

DIGITAL LENDING, HOUSEHOLD DEBT, AND FINANCIAL VULNERABILITY EVIDENCE FROM INDONESIA

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Abstract: Digital lending has rapidly expanded financial inclusion in Indonesia while simultaneously raising concerns over rising household indebtedness and financial vulnerability. Despite growing empirical attention, existing studies primarily examine individual borrowers and rarely distinguish between licensed fintech lending and illegal online lending, leaving the household as the fundamental economic decision-making unit largely unexplored. This study develops a dual-channel model of digital lending-induced household financial vulnerability by integrating behavioral and structural perspectives within a unified analytical framework. Using a cross-sectional household survey complemented by secondary data from the Financial Services Authority (OJK) and Statistics Indonesia (BPS), the study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) with mediation, moderation, and robustness analyses to examine the relationships among digital lending exposure, household debt structure, behavioral propensity, digital financial literacy, and financial vulnerability. The proposed framework distinguishes between legal and illegal digital lending while incorporating household-level behavioral and institutional mechanisms that have received limited attention in previous research. The empirical findings are expected to clarify whether digital lending exposure increases household financial vulnerability through both behavioral and structural pathways, whether digital financial literacy exerts a nonlinear moderating effect, and whether illegal digital lending generates significantly greater financial vulnerability than licensed fintech lending. The study contributes to the household debt literature by extending multidimensional financial vulnerability theory to a fintech-dominated emerging economy and provides policy implications for strengthening macroprudential surveillance through household-level debt monitoring and differentiated regulatory interventions targeting both legal and illegal digital lending markets.

Keywords: Digital lending; Household debt; Financial vulnerability; Fintech; Household finance; Indonesia.

Abstrak: Pinjaman digital telah berkembang pesat dalam memperluas inklusi keuangan di Indonesia, namun pada saat yang sama meningkatkan kekhawatiran terhadap meningkatnya utang rumah tangga dan kerentanan finansial. Meskipun perhatian empiris terhadap topik ini semakin berkembang, sebagian besar penelitian sebelumnya masih berfokus pada peminjam individu dan jarang membedakan antara pinjaman fintech berizin dan pinjaman daring ilegal,

sehingga rumah tangga sebagai unit pengambilan keputusan ekonomi utama masih belum banyak dikaji. Penelitian ini mengembangkan model dua jalur (dual-channel model) kerentanan finansial rumah tangga akibat pinjaman digital dengan mengintegrasikan perspektif perilaku dan struktural ke dalam satu kerangka analisis. Penelitian menggunakan desain survei rumah tangga secara cross-sectional yang dilengkapi dengan data sekunder dari Otoritas Jasa Keuangan (OJK) dan Badan Pusat Statistik (BPS), serta dianalisis menggunakan Partial Least Squares Structural Equation Modeling (PLS-SEM) melalui pengujian mediasi, moderasi, dan uji ketahanan model (robustness analysis) untuk mengevaluasi hubungan antara eksposur pinjaman digital, struktur utang rumah tangga, kecenderungan perilaku, literasi keuangan digital, dan kerentanan finansial. Kerangka yang diusulkan membedakan secara eksplisit antara pinjaman digital legal dan ilegal sekaligus mengakomodasi mekanisme perilaku dan institusional pada tingkat rumah tangga yang selama ini masih terbatas dibahas dalam literatur. Temuan empiris penelitian ini diharapkan dapat menjelaskan apakah eksposur pinjaman digital meningkatkan kerentanan finansial rumah tangga melalui jalur perilaku maupun jalur struktural, apakah literasi keuangan digital memiliki efek moderasi yang bersifat nonlinier, serta apakah pinjaman digital ilegal menimbulkan kerentanan finansial yang secara signifikan lebih besar dibandingkan pinjaman fintech berizin. Penelitian ini berkontribusi pada pengembangan literatur mengenai utang rumah tangga dengan memperluas teori multidimensi kerentanan finansial ke dalam konteks negara berkembang yang didominasi oleh fintech, sekaligus memberikan implikasi kebijakan bagi penguatan pengawasan makroprudensial melalui pemantauan utang rumah tangga dan intervensi regulasi yang lebih terarah terhadap pasar pinjaman digital legal maupun ilegal.

Kata Kunci: Pinjaman digital; Utang rumah tangga; Kerentanan finansial; Fintech; Keuangan rumah tangga; Indonesia.

Introduction

The rapid expansion of digital lending has transformed household borrowing in Indonesia from a marginal phenomenon into a central component of the consumer credit market. According to the Financial Services Authority (Otoritas Jasa Keuangan, OJK), outstanding fintech peer-to-peer (P2P) lending increased from IDR 62.17 trillion in March 2024 (21.85% year-on-year) to IDR 102.07 trillion in April 2026, representing an annual increase of approximately 26% (Bank Indonesia, cited in Tempo, 2026). The Indonesian Joint Funding Fintech Association (AFPI) further reported that cumulative loan disbursements by 97 licensed platforms reached IDR 978 trillion between 2017 and November 2024, serving approximately 137 million individual and institutional borrowers (Tempo, 2025). While this rapid expansion has substantially improved access to credit, it has also heightened concerns over household debt sustainability. The 90-day default rate (TWP90) of online lending reached 4.62% in April 2026, approaching the supervisory threshold of 5.00%, while the non-performing household loan ratio in the banking sector increased from 2.02% in 2024 to 2.39% in 2025 (Bank Indonesia, cited in Tempo, 2026). At the same time, OJK's Illegal Financial Activities Eradication Task Force (Satgas PASTI) blocked 6,991 illegal online lending entities between 2022 and 2024 (Wahyuni et al., 2026), underscoring the dual structure of Indonesia's digital credit market, where tightly regulated fintech lenders operating under POJK No. 40/2024 coexist with illegal lenders that employ predatory practices outside the regulatory framework (Masyhar et al., 2026). These developments have occurred in an economy where household consumption accounts for approximately 54% of gross domestic product (Coordinating Ministry for Economic Affairs, 2025), raising concerns that consumption growth is increasingly financed by high-cost short-term borrowing rather than improvements in real household income (Tempo, 2026).

Despite the rapid expansion of digital credit, the literature provides only a fragmented understanding of its implications for household financial vulnerability in Indonesia. Existing studies predominantly adopt a behavioral perspective, treating individual borrowers as the primary unit of analysis. Warokka et al. (2025), for example, examine the determinants of

propensity to indebtedness among urban civil servants and private-sector employees; Wahyuni et al. (2026) investigate vulnerability to predatory lending among female industrial workers in Batam; and Masyhar et al. (2026) document illegal online lending practices affecting university students through a socio-legal approach. Collectively, these studies offer valuable insights into the behavioral drivers of excessive borrowing but remain confined to specific subpopulations. More importantly, they overlook the household as the relevant economic decision-making unit in which borrowing decisions, debt obligations, and financial risks are jointly allocated among family members. In contrast, structural analyses linking digital finance to household debt have primarily emerged outside Indonesia. Using panel data from the China Family Panel Studies (CFPS), Hou and Zhang (2025) show that digital finance reshapes household debt structures within a financial system closely integrated with formal banking through platforms such as Ant Financial and Alipay. However, this institutional setting differs substantially from Indonesia's more fragmented digital lending landscape, which is characterized by independent fintech P2P platforms and the continued presence of illegal online lenders. A recent systematic review by Haijun, Mao, et al. (2025), covering 161 studies on household debt risk published between 2000 and 2025, further confirms that empirical evidence remains heavily concentrated in advanced economies and China, while Southeast Asian countries—particularly Indonesia, where fintech dominates digital consumer lending—remain significantly underrepresented.

This literature reveals five interrelated research gaps. First, from a theoretical perspective, no existing framework integrates individual behavioral mechanisms—such as cognitive biases, materialism, and peer influence—with structural debt transmission mechanisms, including credit constraints, household mental accounting, and competition among financial institutions, within a unified model of household financial vulnerability. Second, empirically, Indonesian studies continue to rely on individuals rather than households as the unit of analysis, limiting their ability to capture the composition and accumulation of household debt arising from digital borrowing. Third, methodologically, most studies employ cross-sectional PLS-SEM models based on non-probability samples, with limited attention to stronger identification strategies such as the instrumental-variable approaches adopted by Hou and Zhang (2025). Fourth, Indonesia's dual digital credit market—consisting of licensed fintech platforms and illegal online lenders—has not been examined quantitatively in relation to household debt structures or financial vulnerability. Finally, existing policy recommendations overwhelmingly emphasize financial literacy as the primary intervention despite the paradoxical evidence reported by Warokka et al. (2025), who find that financial literacy amplifies rather than mitigates the influence of behavioral biases on indebtedness.

Motivated by these gaps, this study addresses three research questions. First, how does digital lending exposure influence household debt structure and composition in Indonesia? Second, do the behavioral propensities of household members mediate or moderate the relationship between digital lending exposure and household financial vulnerability? Third, does the impact of illegal digital lending differ from that of licensed fintech lending in shaping household financial vulnerability? To answer these questions, this study proposes a dual-channel model of digital lending-induced household financial vulnerability, which integrates micro-level behavioral mechanisms with structural debt transmission processes while explicitly distinguishing between legal and illegal digital lending. By adopting the household rather than the individual as the unit of analysis, the proposed framework addresses an important gap in the literature and reflects the distinctive institutional characteristics of Indonesia's digital credit market. The study contributes to the household debt literature by extending existing multidimensional frameworks of financial vulnerability (Haijun et al., 2025) to a fintech-dominated emerging economy and provides evidence to support macroprudential surveillance by OJK and Bank Indonesia, particularly in monitoring household debt composition and maturity structure as indicators of systemic financial risk. The remainder of this paper is organized as follows. Section 2 reviews the relevant literature and develops the theoretical framework. Section 3 describes the research methodology. Section 4 presents the empirical

findings. Section 5 discusses the results, and Section 6 concludes with the theoretical, practical, and policy implications, as well as directions for future research.

Literature review

The literature on digital lending in emerging economies has largely been framed from a financial inclusion perspective, arguing that financial technology expands credit access for populations underserved by conventional banking through big data, artificial intelligence, and alternative credit-scoring systems (Warokka et al., 2025). This argument is particularly relevant in Indonesia, where household debt remains relatively low at approximately 16% of GDP, while nearly 98 million adults (48% of the adult population) remain unbanked (Neraca, citing World Bank 2021). Similar to the Macmillan gap argument advanced by Hou and Zhang (2025) and Mauliansyah (2024), digital lending therefore has the potential to reduce financial exclusion by reaching borrowers who are typically overlooked by traditional financial institutions. Nevertheless, the same features that facilitate financial inclusion—rapid approval, low transaction costs, and continuous accessibility—may also encourage excessive borrowing, thereby increasing household financial vulnerability.

Existing empirical evidence identifies two complementary mechanisms through which digital lending influences indebtedness. The first is the behavioral mechanism, which emphasizes borrowers' psychological characteristics. Warokka et al. (2025) show that behavioral biases, including overconfidence and herding, significantly increase the propensity to incur debt, with these effects reinforced by emotions, materialism, and collectivist values, whereas religiosity weakens such relationships. Similarly, Wahyuni et al. (2026) find that financial stress and peer influence increase vulnerability to predatory lending, while digital financial literacy and financial self-efficacy serve as protective factors. However, the paradoxical finding that financial literacy strengthens rather than weakens the effect of behavioral bias on indebtedness suggests that knowledge alone may not necessarily reduce financial vulnerability, particularly when it induces greater confidence in borrowing decisions (Warokka et al., 2025).

The second mechanism is structural, emphasizing how digital finance reshapes household debt through changes in credit market institutions. Using panel data from the China Family Panel Studies, Hou and Zhang (2025) identify three transmission channels: the relaxation of household credit constraints, changes in household mental accounting that encourage higher consumption, and competitive responses by traditional banks that expand long-term lending. Their findings indicate that digital finance significantly increases household debt, although the magnitude of the effect differs across household characteristics. While these results provide an important explanation of debt accumulation, they are derived from China's highly integrated digital financial ecosystem, where fintech platforms operate in close conjunction with formal banking institutions. Indonesia presents a markedly different institutional setting, characterized by independent fintech peer-to-peer lending platforms operating alongside a substantial illegal online lending market.

To capture the interaction between these behavioral and structural mechanisms, this study adopts the multidimensional consumer financial vulnerability framework proposed by O'Connor et al. (2019, cited in Wahyuni et al., 2026), which conceptualizes financial vulnerability as a continuum shaped by cognitive, emotional, and structural factors. This perspective is particularly relevant in Indonesia, where Masyhar et al. (2026) demonstrate that illegal online lenders exploit regulatory gaps through aggressive marketing, rapid loan disbursement, and coercive collection practices, generating financial distress that extends beyond repayment difficulties to include psychological pressure and misuse of personal data. These institutional characteristics suggest that household financial vulnerability in Indonesia cannot be fully understood without considering both borrower behavior and the dual structure of the digital credit market.

Drawing on these perspectives, this study argues that household financial vulnerability emerges from the interaction between individual behavioral propensity and structural changes in digital credit markets, while recognizing that the legal status of digital lending providers may condition these relationships. Accordingly, the study develops four hypotheses. H1 proposes that greater digital lending exposure increases both the level and the proportion of short-term household debt. H2 posits that the behavioral propensity of household members strengthens the relationship between digital lending exposure and household financial vulnerability. H3 predicts that household digital financial literacy moderates this relationship in a nonlinear manner, consistent with the paradoxical findings of Warokka et al. (2025). Finally, H4 proposes that illegal digital lending has a significantly stronger effect on household financial vulnerability than licensed fintech lending.

Methods

A cross-sectional household survey design was adopted as the primary research design for this study, given the objective of capturing the relationship between digital lending exposure and household debt structure at a single point in time while allowing sufficient depth for multidimensional financial vulnerability assessment. This design was selected in preference to purely individual-level survey approaches used in prior Indonesian studies (Warokka et al., 2025; Wahyuni et al., 2026), as it enables data collection at the household unit level, thereby capturing aggregate debt composition, intra-household decision-making dynamics, and joint exposure to both legal and illegal digital lending platforms. To strengthen causal inference and mitigate the well-documented limitations of cross-sectional designs—namely the inability to establish temporal precedence—secondary panel data obtained from the Financial Services Authority (Otoritas Jasa Keuangan, OJK) and Statistics Indonesia (Badan Pusat Statistik, BPS), including P2P lending statistics, the National Survey of Financial Literacy and Inclusion (SNLIK), and household expenditure records, were incorporated as a robustness check. This mixed-data strategy follows the precedent established by Hou and Zhang (2025), who combined micro-household panel data (China Family Panel Studies) with a macro-level digital finance penetration index to strengthen the internal validity of household debt maturity estimations.

The population of this study comprised Indonesian households with at least one adult member who had engaged with a digital lending platform, whether formally registered with OJK or classified as illegal (*pinjol ilegal*), within the twelve months preceding data collection. A stratified multistage sampling procedure was employed to ensure adequate representation across geographic regions (Java versus outside Java), income strata (low, middle, and upper-middle income households, based on BPS expenditure classification), and digital lending exposure type (licensed fintech lending only, illegal lending only, or mixed exposure to both). Stratification by exposure type was considered essential, as prior sociolegal evidence indicated that illegal lending platforms disproportionately target financially constrained and digitally underserved populations (Masyhar et al., 2026), while licensed platforms tend to serve middle-income, salaried populations (Warokka et al., 2025). Sample size determination was guided by minimum requirements for structural equation modeling estimation, following the ten-times rule and power analysis procedures recommended by Hair et al. (2022), with an anticipated minimum of 400–500 valid household responses to accommodate the complexity of the proposed dual-channel structural model, including its mediation and moderation pathways. Eligibility criteria required that the responding household member be the primary or joint financial decision-maker within the household, be at least 18 years of age, and have documented evidence (transaction history, application records, or repayment records) of digital loan usage, thereby minimizing recall bias and self-report inconsistency.

Variable definition and measurement were developed based on validated instruments adapted from the reviewed literature. The dependent variables consisted of two constructs: household

debt structure/composition, operationalized as the ratio of short-term versus long-term digital debt obligations relative to total household debt, following the maturity structure measurement approach of Hou and Zhang (2025); and a multidimensional household financial vulnerability index, adapted from the O'Connor et al. (2019) framework as applied in Wahyuni et al. (2026), encompassing cognitive, affective, and structural dimensions of vulnerability measured through Likert-scale items. The independent variables comprised the intensity of digital lending exposure, disaggregated into legal (OJK-registered) and illegal (pinjol) exposure, measured through frequency, cumulative loan amount, and number of active platforms used; and a behavioral propensity index, constructed from validated financial behavioral bias, materialism, and cultural orientation scales adapted from Warokka et al. (2025). Mediating and moderating variables included digital financial literacy, measured using the OECD/INFE digital financial literacy instrument as applied by Wahyuni et al. (2026); financial stress, measured through the InCharge Financial Distress/Financial Well-Being Scale (Prawitz et al., 2006, as cited in Wahyuni et al., 2026); peer influence; and household mental accounting tendencies, adapted from the mental accounting proxy employed by Hou and Zhang (2025). Control variables encompassed household socio-demographic characteristics, including household size, total household income, education level of the primary earner, employment status, and regional location, consistent with control variable specifications used across all reviewed empirical studies.

Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software, selected for its robustness in handling complex models involving multiple mediating and moderating relationships, its suitability for exploratory theory extension, and its minimal distributional assumptions, consistent with the methodological justification provided by Warokka et al. (2025) and Wahyuni et al. (2026). The structural model was estimated in three sequential stages: measurement model evaluation, structural model assessment, and importance-performance map analysis to identify high-priority intervention constructs. To address potential endogeneity arising from the possible reverse causality between debt exposure and financial vulnerability, an instrumental variable strategy was incorporated as a robustness extension, following the identification approach demonstrated by Hou and Zhang (2025), wherein exogenous instruments unrelated to unobserved household debt determinants—such as regional digital infrastructure penetration—were tested for relevance and exogeneity through first-stage F-statistics and overidentification tests.

Validity and reliability were assessed through a multi-stage procedure. Convergent validity was evaluated using average variance extracted (AVE) values exceeding the 0.50 threshold, while internal consistency reliability was assessed through Cronbach's alpha and composite reliability values exceeding 0.70, in accordance with Hair et al. (2022). Discriminant validity was examined using the Heterotrait-Monotrait ratio (HTMT), with values maintained below the conservative threshold of 0.90 (Henseler et al., 2015). Common method bias was assessed through full collinearity variance inflation factor (VIF) testing, following Kock's (2015) full collinearity assessment approach. Robustness of the structural estimates was further verified through bootstrapping procedures with 5,000 resamples, consistent with the reporting standard adopted by Wahyuni et al. (2026), as well as through sample splitting across legal and illegal lending exposure subgroups to confirm the stability of path coefficients across the proposed dual-channel framework.

Results And Discussions

The household profiles in this study reflect the demographic and economic characteristics that have been documented in Indonesia's digital lending ecosystem. Given that OJK statistics report a P2P lending disbursement growth of 26 percent year-on-year by April 2026, reaching Rp102.07 trillion in outstanding value (Bank Indonesia, cited in Tempo, 2026), and that AFPI records indicate the sector has reached 137 million cumulative borrowers since 2017, the

sampled household population is projected to be dominated by economically active, mid-career respondents residing predominantly in Java, mirroring the age and occupational distribution reported by Warokka et al. (2025), in which civil servants and salaried employees constituted 68.3 percent of respondents and the 36–50 age bracket represented the largest cohort. Descriptively, exposure to digital lending is expected to bifurcate along two distinct channels: households with sole exposure to licensed fintech platforms, characterized by relatively stable formal income and higher digital financial literacy, and households with exposure to illegal lending platforms, a segment more closely aligned with the financially constrained, low-income, and digitally underserved population documented by Masyhar et al. (2026) in their sociolegal analysis of predatory lending targeting Indonesian students. A meaningful proportion of the sample is also anticipated to exhibit mixed exposure—simultaneous use of both legal and illegal platforms—a pattern consistent with the "debt cycling" behavior in which households turn to illegal lenders precisely because legal platforms have reached their credit ceiling, a mechanism implicit in the credit rationing literature underlying Hou and Zhang's (2025) liquidity constraint channel.

The measurement model evaluation is expected to demonstrate satisfactory psychometric properties across all latent constructs, consistent with the validation benchmarks reported in the reference studies. Following the threshold conventions applied by Warokka et al. (2025), outer loadings for indicators of behavioral propensity, digital financial literacy, financial stress, peer influence, and the multidimensional financial vulnerability index are anticipated to exceed 0.70, with average variance extracted (AVE) values surpassing 0.50, thereby confirming convergent validity. Discriminant validity, assessed through the Heterotrait-Monotrait ratio (HTMT), is expected to remain below the conservative 0.90 threshold recommended by Henseler et al. (2015), particularly given the conceptual proximity between financial stress and mental accounting constructs—two variables that, if inadequately distinguished, risk conflating affective distress with cognitive budgeting bias. This distinction is analytically important: whereas financial stress captures an emotional state of strain, mental accounting, as operationalized by Hou and Zhang (2025), captures a cognitive-behavioral tendency to compartmentalize income sources and expand subjective budget constraints in response to low nominal borrowing costs. Empirically separating these constructs is essential to isolating the distinct pathways through which digital lending translates into household vulnerability, and their anticipated discriminant validity would substantiate the theoretical claim that behavioral and structural mechanisms, while correlated, remain conceptually and empirically distinct.

Turning to the structural model, the behavioral channel is hypothesized to exert a strong and statistically significant direct effect on household financial vulnerability (H1), a pattern that would corroborate the finding of Warokka et al. (2025) that financial behavior biases constitute the single strongest predictor of indebtedness propensity among Indonesian fintech borrowers, with an effect size (f^2) of 0.421 in their PLS-SEM model. This empirical strength is theoretically explicable through the mechanism of reduced deliberative friction inherent to digital lending platforms: unlike traditional credit application processes that impose cooling-off periods and paperwork barriers, fintech and pinjol applications are engineered for near-instantaneous approval, a design feature that systematically privileges the impulsive "doer" over the deliberative "planner" in the Behavioral Life-Cycle Hypothesis framework (Shefrin & Thaler, as operationalized in Warokka et al., 2025). This finding is expected to extend logically to the household level: because financial decisions within Indonesian households are frequently negotiated collectively rather than made unilaterally, the behavioral biases of even a single decision-making member may propagate risk across the household's aggregate debt portfolio, a dynamic that individual-level studies are structurally incapable of capturing. The structural channel, meanwhile, is hypothesized to exert an independent and comparably significant effect on household debt composition, specifically manifesting as a shift toward higher proportions of short-term, high-frequency digital debt relative to long-term formal credit. This anticipated

pattern stands in partial contrast to Hou and Zhang's (2025) finding that digital inclusive finance penetration in China significantly elevates long-term household debt (with a coefficient of 0.0018, translating to a 34.5 percent increase in long-term debt structure per standard deviation increase in penetration) while exerting no significant effect on short-term debt. This divergence, if confirmed, would not undermine the structural liquidity-constraint mechanism itself but would instead reveal that its manifestation is contingent on the underlying credit market architecture: China's digital inclusive finance ecosystem is deeply integrated with mortgage-eligible formal banking infrastructure, whereas Indonesia's fintech P2P and pinjol sector is structurally confined to short-tenor, high-frequency consumptive lending products, meaning the same liquidity-relaxation mechanism identified by Hou and Zhang (2025) would be expected to manifest as short-term debt accumulation rather than long-term leveraging in the Indonesian context.

The mediation and moderation analysis is anticipated to reveal one of the most theoretically consequential findings of this study: that digital financial literacy does not function as a uniformly protective moderator, but instead exhibits a conditional or even counterintuitive moderating effect on the relationship between behavioral propensity and household financial vulnerability. This expectation is directly informed by the paradoxical result reported by Warokka et al. (2025), in which financial literacy significantly strengthened rather than weakened the effect of financial behavior biases on indebtedness ($\beta = 0.095$, $p < 0.001$), a pattern the authors attribute to literacy-induced overconfidence, wherein individuals with greater technical financial knowledge become more prone to rationalizing biased or impulsive borrowing decisions rather than restraining them. Should this study's household-level model replicate this pattern, it would constitute a critical anomaly relative to Wahyuni et al.'s (2026) findings, in which digital financial literacy functioned as a significant protective factor against predatory lending vulnerability among female industrial workers ($\beta = -0.218$, $p < .001$). This anomaly can be explained through compositional and contextual differences between the two reference populations: Warokka et al.'s (2025) sample comprised civil servants and salaried employees with relatively stable income and higher baseline financial sophistication, a population in which literacy may plausibly translate into overconfidence rather than caution, whereas Wahyuni et al.'s (2026) sample comprised female industrial workers in structurally precarious employment, a population in which literacy is more likely to function as a genuine defensive competency against exploitative loan terms precisely because baseline vulnerability is higher and overconfidence is less likely to develop. This divergence suggests that digital financial literacy's moderating function is not fixed but is instead conditional upon a household's baseline structural vulnerability—a theoretical proposition this study is positioned to test directly by examining whether the sign and magnitude of the literacy moderation effect shifts systematically across income strata within a single unified household-level model, rather than being inferred indirectly through comparison across separate studies conducted on different populations. Financial stress, by contrast, is hypothesized to exert a consistently positive and direct effect on financial vulnerability regardless of literacy level, mirroring its status as the strongest predictor in Wahyuni et al.'s (2026) push-pull model ($\beta = 0.342$, $p < .001$), and is expected to partially mediate the relationship between illegal lending exposure and vulnerability, insofar as financial stress arising from prior debt obligations is theorized to be a proximate psychological trigger that pushes financially strained households toward illegal lenders when licensed platforms deny further credit—a sequential pathway that a cross-sectional single-equation model would fail to detect but which a mediation-specified structural model is designed to isolate.

The comparative analysis between legal and illegal digital lending exposure is expected to constitute the study's most policy-salient empirical contribution, precisely because this distinction has never been formally modeled in the reviewed literature despite its centrality to Indonesia's regulatory discourse. It is hypothesized that illegal lending exposure will exert a

substantially larger positive effect on household financial vulnerability than legal fintech exposure, a pattern strongly anticipated on the basis of the qualitative and structural evidence assembled by Masyhar et al. (2026), who documented that illegal lenders systematically impose excessive charges, misuse personal data, and employ coercive collection methods that compound financial instability with psychological distress—harm channels entirely absent from the regulated segment governed by OJK's interest rate ceilings and standardized collection protocols under POJK Nomor 40/2024. This anticipated asymmetry would empirically validate the dual-market thesis underlying this study's conceptual framework: that the aggregate statistics on Indonesian digital lending growth, such as the sector-wide TWP90 default ratio of 4.62 percent reported by OJK in April 2026, likely obscure a bimodal risk distribution in which the illegal segment contributes disproportionately to household-level vulnerability despite constituting a smaller share of aggregate disbursement volume than the licensed segment. Should the data reveal, however, that legal fintech exposure also exerts a nontrivial vulnerability effect—particularly among households exhibiting high behavioral propensity scores—this would corroborate Warokka et al.'s (2025) finding that behavioral biases remain consequential even within a fully regulated credit environment, indicating that regulatory formalization of lending platforms addresses supply-side predation but does not, by itself, neutralize demand-side behavioral risk.

Robustness and heterogeneity testing is expected to confirm the stability of the core structural pathways across bootstrapped resamples, consistent with the 5,000-resample procedure adopted by Wahyuni et al. (2026), while simultaneously revealing meaningful subgroup variation that qualifies the model's generalizability. Regional heterogeneity is anticipated to echo the central-and-western-region amplification effect identified by Hou and Zhang (2025), in which digital finance penetration exerted a stronger effect on long-term household debt in China's less financially developed central and western provinces (coefficient of 0.00223) relative to the more developed eastern provinces (0.00168); by structural analogy, digital lending exposure in Indonesia is expected to exert a proportionally stronger vulnerability effect among households outside Java, where formal banking penetration remains comparatively thin and digital lenders occupy a larger share of the effective credit market. Gender heterogeneity is expected to reflect the elevated structural exposure documented by Wahyuni et al. (2026) among female industrial workers, whose combination of contractual employment precarity and concentrated residence in industrial estates renders them a structurally exposed demographic for predatory targeting; the anticipated heterogeneity analysis would test whether this gendered vulnerability persists once household-level controls are introduced, or whether it is substantially attenuated once intra-household income pooling and joint decision-making are accounted for—a test that individual-level studies cannot perform by design. Income heterogeneity, finally, is expected to reveal a nonlinear pattern in which middle-income households, rather than the poorest households, exhibit the highest behavioral-channel vulnerability, consistent with Warokka et al.'s (2025) finding that middle-income civil servants and salaried employees—rather than the economically marginalized—constitute the primary target demographic of licensed fintech platforms, precisely because they possess sufficient formal income to qualify for credit approval while remaining susceptible to consumption-smoothing and status-driven borrowing.

Synthesizing these anticipated findings within the dual-channel theoretical framework proposed in Section II reveals a coherent narrative: household financial vulnerability arising from digital lending is not adequately explained by either behavioral or structural mechanisms in isolation, but emerges from their interaction, moderated by the household's financial literacy profile and conditioned by the legal status of the lending platform accessed. This integrative reading directly extends the individual-level behavioral findings of Warokka et al. (2025) and Wahyuni et al. (2026)—hereafter referenced as Studies A and C—by relocating the unit of analysis to the household while preserving the psychological granularity of their behavioral

constructs, and simultaneously extends the structural-macro findings of Hou and Zhang (2025)—Study D—by adapting the liquidity constraint, mental accounting, and bank competition transmission channels to a fintech-dominated rather than bank-integrated digital finance architecture. Where Studies A and C treat the individual borrower as an isolated decision unit, disconnected from the household's aggregate debt portfolio and intra-household bargaining dynamics, the present framework demonstrates that behavioral propensity operates not merely as an individual trait but as a household-level risk factor that propagates through collective financial decision-making, a theoretical extension that resolves the artificial separation between psychological and economic explanations of debt accumulation that has characterized the Indonesian literature to date. Where Study D treats digital finance penetration as a relatively homogeneous macro-level exposure variable, the present framework demonstrates that this exposure must be disaggregated by regulatory status to yield accurate vulnerability estimates, given the qualitatively different risk profiles of legal and illegal lending documented by Masyhar et al. (2026)—hereafter Study B—a disaggregation that Study D's Chinese institutional context did not require, since illegal or unregistered digital lending does not constitute a comparably significant share of that market.

This study's theoretical contribution, positioned against the systematic review of 161 household debt risk publications conducted by Haijun et al. (2025)—hereafter Study E—lies in extending household debt risk theory beyond its current empirical center of gravity in China and the United States toward a fintech-dominated emerging market context characterized by weak regulatory enforcement and market duality. Haijun et al. (2025) identify digital finance development as one of several structural drivers of household debt risk alongside income inequality, rising house prices, financial liberalization, and population aging, yet their review synthesizes this driver primarily through evidence generated in economies where digital finance operates within, rather than parallel to, formal regulatory and banking infrastructure. The present study's anticipated findings would extend this driver-level classification into a mechanism-level theory specific to institutionally fragmented digital credit markets, proposing that in such markets, household debt risk is co-determined by a formal-informal duality mechanism absent from the drivers catalogued in Study E's synthesis. Should the legal-illegal comparative effect prove significant and substantial, as hypothesized, this would constitute a genuinely novel theoretical proposition: that household debt risk theory requires an explicit regulatory-duality parameter when applied to emerging digital credit markets, a parameter that is structurally irrelevant in the predominantly formalized markets from which the bulk of the reviewed household debt risk literature originates. Furthermore, the anticipated conditional moderation effect of financial literacy—protective in structurally precarious populations but potentially counterproductive in stable-income populations—would contribute a nuanced qualification to the behavioral finance literature's conventional treatment of literacy as a uniformly protective factor, suggesting instead that literacy's protective function is contingent upon the presence or absence of overconfidence-inducing conditions, a boundary condition not yet formally theorized in the household debt risk literature synthesized by Study E.

The practical and policy implications of these anticipated findings converge on a central recommendation: that Indonesia's macroprudential authorities, principally OJK and Bank Indonesia, would benefit from monitoring household financial vulnerability not merely through aggregate lending volume or default ratio indicators—such as the current TWP90 metric—but through a multidimensional household vulnerability index that incorporates behavioral risk exposure alongside conventional structural indicators. Given that OJK's existing regulatory apparatus, including the interest rate ceiling framework under Surat Edaran OJK Nomor 19/SEOJK.05/2023 and the ongoing enforcement actions of Satgas PASTI that blocked 6,991 illegal platforms between 2022 and 2024 (Wahyuni et al., 2026), predominantly targets supply-side predation through platform licensing and rate regulation, the anticipated persistence of behavioral-channel vulnerability even within the licensed segment suggests that supply-side

regulation alone is structurally insufficient to contain household debt risk. This implies a need for demand-side complementary interventions, such as behavioral nudges embedded directly within licensed lending platform interfaces—for instance, mandatory cooling-off intervals or real-time debt-to-income disclosure at the point of loan application—designed specifically to interrupt the low-friction, impulsive borrowing pathway identified as the dominant behavioral mechanism in this study's framework. Additionally, given the anticipated conditional and population-specific moderating effect of digital financial literacy, this study cautions against a one-size-fits-all financial literacy campaign strategy; instead, it recommends that OJK and financial education providers differentiate literacy program design by household risk profile, deploying protective-competency-oriented literacy content for structurally precarious populations, such as the industrial and informal-sector households studied by Wahyuni et al. (2026), while incorporating explicit overconfidence-mitigation content, such as scenario-based risk simulation, for stable-income salaried populations more closely resembling Warokka et al.'s (2025) sample. Finally, the anticipated confirmation of a substantial vulnerability gap between legal and illegal lending exposure reinforces the continued strategic priority of illegal platform enforcement documented by Masyhar et al. (2026), while simultaneously indicating that household-level vulnerability tracking—rather than platform-level enforcement metrics alone—should be integrated into Indonesia's financial stability surveillance architecture as a leading indicator of systemic household debt risk, consistent with the macroprudential rationale that motivated Hou and Zhang's (2025) household debt maturity structure analysis in the Chinese context.

Conclusion

This study set out to address a persistent fragmentation in the literature on digital lending and household debt in Indonesia, wherein behavioral-individual explanations and structural-macro explanations have developed largely in isolation from one another. The anticipated findings, synthesized through the proposed dual-channel framework, indicate that household financial vulnerability arising from digital lending exposure is jointly produced by two mechanisms operating in tandem: a behavioral-psychological channel, in which cognitive biases, materialism, and low-friction borrowing design drive impulsive indebtedness, and a structural-transmission channel, in which liquidity relaxation and mental accounting reshape household debt composition toward short-term, high-frequency obligations. Critically, the anticipated results also reveal that this vulnerability is neither uniform across the lending market nor uniformly mitigated by financial literacy; illegal lending exposure is expected to generate substantially greater harm than licensed fintech exposure, while digital financial literacy is expected to function as a conditional moderator whose protective or counterproductive character depends on a household's baseline structural precarity rather than operating as a universally beneficial intervention.

Taken together, these findings yield three interlocking contributions. Theoretically, the study extends household debt risk theory, as synthesized by Haijun et al. (2025), beyond its current empirical center of gravity in bank-integrated, highly formalized credit markets toward a fintech-dominated and institutionally dualistic market such as Indonesia's, proposing that a formal-informal regulatory duality parameter must be incorporated when household debt risk theory is applied to emerging digital credit markets of this type. Methodologically, the study demonstrates the value of relocating the unit of analysis from the individual borrower to the household, combined with a structural equation modeling strategy capable of simultaneously testing mediation, moderation, and subgroup heterogeneity, thereby overcoming a design limitation shared by prior Indonesian studies (Warokka et al., 2025; Wahyuni et al., 2026) that could not capture intra-household risk propagation. In terms of policy, the study offers macroprudential authorities—particularly OJK and Bank Indonesia—an empirically grounded rationale for supplementing supply-side platform regulation with a household-level financial vulnerability index and demand-side behavioral safeguards, while cautioning against

undifferentiated financial literacy campaigns whose effects, as this study anticipates, may vary in sign depending on the target population's structural exposure.

Several limitations of the present design point toward productive directions for future research. Because the cross-sectional survey design employed here captures household debt exposure and vulnerability at a single point in time, it cannot fully disentangle the sequential, self-reinforcing dynamics through which behavioral propensity, repeated borrowing, and structural debt accumulation interact over the household life cycle. A longitudinal or multi-wave panel design—potentially constructed by linking household survey data with administrative OJK and BPS records over successive years—would allow future research to trace causal trajectories of debt accumulation and vulnerability with greater confidence, addressing the endogeneity concerns only partially resolved through the instrumental variable strategy adopted in this study. Equally important is the need for cross-national replication across the ASEAN region, given that member states exhibit markedly divergent fintech regulatory maturity and financial inclusion trajectories, ranging from Singapore's advanced regulatory infrastructure to Cambodia and Laos, where financial exclusion rates remain as high as 71 and 59 percent respectively (Ha, 2025). Such comparative replication would test whether the dual-channel framework proposed here, and particularly its formal-informal duality mechanism, generalizes across institutional contexts or is instead contingent on features specific to Indonesia's regulatory environment, a question of considerable relevance given emerging global evidence that fintech's effect on household debt quality is itself contested, alternately documented as credit-broadening or risk-exacerbating depending on market structure ("The impact of Fintech on the nexus between household debt and financial crises," ScienceDirect, 2023). Pursuing these longitudinal and comparative extensions would situate Indonesia's digital lending experience within a broader Southeast Asian evidentiary base, strengthening both the theoretical generalizability and policy relevance of the household-level vulnerability framework proposed in this study.

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