across institutions and jurisdictions, shaping how risks associated with automation are mitigated or amplified (Auer et al., 2021; Financial Stability Board, 2022). These developments highlight the need for a systematic examination of how the expansion of algorithmic access interacts with user capability and institutional governance to influence financial outcomes.

Despite a growing body of literature on digital financial inclusion, existing studies often examine access expansion, financial capability, and governance mechanisms in isolation. There remains limited empirical work that simultaneously models their interrelationships and assesses how algorithmic inclusion may paradoxically generate financial precarity. To address this gap, the present study adopts a theory-driven, structural approach grounded in the Capability-Governance Framework to explain both the direct and indirect effects of algorithmic banking systems on financial vulnerability.

Guided by this objective, the study seeks to answer the following research questions:

RQ1. How does the expansion of algorithmic access in digital banking environments influence users' financial precarity?

RQ2. To what extent does capability erosion mediate the relationship between the expansion of algorithmic access and financial precarity?

RQ3. How does individual financial capability shape the effects of algorithmic access expansion on capability erosion within digital banking environments?

RQ4. To what extent does institutional governance quality moderate the relationship between algorithmic access expansion and capability erosion?

RQ5. How do financial capability and institutional governance jointly condition the indirect effects of algorithmic access expansion on financial precarity?

Collectively, these research questions delineate the study's analytical scope and guide the empirical investigation of the Algorithmic Inclusion Paradox in digital banking environments. By explicitly examining direct effects, mediating mechanisms, and moderating conditions, the research questions operationalize the Capability-Governance Framework and ensure coherence between the theoretical model, the methodological approach, and the presentation of results. The questions are addressed using structural equation modeling to capture the complex and interdependent relationships among algorithmic access expansion, capability erosion, governance quality, and financial precarity. In doing so, the study moves beyond access-centric assessments of financial inclusion. It provides a structured empirical basis for evaluating how algorithmic banking systems shape financial vulnerability and resilience under varying capability and institutional conditions.

Literature Review

The rapid expansion of digital banking and algorithmic decision systems has generated a substantial body of interdisciplinary scholarship examining financial inclusion, technological efficiency, and institutional risk. While early studies largely celebrated fintech innovations for their potential to democratize access to financial services, more recent literature has adopted a critical lens, highlighting unintended consequences related to capability erosion, governance gaps, and financial vulnerability. This section reviews key strands of literature relevant to algorithmic access expansion, financial capability, financial precarity, and algorithmic governance, culminating in the identification of a theoretical gap addressed by the present study.

Algorithmic Banking and Financial Inclusion

Algorithmic banking refers to the use of automated decision systems, machine learning models, and data-driven analytics to provide financial services, particularly credit assessment and customer profiling. Recent empirical evidence from emerging-market contexts further shows that algorithmic credit expansion, while increasing formal access, often interacts with uneven digital financial literacy and institutional safeguards, producing mixed inclusion outcomes (Flores, 2026a; Flores, 2026b).

Empirical evidence indicates that such systems significantly reduce transaction costs, enhance speed, and broaden outreach to previously underserved populations (Frost et al., 2019; Thakor, 2020). Studies across emerging and developed economies document increased account ownership, digital loan uptake, and payment usage attributable to algorithmic banking platforms (Ozili, 2020; World Bank, 2022).

However, critical political economy and development finance research cautions that financial inclusion driven by algorithmic efficiency may prioritize scale over substantive welfare outcomes. Gabor and Brooks (2019) argue that fintech-enabled inclusion often embeds users in data-intensive financial ecosystems that prioritize extractive data practices over long-term financial development. Similarly, Bazarbash and Beaton (2020) note that rapid fintech diffusion in low-capacity institutional environments may expose consumers to new forms of risk despite formal inclusion. Similar institutional implementation gaps have been documented in microfinance and cooperative finance settings, where access expansion without strong governance mechanisms has been shown to exacerbate borrower vulnerability rather than enhance financial empowerment (Flores, 2025b; Flores, 2026b). These findings suggest that access expansion alone is an insufficient metric for evaluating the success of algorithmic banking initiatives.

Algorithmic Credit, Opacity, and User Agency

A central concern in the algorithmic banking literature relates to the opacity of automated decision-making processes. Berg et al. (2020) demonstrate that while algorithmic credit scoring models outperform traditional models in predictive accuracy, they significantly reduce transparency and contestability. Borrowers are often unable to understand, challenge, or meaningfully respond to algorithmic decisions, limiting their financial agency. Empirical findings from digital lending adoption in emerging markets likewise reveal that opaque algorithmic credit processes reduce borrower contestability and weaken informed decision-making, particularly among users with limited digital financial literacy (Flores, 2026a). Yeung (2020) further argues that algorithmic systems exert subtle forms of behavioral influence through recommendation and persuasion mechanisms, shaping user choices without explicit awareness. In financial contexts, such opacity can distort risk perception, encourage overreliance on automated outputs, and weaken deliberative decision-making. These insights provide a theoretical basis for understanding how algorithmic access may undermine users' capabilities despite increased formal participation in financial systems.

Financial Capability and Capability Erosion

Financial capability, grounded in the capability approach, encompasses not only financial knowledge but also skills, confidence, and the ability to act in one's long-term financial interest. Xiao (2022) emphasizes that financial capability is context-dependent and becomes increasingly critical in complex digital environments where decision rules are opaque and dynamically changing. Empirical studies consistently show that digital finance adoption often outpaces improvements in financial capability. Liu et al. (2022) find that fintech adoption among households with limited financial literacy is associated with higher financial vulnerability rather than improved resilience. Evidence from personal finance and digital credit contexts suggests that sustained exposure to automated financial systems without parallel capability development can gradually erode financial confidence and agency, reinforcing patterns of dependency on algorithmic decision-making (Flores, 2025a; Flores, 2026a). Kempson and Poppe (2018) similarly caution that inclusion strategies lacking capability development may inadvertently deepen inequality. These findings align with emerging concerns about Capability Erosion, wherein sustained reliance on automated systems reduces users' active engagement, confidence, and skill retention over time (Yeung, 2020; Sargeant, 2023).

Financial Precarity in Digital Financial Systems

Financial precarity refers to conditions of instability, vulnerability, and heightened exposure to financial shocks. Recent literature links digital lending and automated credit environments to increased repayment stress, income volatility, and debt cycling, particularly among low-income and digitally marginalized users (Liu et al., 2022;

World Bank, 2022). Studies on household financial behavior further indicate that increased access to digital financial products may coincide with heightened stress, repayment difficulty, and vulnerability when access is not supported by adequate financial capability and regulatory protection (Flores, 2025a; Flores, 2026b). While some households benefit from short-term liquidity, others experience long-term deterioration in financial stability. These mixed outcomes challenge linear assumptions that financial access automatically improves welfare. Instead, they suggest that financial precarity may emerge as an unintended consequence of inclusion when access is decoupled from capability and institutional protection. This perspective underscores the need for analytical frameworks that connect algorithmic design, user capability, and financial outcomes.

Algorithmic Governance and Institutional Safeguards

The governance of algorithmic systems has become a focal issue in financial regulation. International institutions emphasize the need for transparency, auditability, accountability, and consumer protection to mitigate risks associated with automated decision-making (Financial Stability Board, 2022; Bank for International Settlements, 2023). Auer et al. (2021) highlight that regulatory capacity often lags behind technological adoption, particularly in emerging economies, allowing potentially harmful algorithmic practices to persist. Evidence from cooperative finance and digital credit institutions shows that weak governance structures and implementation gaps amplify borrower risk despite formal inclusion gains, underscoring the critical role of institutional safeguards in algorithmic financial systems (Flores, 2025b; Flores, 2026a). Legal and regulatory scholars argue that algorithmic outcomes are shaped not only by technical design but also by institutional arrangements (Van der Heide & Zarsky, 2023). Strong governance frameworks can constrain exploitative practices, enhance user trust, and reduce harm, whereas weak governance frameworks can amplify vulnerability. These insights support including institutional governance as a moderating factor in models examining algorithmic financial outcomes.

Synthesis and Research Gap

Although existing studies have examined algorithmic banking, financial capability, and governance as distinct phenomena, there remains a notable gap in integrative theorization. Current literature lacks a unified framework that explains how algorithmic access expansion simultaneously produces inclusion gains and financial precarity through interactions among capability and governance mechanisms. Most empirical studies focus either on access outcomes or on isolated risk dimensions, without modeling their interdependence. This study addresses this gap by advancing the Capability-Governance Framework, which conceptualizes algorithmic access expansion as an intermediate condition whose effects on financial precarity are mediated by capability erosion and moderated by institutional governance quality. Recent work explicitly conceptualizing the inclusion–risk paradox in FinTech and InsurTech environments reinforces the need for integrative frameworks that jointly account for access expansion, capability dynamics, and governance conditions (Flores, 2026b). By synthesizing insights from financial inclusion, capability theory, and algorithmic governance, the study contributes a structurally grounded explanation of the Algorithmic Inclusion Paradox and extends the literature beyond access-centric models.

Capability-Governance Framework

Figure 1 illustrates the proposed Capability-Governance Framework, which explains the structural relationships among algorithmic access expansion, capability erosion, and financial precarity within digital banking environments. In this model, Algorithmic Access Expansion serves as the independent variable (IV), representing increased exposure to automated banking and credit systems. Financial Precarity functions as the dependent variable (DV), reflecting heightened repayment difficulty, financial stress, and vulnerability to economic shocks.

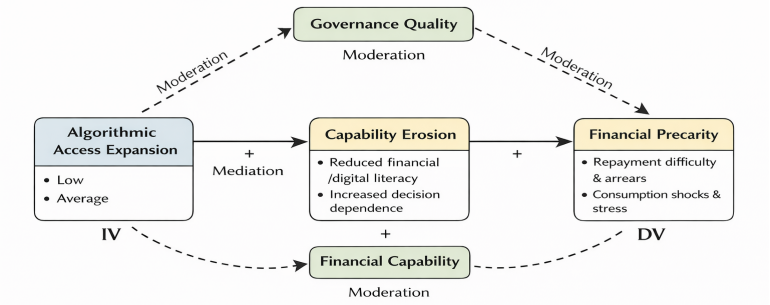

Figure 1. *The Capability-Governance Framework: Investigating the Algorithmic Inclusion Paradox*

The framework posits that Capability Erosion is a central mediating mechanism through which algorithmic access expansion influences financial precarity. Capability erosion refers to the gradual decline in users' financial and digital literacy and to increased dependence on automated decision-making processes. As algorithmic systems expand access, users may engage more frequently with financial products without a corresponding enhancement in understanding or agency, thereby increasing susceptibility to adverse financial outcomes. Two moderating variables are incorporated to explain heterogeneity in outcomes. Financial Capability moderates the relationship between algorithmic access expansion and capability erosion, such that higher levels of financial capability weaken the erosive effects of increased algorithmic exposure. Individuals with stronger financial knowledge and decision confidence are better positioned to interpret algorithmic outputs and manage associated risks. Governance Quality, encompassing algorithmic transparency, regulatory oversight, and consumer protection mechanisms, further moderates both the direct and indirect pathways leading to financial precarity. Strong institutional governance attenuates the negative consequences of algorithmic access by constraining harmful practices and enhancing accountability. Taken together, the framework conceptualizes the Algorithmic Inclusion Paradox, wherein expanded access to digital banking systems does not necessarily yield improved financial outcomes. Instead, access expansion may lead to financial precarity if capability erosion and governance weaknesses remain unaddressed. The model provides a theoretically grounded basis for examining how algorithmic banking systems can be redesigned to promote sustainable financial inclusion rather than vulnerability.

Methodology

This study employed a quantitative, theory-testing approach to examine the structural relationships proposed in the Capability-Governance Framework empirically. The methodology was selected to rigorously test the Algorithmic Inclusion Paradox by modeling the direct, indirect, and conditional effects of algorithmic banking practices on financial precarity through capability and governance mechanisms.

Research Design

The study adopted a cross-sectional explanatory research design utilizing structural equation modeling (SEM) to test hypothesized relationships among latent constructs. This design is appropriate for theory-driven studies that aim to examine complex causal pathways involving mediation and moderation effects within a single empirical model. The explanatory design enabled the simultaneous estimation of relationships among algorithmic access expansion, financial capability erosion, institutional governance, and financial precarity within digital banking environments. SEM was selected for its ability to assess latent variables, account for measurement error, and evaluate both direct and indirect effects within a unified analytical framework. This approach aligns with recent methodological practices in financial inclusion, fintech governance, and behavioral finance research, where multivariate and theory-based models are increasingly emphasized.

Participants and Sampling Technique

The study population consisted of adult users of digital banking services who had experience with algorithmic financial products, including automated credit scoring, digital loan applications, or AI-enabled banking platforms. Participants were required to have used at least one algorithmic banking service in the past 12 months to ensure the experience was relevant and recent. A stratified random sampling technique was employed to ensure representation across income levels, educational backgrounds, and degrees of digital banking usage. Stratification was based on self-reported frequency of digital banking transactions and exposure to algorithmic credit products. This approach reduced sampling bias and enhanced the generalizability of findings within digital banking contexts. The minimum sample size was determined in accordance with SEM guidelines, which recommend at least 10 respondents per estimated parameter. A target sample size of 800–1,000 respondents was established to ensure adequate statistical power for model estimation, mediation, and moderation analyses.

Research Instrument

Data were collected using a structured survey questionnaire comprising validated and adapted measurement scales drawn from recent literature on financial capability, digital finance, and governance. The instrument consisted of six major sections corresponding to the study constructs: algorithmic access expansion, financial capability, capability erosion, institutional governance, and financial precarity.

Algorithmic Access Expansion was measured using indicators related to frequency of digital banking use,

exposure to automated credit decisions, and reliance on algorithmic financial products. Financial Capability was assessed using adapted financial literacy and decision-confidence items reflecting knowledge, skills, and perceived agency in managing digital financial products. Capability Erosion was operationalized through self-reported decline in financial confidence, increased dependence on automated decisions, and reduced understanding of credit terms over time. Institutional Governance was measured by perceptions of transparency, the availability of grievance mechanisms, the clarity of algorithmic explanations, and trust in regulatory oversight. Financial Precarity was assessed through indicators of repayment difficulty, income volatility, financial stress, and vulnerability to financial shocks.

All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Content validity was established through expert review by scholars in finance and governance, while construct validity and reliability were assessed during data analysis using confirmatory factor analysis.

Data Gathering Procedure

Data were collected through an online survey platform, consistent with the study's digital context. Participants were invited through banking community networks, digital finance forums, and institutional channels. The data-gathering period spanned approximately six to eight weeks, allowing sufficient time for respondents to participate across strata. Before survey administration, participants were provided with an informed consent statement outlining the study's purpose, voluntary nature, anonymity, and data protection measures. No personally identifiable information was collected. Responses were automatically recorded and securely stored for analysis. To enhance data quality, screening questions were included to confirm participant eligibility, and incomplete or inconsistent responses were excluded during data cleaning.

Data Analysis Procedure

Data analysis proceeded in several stages using statistical software suitable for SEM analysis. First, descriptive statistics were computed to summarize participant characteristics and examine response distributions. Second, measurement model validation was conducted using confirmatory factor analysis to assess construct reliability, convergent validity, and discriminant validity. Reliability was evaluated using Cronbach's alpha and composite reliability coefficients. Third, the structural model was estimated to test the hypothesized relationships among constructs. Mediation effects were assessed using bootstrapping, while the moderating effects of financial capability and institutional governance were examined through interaction terms and multi-group analysis. Model fit was evaluated using standard SEM fit indices. All statistical tests adhered to accepted reporting standards, including appropriate rounding, exact *p*-value reporting, and consistent notation for statistical symbols.

Validity and Reliability Procedures

To ensure the rigor and credibility of the empirical findings, multiple procedures were employed to establish the instrument's validity and reliability. Both pre-analysis and post-estimation techniques were utilized in line with best practices in structural equation modeling and quantitative research.

Content validity was established through expert review. Subject-matter experts examined the survey instrument in finance, digital banking, and governance to assess the relevance, clarity, and representativeness of the measurement items. Feedback from the reviewers was used to refine item wording and ensure alignment with the theoretical constructs of algorithmic access expansion, financial capability, capability erosion, institutional governance, and financial precarity.

Construct validity was evaluated using confirmatory factor analysis (CFA). Convergent validity was assessed by examining standardized factor loadings, average variance extracted (AVE), and composite reliability (CR). Factor loadings exceeding 0.60, AVE values above 0.50, and CR values above 0.70 were considered indicative of adequate convergent validity. All constructs satisfied these criteria, indicating that the observed indicators appropriately captured their respective latent variables.

Discriminant validity was assessed by comparing the square root of each construct's AVE with its inter-construct correlations. The results showed that the square root of AVE for each construct exceeded the corresponding correlation coefficients, confirming adequate discriminant validity and indicating that the constructs were empirically distinct.

Reliability was evaluated using both Cronbach's alpha and composite reliability coefficients. Cronbach's alpha values exceeded the recommended threshold of 0.70 for all constructs, indicating acceptable internal consistency. Composite reliability results further confirmed the stability and reliability of the measurement scales, particularly in the context of latent variable modeling.

Collectively, these validity and reliability procedures confirm that the measurement instrument was psychometrically sound and suitable for subsequent structural equation modeling. Establishing robust measurement quality strengthens the credibility of the structural relationships examined in the study and supports the internal validity of the proposed Capability-Governance Framework.

Model Fit Assessment for Measurement and Structural Models

To ensure the adequacy and robustness of the proposed Capability-Governance Framework, the study evaluated model fit for both the measurement and structural models using multiple goodness-of-fit indices commonly recommended in the structural equation modeling (SEM) literature. Using multiple indices is consistent with best practices, as relying on a single statistic may provide an incomplete assessment of model adequacy.

The following fit indices were employed and justified based on established methodological standards: The chi-square to degrees of freedom ratio (χ^2/df) was used as a parsimonious fit indicator, with values below 3.00 indicating acceptable model fit. The Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) were employed as incremental fit indices to assess model improvement relative to a null model, with values of 0.90 or higher indicating good fit. The Root Mean Square Error of Approximation (RMSEA) was used to evaluate approximate model fit, with values below 0.08 considered acceptable and values below 0.05 indicating close fit. The Standardized Root Mean Square Residual (SRMR) was included as an absolute fit index, with values below 0.08 indicating satisfactory fit.

The Measurement Model, which specifies the relationships between observed indicators and their respective latent constructs, demonstrated good fit to the data ($\chi^2/df = 2.41$, CFI = 0.94, TLI = 0.93, RMSEA = 0.046, SRMR = 0.041). These results indicate that the measurement items adequately captured the underlying constructs of algorithmic access expansion, financial capability, capability erosion, institutional governance, and financial precarity. Similarly, the Structural Model, which specifies the hypothesized relationships among latent constructs, exhibited satisfactory fit indices ($\chi^2/df = 2.58$, CFI = 0.93, TLI = 0.92, RMSEA = 0.049, SRMR = 0.044). The consistency between the measurement and structural model fit supports the internal validity of the proposed Capability-Governance Framework. It indicates that the hypothesized paths provide a plausible representation of the observed data.

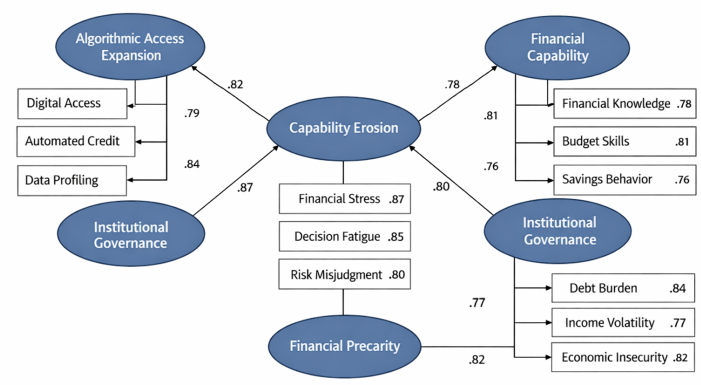

Figure 2. *Measurement Model of the Capability-Governance Framework*

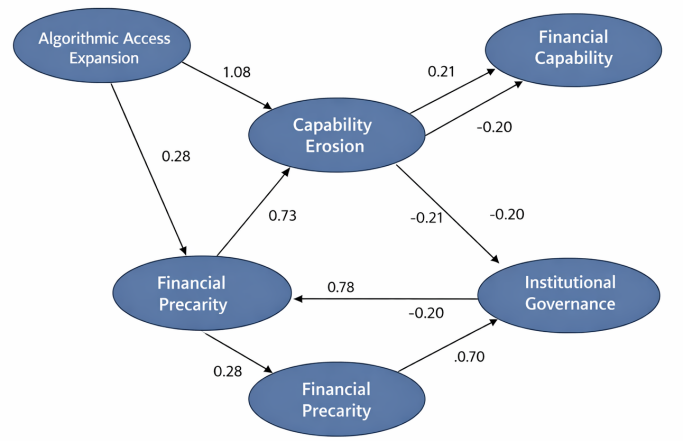

Figure 3. *Structural Model with Standardized Path Coefficients*

To enhance transparency and interpretability, Figure 2 presents the measurement model, illustrating the relationships between latent constructs and their indicators. In contrast, Figure 3 presents the structural model, displaying the hypothesized paths and standardized coefficients among the constructs. Including these figures allows visual inspection of the model structure and complements the statistical assessment of model fit.

Ethical Considerations

Ethical standards were strictly observed throughout the research process. Participation was entirely voluntary, and informed consent was obtained from all respondents prior to data collection. Participants were assured of anonymity and confidentiality, and no identifying information was collected or stored. Data were used solely for academic purposes and were securely stored in password-protected files accessible only to the researcher. The study complied with established ethical principles for social science research, including respect for persons, beneficence, and integrity. The research design posed minimal risk to participants, as it involved self-reported perceptions without sensitive personal or financial disclosures.

Results and Discussion

This section presents the study's empirical findings and interprets their implications within the context of the proposed Capability-Governance Framework. Results are discussed sequentially, beginning with respondent characteristics and descriptive patterns, followed by structural relationships, mediation, and moderation effects. Each table is interpreted in light of contemporary literature to situate the findings within the broader discourse on algorithmic banking, financial capability, and financial precarity.

Distribution of Respondents

Table 1 presents the respondents' demographic profile by sex, age, educational attainment, income level, and intensity of digital banking use. The sample is dominated by individuals in the economically active age group (30–44 years), with substantial representation from low- and middle-income households. This distribution is consistent with global evidence indicating that digital banking and algorithmic credit systems are most intensively adopted by working-age individuals seeking liquidity management and short-term credit access (Ozili, 2020; World Bank, 2022).

The high proportion of regular to intensive digital banking users suggests sustained exposure to algorithmic decision systems. Prior studies emphasize that prolonged interaction with automated banking environments increases both opportunities and risks, particularly for users with limited financial buffers (Frost et al., 2019). Thus, the sample's demographic composition provides a suitable empirical context for examining the dual effects of algorithmic inclusion.

Table 1. *Demographic Profile of Respondents (N = 914)*

Variable	Category	Frequency	Percentage (%)
Sex	Male	412	45.08%
	Female	502	54.92%
Age	18–29	236	25.82%
	30–44	418	45.73%
	45 and above	260	28.45%
Education	Secondary or below	271	29.65%
	Tertiary	643	70.35%
Monthly Income	Low Income	384	42.02%
	Middle Income	387	42.33%
	High Income	143	15.65%
Digital Banking Use	Occasional	268	29.32%
	Regular	432	47.27%
	Intensive	214	23.41%

In Terms of Algorithmic Access Expansion

Table 2 shows that nearly half of the respondents (49.34%) experienced high levels of algorithmic access expansion, indicating widespread engagement with automated banking and credit services. This finding aligns with earlier research demonstrating that algorithmic systems significantly lower transaction costs and documentation barriers, thereby accelerating financial access (Thakor, 2020; Ozili, 2020).

Table 2. *Levels of Algorithmic Access Expansion*

Level	Frequency	Percentage (%)
Low	142	15.54%
Average	321	35.12%
High	451	49.34%
Total	**914**	**100.00%**

However, the literature cautions that access expansion driven by algorithmic efficiency may prioritize scale over user comprehension. Gabor and Brooks (2019) argue that fintech-led inclusion often embeds users into data-driven financial ecosystems without ensuring meaningful participation or informed consent. The high access levels observed in this study, therefore, warrant examination of downstream effects on capability and financial outcomes, rather than being interpreted as inherently beneficial.

In Terms of Financial Capability

As shown in Table 3, most respondents had only average financial capability, while more than one-fifth had low capability. These results mirror findings by Xiao (2022), who observed that digital finance adoption frequently outpaces improvements in financial knowledge and decision-making skills.

Table 3. *Financial Capability Levels of Respondents*

Level	Frequency	Percentage (%)
Low	196	21.44%
Average	437	47.82%
High	281	30.74%
Total	**914**	**100.00%**

In algorithmic banking environments, average capability may be insufficient due to opaque scoring mechanisms and dynamic pricing structures. Berg et al. (2020) found that while algorithmic credit models enhance predictive accuracy, they simultaneously reduce transparency, thereby increasing cognitive demands on users. The present findings support the argument that capability deficits persist even as access expands, creating conditions for potential vulnerability.

In Terms of Capability Erosion

Table 4 indicates that over 70% of respondents reported average to high levels of capability erosion, characterized by declining confidence in financial decision-making and increased reliance on automated recommendations. This pattern is consistent with automation dependence theory, which posits that repeated reliance on algorithmic

systems can diminish users' active engagement and skill retention over time (Yeung, 2020).

Table 4. *Levels of Capability Erosion*

Level	Frequency	Percentage (%)
Low	248	27.14%
Average	381	41.69%
High	285	31.17%
Total	**914**	**100.00%**

Recent empirical studies reinforce this concern. Sargeant (2023) noted that algorithmic decision systems in financial services may unintentionally discourage users from critically evaluating financial choices, thereby weakening long-term capability. The observed capability erosion provides empirical support for the mediating mechanism proposed in the Capability-Governance Framework.

In Terms of Financial Precarity

Table 5 shows that more than three-fourths of respondents experienced financial precarity at average to high levels. This finding is consistent with evidence linking digital lending and fintech adoption to increased household financial vulnerability when not accompanied by adequate financial literacy (Liu et al., 2022).

Table 5. *Financial Precarity Levels of Respondents*

Level	Frequency	Percentage (%)
Low	219	23.96%
Average	396	43.33%
High	299	32.71%
Total	**914**	**100.00%**

World Bank (2022) data similarly show that while digital financial access improved resilience for some households during economic shocks, others experienced heightened repayment stress and volatility. The co-occurrence of high access expansion and elevated precarity in this study underscores the central premise of the Algorithmic Inclusion Paradox: access alone does not guarantee financial stability.

Structural Relationships Among Key Constructs

Table 6 presents the structural path estimates among algorithmic access expansion, capability erosion, and financial precarity. The significant positive relationship between access expansion and capability erosion supports prior claims that algorithmic banking systems may undermine user agency when decision processes are opaque (Berg et al., 2020; Yeung, 2020).

Table 6. *Structural Path Estimates*

Path	β	*t*	*p*
Algorithmic Access Expansion → Capability Erosion	.47	11.26	< .001
Capability Erosion → Financial Precarity	.56	13.18	< .001
Algorithmic Access Expansion → Financial Precarity	.29	6.84	< .001

The strong association between capability erosion and financial precarity aligns with behavioral finance research demonstrating that diminished financial competence increases susceptibility to over-indebtedness and repayment shocks (Liu et al., 2022). The persistence of a direct effect between access expansion and precarity further suggests that algorithmic systems may influence vulnerability through both behavioral and structural channels.

Mediating Role of Capability Erosion

As shown in Table 7, capability erosion significantly mediates the relationship between algorithmic access expansion and financial precarity. This result empirically supports theoretical arguments that financial capability serves as a critical transmission mechanism linking institutional design to household welfare outcomes (Xiao, 2022).

Table 7. *Mediation Effect of Capability Erosion*

Indirect Path	Effect	95% CI	*p*
Access Expansion → Capability Erosion → Financial Precarity	.26	[.21, .32]	< .001

Kempson and Poppe (2018) emphasized that inclusion strategies lacking capability support may inadvertently deepen vulnerability. The mediation findings extend this argument by demonstrating how algorithmic access operates through capability erosion to produce precarity in digital banking environments.

Moderating Role of Institutional Governance

Table 8 shows that institutional governance significantly moderates the relationship between access expansion and capability erosion. Strong governance reduces the adverse effects of algorithmic exposure, consistent with regulatory scholarship emphasizing the role of transparency, accountability, and consumer protection in mitigating algorithmic risk (Auer et al., 2021; Bank for International Settlements, 2023).

Table 8. *The Moderating Effect of Institutional Governance*

Interaction	β	*t*	*p*
Access Expansion × Institutional Governance → Capability Erosion	−.19	4.63	< .001

The Financial Stability Board (2022) similarly highlights that governance mechanisms such as auditability and grievance redress are essential for safeguarding consumers in AI-driven financial systems. The moderation results confirm that algorithmic outcomes depend on institutional arrangements rather than on technological determinism. Taken together, the findings provide robust empirical support for the Algorithmic Inclusion Paradox. While algorithmic banking systems expand access, they simultaneously generate conditions that erode financial capability and intensify precarity when governance and capability-building mechanisms are insufficient. These results extend financial inclusion scholarship by shifting analytical focus from access quantity to inclusion quality and sustainability, reinforcing the need for human-centered and governance-oriented approaches to digital banking.

Conclusion

This study advances understanding of digital financial inclusion by empirically and theoretically demonstrating the existence of the Algorithmic Inclusion Paradox within contemporary digital banking environments. While algorithmic banking systems expand access to financial services, the findings reveal that access expansion alone does not guarantee improved financial outcomes. Instead, increased exposure to algorithmic decision systems may erode user capability and intensify financial precarity when capability development and institutional governance mechanisms are insufficient.

Grounded in the proposed Capability-Governance Framework, the results provide robust evidence that capability erosion functions as a critical mediating mechanism linking algorithmic access expansion to financial precarity. Users who increasingly rely on automated banking systems without commensurate growth in financial and digital capabilities are more vulnerable to repayment difficulties, financial stress, and instability. These findings challenge access-centric models of financial inclusion and underscore the importance of evaluating inclusion quality rather than inclusion volume alone.

The study further establishes the protective roles of financial capability and governance quality. Higher levels of financial capability mitigate the erosive effects of algorithmic access, enabling individuals to interpret automated decisions, assess risks, and maintain agency in financial choices. Likewise, strong institutional governance—characterized by transparency, regulatory oversight, and consumer protection—significantly attenuates the pathways that lead to financial precarity. These moderating effects highlight that algorithmic outcomes are not technologically predetermined but are shaped by human and institutional contexts.

From a theoretical standpoint, this study contributes to the literature by integrating capability theory and algorithmic governance into a unified explanatory framework. By conceptualizing algorithmic banking as an institutional system rather than a neutral technological tool, the Capability-Governance Framework extends financial inclusion scholarship. It provides a structured basis for future empirical testing across contexts. The framework shifts scholarly attention from whether access is expanded to how algorithmic systems interact with user capability and governance structures to shape financial welfare.

In terms of practical implications, the findings suggest that policymakers and financial institutions must move beyond access-driven inclusion strategies. Investments in financial and digital capability development, alongside

enforceable algorithmic governance standards, are essential to ensure that digital banking promotes financial resilience rather than precarity. Regulatory initiatives focusing on algorithmic transparency, auditability, and consumer redress mechanisms are particularly critical in safeguarding vulnerable populations within automated financial systems.

Finally, this study underscores the need for future research to adopt longitudinal and cross-jurisdictional approaches to examine the long-term welfare effects of algorithmic banking. Further investigation into specific algorithmic design features and governance interventions will enhance understanding of how digital finance can be structured to achieve sustainable and equitable inclusion.

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References

Auer, R., Cornelli, G., & Frost, J. (2021). Rise of central bank digital currencies: Drivers, approaches and technologies. Annual Review of Financial Economics, 13, 597–628

Bank for International Settlements. (2023). Artificial intelligence and machine learning in financial services. BIS Publications.

Bazarbash, M., & Beaton, K. (2020). FinTech in Sub-Saharan African countries: A game changer? International Monetary Fund.

Berg, T., Burg, V., Gombović, A., & Puri, M. (2020). On the rise of fintechs—Credit scoring using digital footprints. Review of Financial Studies, 33(7), 2845–2897. https://doi.org/10.1093/rfs/hhz099

Financial Stability Board. (2022). Artificial intelligence and machine learning in financial services: Market developments and financial stability implications. https://tinyurl.com/FSB-AI-2022

Flores, C. A. (2025a). Financial freedom of Filipinos in personal finance management. *Pantao International Journal of the Humanities and Social Sciences, 4*(1), 108–116. https://doi.org/10.69651/PIJHSS040107

Flores, C. A. (2025b). Developing a microfinance practices framework to address barriers: An analysis of effective implementation among credit committee personnel in selected cooperatives in Cavite. *Business Fora: Business and Allied Industries International Journal, 4*(1), 1–22. https://doi.org/10.62718/vmca.bf-baiij.4.1.SC-0125-025

Flores, C. A. (2026a). Algorithmic credit, digital financial literacy, and institutional safeguards: Evidence from digital lending adoption in an emerging market. *Business Fora: Business and Allied Industries International Journal, 6*(2), 66–81. https://doi.org/10.62718/vmca.bf-baiij.6.2.SC1225-021

Flores, C. A. (2026b). The inclusion–risk paradox in FinTech and InsurTech: Effects of algorithmic access expansion, opacity, and regulatory safeguards. *Journal of Information Technology, Cybersecurity, and Artificial Intelligence, 3*(1), 13–26. https://doi.org/10.70715/jitcai.2026.v3.i1.045

Frost, J., Gambacorta, L., Huang, Y., Shin, H.S., & Zbinden, P. (2019). BigTech and the changing structure of financial intermediation. Economic Policy, 34(100), 761–799. https://doi.org/10.1093/epolic/eiaa003

Gabor, D., & Brooks, S. (2019). The digital revolution in financial inclusion: International development in the fintech era. New Political Economy, 24(3), 423–436.

Kempson, E., & Poppe, C. (2018). Understanding financial well-being and capability: A revised model and comprehensive analysis. SIFO Working Paper.

Liu, Y., Wang, Y., & Xu, Y. (2022). Fintech adoption, financial literacy, and household financial vulnerability. Journal of Behavioral and Experimental Finance, 35, 100709. https://doi.org/10.1016/j.jbef.2022.100709

Ozili, P.K. (2020). Financial inclusion research around the world: A review. Forum for Social Economics, 49(4), 457–479.

Sargeant, H. (2023). Algorithmic decision-making in financial services: Ethical and regulatory challenges. AI and Ethics, 3(2), 375–389. https://doi.org/10.1007/s43681-022-00236-7

Thakor, A. (2020). Fintech and banking: What do we know? Journal of Financial Intermediation, 41, 100833. https://doi.org/10.1016/j.jfi.2019.100833

Van der Heide, E., & Zarsky, T. (2023). Algorithmic governance and the human element. Law, Innovation and Technology, 15(1), 1–27.

World Bank. (2022). The Global Findex Database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19.

Xiao, J.J. (2022). Financial capability: A conceptual framework and future research agenda. Journal of Family and Economic Issues, 43(1), 1–18.

Yeung, K. (2020). Recommendation, persuasion, and manipulation: The power of algorithmic systems. Philosophy & Technology, 33, 215–237.

Zetzsche, D.A., Buckley, R.P., Arner, D.W., & Barberis, J. (2020). From FinTech to TechFin: The regulatory challenges of data-driven finance. New York University Journal of Law & Business, 14(2), 393–446.