International Review of Economics and Finance 112 (2026) 105890



Contents lists available at ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref



# Neobanking and household financial behavior: Insights from savings and borrowings

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ARTICLE INFO

Handling Editor: Dr. He Feng

*Keywords:*
FinTech
Neobanking
Savings
Borrowings
Financial intermediation
Household finance
Personal finance

ABSTRACT

A growing body of literature shows that financial technology and Neobanks are transforming traditional financial intermediation by reducing information asymmetries and transaction costs. Building on the theory of financial intermediation, theory of financial inclusion, and credit constraint theory, this study examines whether Neobanking displaces household savings and borrowings from traditional banks, and whether such displacement varies across levels of digitalization and economic development. Using panel data from 72 countries spanning 2017 to 2022, we accomplish the study objective by employing fixed effect panel regression, Pooled OLS, heterogeneity analyses, mechanism testing, and finally endogeneity treatment. We find robust evidence that greater Neobanking penetration is associated with a significant decline in savings held with traditional banks. Although Neobanking has no significant impact on traditional bank borrowings in the full sample, it reduces borrowings from traditional banks in highly digitalised frontrunner economies but not in early-stage or non-high-income economies, where digital markets remain less competitive. From a policy perspective, the results highlight the need for regulators to reassess competition, consumer protection, and financial stability frameworks as digital banks increasingly influence the allocation of savings and credit within the financial system.

## 1. Introduction

Financial Technology (FinTech) refers to the rapid emergence of innovative digital technologies transforming the delivery and consumption of financial services, such as banking, borrowings, payments, and investments. It encompasses a broad range of tools and platforms that automate, streamline, and enhance various aspects of the financial ecosystem. FinTech services are now prevalent in almost every country, with products ranging from mobile payments to algorithmic investment platforms. FinTech has evolved across several distinct phases. Arner et al. (2015) identify three and a half key waves: FinTech 1.0, involving the digitization of traditional finance; FinTech 2.0, which emerged pre-global financial crisis with the growth of digital financial intermediaries; FinTech 3.0 and 3.5, which characterize the post-global financial crisis period, a financial sector influenced by open banking, artificial intelligence, and fully digital financial ecosystems. Within this third wave, Neobanking has emerged as one of the most disruptive forces, offering

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https://doi.org/10.1016/j.iref.2026.105890
Received 3 August 2025; Received in revised form 28 May 2026; Accepted 20 September 2026
Available online 21 September 2026
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comprehensive, branchless, and digital-first banking services.

Existing research on FinTech has examined its influence through diverse lenses. Hasan et al. (2024) present a list of 104 different variables previously referred to define FinTech. Yet, another emerging FinTech product, Neobanking, remains empirically underexplored or remains in its initial stage of academic research (See Appendix B). Although Neobanks often operate alongside traditional banks institutionally, they may still substitute for traditional banking relationships at the household level. They offer a suite of financial services, ranging from checking and savings accounts to borrowings, budgeting, and investment tools through fully digital platforms accessible via computers and smartphones (Bhatnagr et al., 2025; Kerner, 2024). Their design is especially appealing to digitally literate users and seamlessly integrates with digital ecosystems such as e-commerce and ride-sharing platforms (Minchan-Wolstrohn & Rodríguez-Serra, 2025; Volopay, 2024). More importantly, by leveraging data analytics and artificial intelligence, Neobanks also provide tailored financial products based on consumer income, spending behavior, and credit profiles. These personalized services improve financial decision-making, enhance user engagement, and foster trust through transparency and low transaction costs. They represent a distinct improvement upon traditional mobile banking by offering complete end-to-end banking services without requiring any physical presence. Nevertheless, a key question arises: does the rise of digital-only banks displace household savings and borrowings from traditional financial institutions, and if so, does this displacement occur uniformly across economies or does it vary depending on the level of digitalization and economic development?

Despite their growing popularity, empirical evidence on whether Neobanks displace or complement traditional financial intermediation remains limited, particularly across varying levels of digitalization and economic development. Existing studies largely focus on mobile money platforms or broad measures of FinTech adoption and predominantly rely on mean-based estimation techniques, which fail to capture distributional heterogeneity. As a result, it remains unclear whether Neobanking displaces savings and borrowings from traditional institutions uniformly or in ways conditioned by digital and economic context. In this context, it is important to distinguish between two related but conceptually different services: mobile banking and Neobanking. Mobile banking refers to a digital service offered by traditional banks - whether brick-and-mortar or digital - that enables customers to access existing accounts through an electronic channel. Neobanks, by contrast, are fully digital financial technology firms that operate exclusively online and typically lack physical branches and, in many cases, traditional banking licenses. Given that much of the existing literature focuses on mobile banking and often treats it as synonymous with FinTech, this study addresses an important gap by explicitly examining the role of Neobanking. Specifically, we investigate whether and how Neobanking influences individual financial behaviors, particularly access to savings and borrowings, and whether these effects are equitably distributed across different levels of digitalization and economic development.

Accordingly, the primary objective of this study is to empirically examine whether Neobanking displaces savings and borrowings from traditional banks, and whether these effects vary across levels of digitalization and economic development. In pursuing this objective, the study contributes to the existing literature in several important ways. First, it provides novel empirical evidence on the displacement effects of Neobanking on traditional bank intermediation by analysing both savings and borrowings behavior across 72 countries. Second, the study uncovers distributional heterogeneity in the effects of Neobanking by employing quantile regression and classifications based on levels of digitalization and income-based economic development, thereby capturing variations across different degrees of financial behavior. Third, it examines the moderating roles of digitalization - proxied by internet access and digital affordability - economic growth measured by GDP, and regulatory quality, providing insights into how digitalization, economic development, and institutional quality condition the displacement effects of Neobanking across diverse contexts.

This research significantly enhances the literature on Neobanking and financial intermediation by offering one of the initial, extensive cross-country empirical analyses of how Neobanking transforms the fundamental intermediation roles of conventional banks, specifically in savings mobilization and credit provision. This research specifically analyses both sides of the traditional banking balance sheet within a coherent empirical framework, contrasting with prior studies that mostly concentrate on FinTech adoption, payment innovations, or financial inclusion outcomes in isolation. Prior studies have primarily focused on the contribution of mobile money. In contrast, this study goes beyond examining Neobanking from the perspective of usage or ease of access and instead investigates whether and how Neobanking alters the fundamental role of banks as intermediaries between savers and borrowers across different economic and institutional contexts. These contributions are closely aligned with the theory of financial intermediation by incorporating digital-only banks into the intermediation framework, as well as with financial inclusion theory, which emphasizes access to financial services. However, rather than enhancing inclusion for underserved populations, the findings suggest that Neobanking displaces savings from traditional banks, consistent with substitution effects anticipated by financial inclusion theory, while its impact on borrowings aligns with credit constraint theory in highly digitalised economies. Nonetheless, the empirical evidence warrants further investigation using larger-scale and more granular datasets in future research.

The remainder of the paper is structured as follows: Section 2 provides the theoretical background and conceptual foundations of the study. Section 3 outlines the data sources and methodological approach. Section 4 presents the results and empirical analysis. Section 5 concludes with a summary of findings and implications for policy and practice.

## 2. Research foundations and hypothesis development

The following section outlines the theoretical foundations of the study, introduces Neobanking as a FinTech innovation, and develops the research hypotheses.

### 2.1. Theoretical framework

#### 2.1.1. The theory of financial intermediation and neobanking

The Theory of Financial Intermediation (TFI) serves as a foundational framework in the study of financial institutions and their role in the broader economy. Historically, scholars have emphasized the intermediary role of financial institutions in bridging the gap between savers and borrowers. Foundational contributions by Pyle (1971), Benston and Smith (1976), Leland and Pyle (1977), Campbell and Kracaw (1980), and Ramakrishnan and Thakor (1984) laid the groundwork for understanding how financial intermediaries address issues such as information asymmetry, transaction costs, and risk transformation.

As the financial landscape evolved, the theory expanded to include new technological developments. Notably, scholars like Allen and Santomero (1997), Scholtens and Van Wensveen (2000), and Gorton and Winton (2003) further advanced the theory to reflect the changing nature of financial markets. In a more recent contribution, Thakor (2020) clearly incorporates FinTech into the TFI paradigm, contending that digital financial platforms constitute a novel form of intermediation rather than the disintermediation of the financial system. In this context, Neobanks are digital financial intermediaries that do the same things as traditional intermediaries, like screening, monitoring, facilitating payments, and managing risk, but they do these using technology-driven, platform-based approaches. Neobanks cut down on operating and transaction costs, make it easier to get information, and make it easier for people to obtain financial services. These are all important goals for TFI. As a result, Neobanking can be seen as an extension of traditional financial intermediation that maintains the basic economic role of intermediaries while changing how these duties are carried out. From a TFI perspective, Neobanks do not supplant financial intermediaries; instead, they signify an evolution that enhances efficiency, consistent with the theory's core assertion that intermediaries emerge and endure when they provide financial services more effectively and inclusively than alternative market structures.

#### 2.1.2. Theory of financial inclusion and neobanking

According to the theory of financial inclusion, financial inclusion practices differ across countries, creating a need to uncover the underlying principles or propositions that explain this observed variation (Ozili, 2020). In emerging markets, traditional branch-based banking systems often struggle to reach all segments of the population. High operating and fixed costs limit banks' ability to serve rural and geographically dispersed areas, while stringent regulatory and documentation requirements further constrain access for low-income groups. Recent studies show that these economic and regulatory barriers significantly impede banks' capacity to serve vulnerable populations (Anarfo & Abor, 2020), underscoring the urgent need for alternative service delivery models - such as digital and branchless banking - to enhance financial inclusion.

Digital transformation, particularly through FinTech products and services, has substantially reshaped financial inclusion practices. By leveraging digital platforms, alternative data, and low-cost delivery channels to expand access and usage, fully digital financial intermediaries - such as marketplace lenders - help alleviate these frictions (Thakor, 2020; Vives, 2019). From an inclusion perspective, branchless financial intermediaries can facilitate entry into the formal financial system by enabling transaction accounts, payments, and simplified onboarding processes at minimal cost.

However, financial inclusion theory does not solely predict an expansion of intermediation; it also allows for substitution effects. FinTech-enabled organizations may reallocate deposits and credit away from traditional banks (Buchak et al., 2018) rather than increasing aggregate savings or borrowing. In particular, if customers hold more liquid balances on digital-only banking platforms that prioritize transactions over long-term deposit accumulation, digital-only banking may weaken traditional savings mobilization. Similarly, while these platforms can enhance loan access through FinTech-based screening technologies (such as P2P lending), their impact on borrowings from incumbent banks remains theoretically ambiguous due to competitive and displacement effects (Thakor, 2020).

Importantly, the effectiveness of Neobanking in advancing financial inclusion depends on complementary institutional and digital infrastructures. Prior research shows that digital connectivity, regulatory quality, and supportive policy frameworks are critical for technology-driven financial inclusion to translate into meaningful financial outcomes (Claessens et al., 2018; Vives, 2019). This conditionality is consistent with World Bank evidence demonstrating that FinTech adoption produces heterogeneous outcomes across countries, depending on regulatory and digital readiness (Didier et al., 2022; Pazarbasioglu et al., 2020). Building on this framework, our study examines whether Neobanking adoption reshapes savings and borrowings behavior in traditional banks and how these effects vary across different levels of digitalization, income, and institutional quality.

#### 2.1.3. Credit constraint theory and neobanks

The concept of credit constraints holds that limited access to financing arises from information asymmetry and adverse selection, which prevent credit markets from clearing (Stiglitz & Weiss, 1981). In traditional banking, these limitations are compounded by collateral requirements, rising costs, and branch-based delivery (Claessens et al., 2018). Marketplace lending or other branchless financial institutions, such as Neobanks, might help address these problems by making it easier to share information and reducing operating expenses (Thakor, 2020). Theoretically, this suggests that Neobanking could alleviate borrowings limitations for previously neglected households and businesses. Credit constraint theory also permits substitution effects; digital lenders may divert credit from traditional banks instead of increasing overall borrowings, especially when FinTech platforms vie for existing bank customers (Buchak et al., 2018). Thus, the effect of Neobanking on borrowings from traditional banks is conceptually substitutive and is expected to be influenced by many other institutional and digital forces.

### 2.2. Neobanking: a FinTech innovation

Neobanking has emerged as a significant innovation within the FinTech ecosystem, alongside other technological advancements such as Robo-advisors, decentralized finance, automated lending platforms, and digital currencies. The FinTech magazine (Written by Evelyn Howat) define Neobank "A neobank is a FinTech (financial technology) based bank that operates solely digitally or via a mobile app, that means accomplishing most things a conventional bank can, minus the physical branches."[1] Citterio et al. (2025) defined Neobank as "licensed banking institutions, born during the post internet-era (i.e., after 2000), focused on retail banking activities (as shown by their involvement in borrowings and deposit-taking activities), and with a strong orientation towards digital distribution channels, rather than physical branches." These defining characteristics position Neobanks as formidable challengers within the broader financial services industry. In this regard, Shanti et al. (2024) identify Neobanks as major competitors to traditional banking systems, largely due to their innovative services, and similarly, Mogaji and Nguyen (2024) note that the disruptive services of industry newcomers, such as Neobanking, challenge the conventional banking paradigm. Particularly, Neobanks target persistent structural inefficiencies such as high banking fees, low trust in traditional banks, and limited banking access, especially for unbanked individuals and SMEs (Au, 2024). A notable example of this financial inclusion agenda is evident in how Neobanks such as Wise, N26, and Revolut can also reduce remittance costs for North African migrants in Europe and enhance their financial inclusion (Badre, 2024).

Operating without physical branches, Neobanks provide users with streamlined access to a wide array of financial services, including digital savings and checking accounts, personal loans, budgeting tools, and investment products (Bhatnagr et al., 2025; Gupta & Srivastava, 2025; Máté et al., 2026; Palos-Sanchez et al., 2025). These services are typically delivered via mobile apps or online platforms, often using cloud-based infrastructure, artificial intelligence, and open banking APIs to enhance customer experience and automate service delivery (Kerner, 2024; Volopay, 2024). Neobanks distinguish themselves through their agility, lower operating costs, and ability to offer personalized, transparent services tailored to user data such as income, spending patterns, and financial goals (Minchan-Wolstrohn & Rodríguez-Serra, 2025). Their integration with broader digital ecosystems, such as e-commerce, ride-sharing, and lifestyle applications, further elevates their role in shaping modern financial behavior. Furthermore, compared to traditional banks, Neobanks place greater emphasis on users' accessibility and usage of advanced technology (Sidorenko, 2026). Beyond operational efficiency, Neobanking's efforts not only improve the client experience but also help create a more ethical and sustainable financial system with the potential to lower carbon emissions (Subramanian & Baby, 2024).

Complementing the service-oriented literature, some researchers also focus on the adoption of Neobanking from the technology acceptance perspective. The adoption intention of Neobanking is largely driven by attitude, which is shaped by trust, perceived ease of use, perceived usefulness, and green concern, while trust - influenced by perceived security, risk, and environmental values - emerges as a critical antecedent operating both directly and indirectly through attitude (Nagy et al., 2024; Soelasih et al., 2025; Taneja et al., 2024). Beyond initial adoption, sustained engagement depends on several post-adoption success factors; Bhatnagr et al. (2025) found that the success of Neobanking mobile applications is mostly determined by overall user experience, personalized services, security features, and technological innovation. These adoption dynamics, however, vary across contexts; in Peru, for instance, Neobank adoption intentions are heavily influenced by user experience, expense control, service quality, and, paradoxically, privacy concerns, while digital financial abilities have no impact (Minchan-Wolstrohn & Rodríguez-Serra, 2025). At the demographic level, higher-educated and single people are more inclined to utilize Neobanks, whereas older, self-employed, and lower-income customers choose traditional banking options. Furthermore, Neobank users prefer price, service availability, and payment speed, but traditional bank customers value institutional stability and personal engagement more (Amon & Jagrič, 2025).

Across these varied adoption dynamics, trust consistently emerges as one of the most important factors of Neobanking adoption. Users' willingness to accept and freely use Neobanking apps is highly shaped by trust in the brand (Máté et al., 2026), and this trust further influences users' decisions to switch from and to traditional banking (Puente-Cavazos et al., 2025). Despite trust's pivotal role, however, some researchers also highlight the risks associated with Neobanking adoption; for example, Betancourt et al. (2026) indicate that the most noteworthy risks are connected to technological competition, cybersecurity, consumer trust, and regulatory shifts.

### 2.3. Hypotheses development

Recent evidence suggests that digital banking fundamentally reshapes where households choose to hold their savings. Erel et al. (2023) show that online banks respond much more aggressively to monetary policy tightening than traditional banks. When interest rates rise, online banks quickly raise deposit rates and attract substantial deposit inflows, while traditional banks adjust slowly and experience deposit outflows. This pattern is robust across different market structures and varies based on the stickiness of depositors, indicating that lower depositor loyalty accelerates the reallocation of savings away from traditional brick-and-mortar institutions. Zhu and Lu (2025) document that FinTech competition initially pulls household deposits away from traditional banks. Although banks adapt over time by innovating and raising deposit rates, the early phase of FinTech entry is marked by significant deposit displacement, especially during periods of monetary tightening. Importantly, this reallocation does not increase bank risk, suggesting that deposit losses reflect competitive pressure rather than instability. Consistent with this, Buchak et al. (2021) show that FinTech money market funds with deposit-like features cause large household deposit outflows from traditional banks, particularly from demand deposits.

[1] https://fintechmagazine.com/banking/what-neobank.

Banks respond by introducing competing products, but only after a substantial shift in household savings has already occurred. Besides, Naito et al. (2021) employ household-level data from Tanzania to demonstrate that mobile money profoundly alters saving and borrowings behaviors. When households experience negative income shocks, those who use mobile money are less likely to borrow. On the other hand, those who do not use mobile money are more likely to borrow. Mobile money use increases the likelihood of receiving remittances and accumulating savings in mobile money accounts, while reducing reliance on less liquid, informal assets such as livestock and community-based savings. Importantly, these behavioral shifts do not reduce household welfare. In general, mobile money can replace both official and informal ways of saving money, making borrowings less necessary.

Together, these studies imply that digital and FinTech-based banking models weaken depositor stickiness and redirect household savings away from traditional banks. Based on these concepts, this study proposes the following hypothesis 1 (H1).

**H1**. Neobanking significantly reduces savings held in traditional banks.

Recent research also suggests that FinTech and Neobanks are redefining where firms go to borrow money. FinTech lenders find it easier to enter markets where traditional borrowings is dominated by big banks with weak local relationships, according to Balyuk et al. (2026). FinTech, on the other hand, is less effective in places where small, neighborhood banks depend on strong bonds with borrowers. This shows that FinTech competes primarily by leveraging data and technology to assess borrowers, rather than by building long-term relationships. Importantly, FinTech lending helps small firms develop and does not increase credit risk, meaning it substitutes for some bank lending rather than creating financial instability. More particularly, FinTech has the greatest effect on smaller banks. According to Cornaggia et al. (2024), small banks experience a discernible decline in their personal loan business as peer-to-peer lending grows. At the same time, the quality of the borrowers left behind deteriorates as safer borrowers migrate to FinTech platforms offering cheaper loans. However, large banks are largely unaffected. This suggests that FinTech lenders directly compete with small banks and limit their position in traditional lending. Another evidence from China offers a similar story. Guo et al. (2025) indicate that when FinTech and BigTech enterprises expand, small banks lose their advantage in lending to small and medium-sized businesses. Large banks employ FinTech tools to boost their lending, whereas BigTech firms entice borrowers by leveraging alternative data. Because of this, companies depend less on small banks unless they have robust technology or established local ties.

Overall, these findings imply that Neobanks and FinTech lenders make borrowings simpler outside the traditional banking system and diminish the need for borrowers to rely on traditional banks - especially smaller, relationship-based banks. Based on these concepts, this study proposes the following hypothesis 2 (H2).

**H2**. Neobanking significantly reduces borrowings from traditional banks.

According to financial intermediation theory, banks use relationship lending, monitoring, and depositor stickiness to lower transaction costs and information asymmetries. According to the facts discussed above, Neobanks and FinTech companies use digital platforms and alternative data to perform these intermediation tasks, thereby reducing their dependence on conventional, relationship-based banking. By cutting search costs and hardening soft information, Neobanks erode both depositor and borrower loyalty to traditional banks. This provides a solid theoretical foundation for the hypotheses that Neobanking reduces savings held in, and borrowings from, traditional banks.

## 3. Methods and data

### 3.1. Data

This study collects data from the IMF Financial Access Database for two key dependent variables. Neobanking data is extracted from the FinTech - statistics & facts report 2023 by Statista, which covers 2017 to 2022. Data on GDP, population, urbanisation, regulatory quality, and internet penetration have been collected from the World Bank database. This study also uses some other indices to examine the influence of the key independent variables. The variable on digital affordability is sourced from the Mobile Connectivity Index, and the ranking of digitalization is sourced from the Global Digitalization Index.

### 3.2. Empirical model

#### 3.2.1. Baseline model with fixed effect estimation

To formally assess the relationship between Neobanking and household financial behavior, this study begins with a generalized model framework (Eq. (1)).

$$HFB_{it} = \beta_0 + \beta_1 NEO_{it} + \beta_2 Control_{it} + Country_FE + Year_FE + u_{it} \quad \text{(Eq. 1)}$$

In the above model, $HFB_{it}$ refers to the household financial behavior, proxied by either savings ($SAV_{it}$) or borrowings ($BOR_{it}$), provided by traditional banks of country $i$ at time $t$, substituting these two dependent variables into the generalized model allows empirical testing of the two hypotheses: savings behavior (H1) and borrowings from formal institutions (H2). The estimation proceeds with an expanded model specification that incorporates key macroeconomic and institutional control variables:

$$\mathrm{SAV_{it}\ or\ BOR_{it}} = \beta_0 + \alpha_1 \mathrm{NEO_{it}} + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 2)}$$

Equation (2) tests H1, where $SAV_{it}$ is used as the dependent variable, and H2 where $BOR_{it}$ is used. $NEO_{it}$ refers to Neobanking, the key independent variable, measured as the % of adults using Neobanking financial services. We add a number of control variables, such as $INT_{it}$ refers to the Internet, $DAF_{it}$ refers to the digital affordability, $GDP_{it}$ refers to gross domestic product, $POP_{it}$ refers to population, $URB_{it}$ refers to urbanisation, $REG_{it}$ refers to regulatory quality.

### 3.2.2. Heterogeneity (quantile regression, digitalization, and income levels)

We use quantile regression to identify differences in the effects of Neobanking that are not captured by mean-based estimators such as OLS or fixed effects. This method lets us see if Neobanking has different effects on countries with low, medium, and high levels of savings and borrowing. This gives us a better idea of how Neobanking affects traditional banking activities. For quantile regression, we use the following equations (Eq. (3)).

$$Q_\tau(SAV_{it}\ or\ BOR_{it}|X_{it}) = \beta_0^\tau + \alpha_1^\tau NEO_{it} + \beta_2^\tau INT_{it} + \beta_3^\tau\ DAF_{it} + \beta_4^\tau\ GDP_{it} + \beta_5^\tau\ POP_{it} + \beta_6^\tau URB_{it} + \beta_7^\tau\ REG_{it} + Country_FE + Year_FE + u_{it} \quad \text{(Eq. 3)}$$

In Eq. (3), $Q_\tau(SAV_{it}\ or\ BOR_{it}|X_{it})$ refers to the $\tau^{\mathrm{th}}$ conditional quantile of savings or borrowings given covariates. The quantile levels are 0.25 (25th percentile), 0.50 (50th percentile), and 0.75 (75th percentile).

Additionally, this study investigates heterogeneity based on the level of digitalization and income. First, heterogeneity by digitalization is examined using the Global Digitalization Index (2024), which classifies countries into three groups: frontrunners, adopters, and starters. Second, heterogeneity by income level is analyzed by dividing countries into two groups: high-income countries and all other countries. The following equations (Eq. (4) and Eq. (5)) are used to test for heterogeneity by level of digitalization and income.

$$\mathrm{SAV_{it}\ or\ BOR_{it}} = \beta_0 + \alpha_1 \left(\mathrm{NEO_{front}}/\mathrm{NEO_{adopt}}/\mathrm{NEO_{start\,it}}\right) + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 4)}$$

$$\mathrm{SAV_{it}\ or\ BOR_{it}} = \beta_0 + \alpha_1 \left(\mathrm{NEO_{high}}/\mathrm{NEO_{others\,it}}\right) + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 5)}$$

### 3.2.3. Alternative timing specification

Additionally, the following equations (Eq. (6) and Eq. (7)) are used to test alternative timing specification robustness.

$$\mathrm{SAV_{i,t-1}\ or\ SAV_{i,t-2}} = \beta_0 + \alpha_1 \mathrm{NEO_{it}} + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 6)}$$

$$\mathrm{BOR_{i,t-1}\ or\ BOR_{i,t-2}} = \beta_0 + \alpha_1 \mathrm{NEO_{it}} + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 7)}$$

In the above alternative timing robustness testing model, $SAV_{i,t-1}$ refers to lagged 1 of savings and $SAV_{i,t-2}$ refers to lagged 2 of the savings variable, similarly, $BOR_{i,t-1}$ refers to lagged 1 of borrowings and $BOR_{i,t-2}$ refers to lagged 2 of the borrowings variables.

### 3.2.4. Mechanism testing models

To address variation in the marginal effects of Neobanking, the model incorporates interaction variables (equations (8)–(11)) among Neobanking, internet access (NEO*INT), digital affordability (NEO*DAF), GDP (NEO*GDP), and regulatory quality (NEO-*REG). These interactions enable the anticipated influence of Neobanking to fluctuate based on technology readiness, cost accessibility, economic development, and institutional quality, rather than supposing a uniform effect across nations. This specification helps determine whether the effect of Neobanking on household financial behavior is amplified or attenuated depending on the level of digital infrastructure, economic growth, and institutional quality.

$$\mathrm{SAV_{it}\ or\ BOR_{it}} = \beta_0 + \alpha_1 \mathrm{NEO_{it}} + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \beta_8 (\mathrm{NEO_{it}}{*}\mathrm{INT_{it}}) + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 8)}$$

$$\mathrm{SAV_{it}\ or\ BOR_{it}} = \beta_0 + \alpha_1 \mathrm{NEO_{it}} + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \beta_8 (\mathrm{NEO_{it}}{*}\mathrm{GDP_{it}}) + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 9)}$$

$$\mathrm{SAV_{it}\ or\ BOR_{it}} = \beta_0 + \alpha_1 \mathrm{NEO_{it}} + \beta_2 \mathrm{INT_{it}} + \alpha_3 \mathrm{DAF_{it}} + \beta_4 \mathrm{GDP_{it}} + \beta_5 \mathrm{POP_{it}} + \beta_6 \mathrm{URB_{it}} + \beta_7 \mathrm{REG_{it}} + \beta_8 (\mathrm{NEO_{it}}{*}\mathrm{REG_{it}}) + \mathrm{Country_FE} + \mathrm{Year_FE} + \mathrm{u_{it}} \quad \text{(Eq. 10)}$$

$$SAV_{it} \text{ or } BOR_{it} = \beta_0 + \alpha_1 NEO_{it} + \beta_2 INT_{it} + \alpha_3 DAF_{it} + \beta_4 GDP_{it} + \beta_5 POP_{it} + \beta_6 URB_{it} + \beta_7 REG_{it} + \beta_8 (NEO_{it} * DAF_{it}) + Country_FE + Year_FE + u_{it} \quad \text{(Eq. 11)}$$

### 3.2.5. Endogeneity (Three-Stage Least Squares)

Finally, to assess the robustness of our primary model, we extend the analysis by employing instrumental variable approaches using Three-Stage Least Squares (3SLS) estimations (reg3 stata model), as detailed in the following section. In the first stage of the 3SLS model, we estimate the endogenous regressor *NEO* using a set of instruments.

$$NEO_{it} = \alpha_0 + \alpha_1 * INSTRUMENTS_{it} + Country_FE + Year_FE + u_{it} \quad \text{(Eq. 12)}$$

In the second stage, we obtain the predicted value of *NEO*, denoted by $\widehat{NEO}$. This predicted value is then used as a regressor in the third stage. In the third stage, we estimate the main structural equation, substituting *NEO* with $\widehat{NEO}$ and including the full set of control variables. The final specification is presented in the following section.

$$SAV \text{ or } BOR_{it} = \Upsilon + \delta_1 \widehat{NEO}_{it} + \delta_2 INT_{it} + \delta_3 DAF_{it} + \delta_4 GDP_{it} + \delta_5 POP_{it} + \delta_6 URB_{it} + \delta_7 REG_{it} + Country_FE + Year_FE + u_{it} \quad \text{(Eq. 13)}$$

In the above model, $\Upsilon$ is the intercept for the predicted value, $\delta_1 \widehat{NEO}_{it}$ refers to the effect of the predicted value of the endogenous variable on the dependent variable, *SAV* and *BOR*.

## 3.3. Variables measurement

The dependent variables in this study capture two major services provided by conventional branch-based banks. These are (i) savings, measured as the per 100 adults with deposit accounts at formal financial institutions, and (ii) borrowings, measured as the per 100 adults with loan or credit accounts at such institutions. The key independent variable is Neobanking, measured by the % of adults using Neobanking financial services. Neobanking is one of the emerging FinTech services in the era of technological innovation. Though the literature on Neobanking is in its infancy (a list of published studies discussing the significance of Neobanks across various dimensions is provided in Appendix B), there are numerous discussions, news editorials, and magazine articles that emphasize Neobanking's role as an emerging FinTech tool for household financial behavior.

To ensure the empirical relationship between Neobanking and household financial behavior is not confounded by omitted-variable bias, we include a set of theoretically grounded control variables, including internet usage, digital affordability, gross domestic product, population, regulatory quality, trade, and urbanisation. The overall concept of variable measurement used in this study is described in Table 1.

**Table 1**
Variable measurement.

| Code | Variables | Definition of the variables | Sources |
|---|---|---|---|
| BOR | Borrowings | Per 100 adults with borrowing/loan accounts in formal financial institutions | IMF |
| DAF | Digital affordability | Captures whether mobile services and devices (mobile data and handset affordability, and taxation on mobile data and handsets) are financially accessible. | MCI |
| GDP | Gross Domestic Product | Percentage growth (annual) rate of real GDP. | WB |
| GDI | Global Digitalization Index | The Global Digitalization Index 2024 is a composite indicator developed to assess the maturity and progress of countries' digital transformation. | Huawei GDI Index |
| INT | Internet | The percentage of individuals using the Internet in a given country and year. | WB |
| NEO | Neobank | Per 100 adults using Neobanking financial services | Statista Outlook 2023 |
| POL | Policy | Neobank-specific regulatory policy formulated by the government, central bank, or any other official financial/regulatory body. If a country implements a relevant policy in any year during the study period, the policy variable is coded as 1 (0 otherwise) for the year of implementation and all subsequent years. | Self-searched |
| POP | Population | The percentage growth (annual) rate of the total population. | WB |
| REG | Regulatory quality | Percentile rank (0–100) of regulatory quality, where higher values indicate stronger regulatory effectiveness | WB |
| SAV | Savings | Percentage of adults with deposit accounts in the formal financial institutions | IMF |
| URB | Urbanisation | Percentage of the population living in urban areas | WB |
| INT_DAF | Effective Digital Connectivity | Multiplying INT and DAF to capture how affordability conditions the effectiveness of internet access | Self-created |
| INT_REG | Regulated Digital Infrastructure | Multiplying INT and REG to capture the extent to which regulatory quality enhances the effectiveness of digital connectivity | Self-created |

Notes: MCI: Mobile Connectivity Index; IMF refers to the International Monetary Fund; WB refers to the World Bank database.

## 4. Findings and analysis

The findings of this study are presented in several stages. First, we report descriptive statistics and correlation analyses. This is followed by the main empirical results based on pooled OLS and fixed-effects estimations. We then present results from quantile regressions, examine heterogeneity across levels of digitalization and income, and estimate dynamic specifications as additional robustness checks. Next, we conduct mechanism analyses and finally address potential endogeneity concerns using 3SLS estimations.

### 4.1. Descriptive statistics and correlations

Table 2 displays the descriptive statistics, while Table 3 provides the pairwise correlation matrix for the variables used in this study. The primary variable of interest is Neobanking, measured by percentage of users engaging with Neobanking services.

Table 2 reveals substantial cross-country variation in savings and borrowings behavior. The average savings rate (SAV) is 117.53%, which may reflect multiple account holdings or the inclusion of institutional and corporate deposits in some countries. In contrast, the average borrowings rate (BOR) is significantly lower at 26.17%, indicating more limited access to formal credit channels. Neobanking adoption appears relatively modest across the sample. The average Neobanking usage (NEO) is 2.29, with several countries exhibiting near-zero adoption. However, the maximum value of 31.08 highlights that a few countries have achieved significant penetration, likely attributable to supportive regulatory environments and higher levels of digital literacy. The data also suggest strong infrastructure readiness for digital banking. The mean urbanisation rate (URB) is 70.75%, while the average internet penetration (INT) is 77.54%, indicating that most countries have the foundational infrastructure to engage with Neobanking platforms.

The correlation matrix presented in Table 3 offers several insights among all study variables relevant to this study. We report the full correlation matrix for transparency and to screen for potential multicollinearity among predictors before estimating the multivariate models; the correlations do not suggest problematic collinearity. There is a noticeable correlation between GDP and three key variables: NEO, SAV, and BOR. In contrast to long-term financial development, short-term behavioral and structural dynamics are evident as negative correlations between GDP growth and savings, borrowings, and Neobanking. According to life-cycle and permanent-income theories, higher income expectations discourage precautionary saving, which is why consumption drives GDP growth in many nations. Also, economic growth increases internal financing capacity, reducing the need for households and businesses to borrow externally. Moreover, Neobanking adoption is largely driven by financial frictions and exclusion; it tends to expand more rapidly in weaker or transitional economic environments, while during high-growth periods, traditional banks increase outreach and credit provision, reducing the relative demand for Neobanks. Importantly, these are unconditional correlations; the multivariate approach accounts for heterogeneity and endogeneity, producing more accurate results.

### 4.2. Baseline regressions

In Table 4, we examined the impact of Neobanking on household financial behavior, specifically focusing on savings and borrowings as dependent variables. We estimated multiple regression models to assess the robustness of the Neobanking effect under various model specifications. Across columns (1) to (3), we analyzed savings behavior, and across columns (4) to (6), we analyzed borrowings. The models differ in the inclusion of fixed-effect adjustments. Specifically, in the Fixed-effect (FE) model (we also result from POLS models presented in Appendix C and result are similar), we progressively introduced individual (country), year, and region fixed effects to control for unobserved heterogeneity, time-specific shocks, and potential serial correlation in the panel data. This layered approach allowed us to assess the consistency and reliability of the estimated effects across different econometric controls. Based on the data presented in Table 4, we suggest focusing on the results of the second regression, which encompasses base models for savings. In examining the role of Neobanking on household financial behavior, Model 2 reveals that Neobanking has a statistically

**Table 2**
Descriptive statistics.

| Variables | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| BOR | 432 | 26.165 | 21.861 | 0.060 | 85.371 |
| DAF | 432 | 65.779 | 14.969 | 18.965 | 99.138 |
| GDP | 432 | 2.631 | 4.357 | −29.100 | 13.588 |
| INT | 432 | 77.544 | 20.263 | 12.200 | 100.000 |
| NEO | 432 | 2.286 | 3.985 | 0.002 | 31.082 |
| NEO_front | 132 | 4.197 | 5.866 | 0.005 | 31.082 |
| NEO_adopt | 168 | 1.659 | 2.447 | 0.008 | 18.786 |
| NEO_start | 132 | 1.174 | 2.183 | 0.002 | 17.815 |
| NEO_high | 258 | 3.025 | 4.549 | 0.012 | 31.082 |
| NEO_others | 174 | 1.190 | 2.606 | 0.002 | 18.786 |
| POL | 432 | 0.426 | 0.495 | 0.000 | 1.000 |
| POP | 431 | 0.623 | 1.237 | −14.188 | 3.931 |
| REG | 432 | 67.643 | 25.084 | 4.245 | 100.000 |
| SAV | 432 | 117.525 | 43.072 | 14.557 | 242.779 |
| URB | 432 | 70.749 | 19.114 | 18.384 | 100.000 |

Notes: Differences in observation counts across models arise from missing values in lagged variables and subgroup classifications.

**Table 3**
Correlation between the variables.

| Variables | BOR | DAF | GDP | INT | NEO | POL | POP | REG | SAV | URB |
|---|---|---|---|---|---|---|---|---|---|---|
| BOR | 1.000 | | | | | | | | | |
| DAF | 0.607 | 1.000 | | | | | | | | |
| GDP | −0.097 | −0.063 | 1.000 | | | | | | | |
| INT | 0.534 | 0.671 | −0.160 | 1.000 | | | | | | |
| NEO | 0.238 | 0.279 | −0.023 | 0.325 | 1.000 | | | | | |
| POL | 0.200 | 0.202 | −0.007 | 0.138 | 0.190 | 1.000 | | | | |
| POP | −0.138 | −0.187 | 0.263 | −0.245 | −0.132 | −0.184 | 1.000 | | | |
| REG | 0.589 | 0.791 | −0.095 | 0.658 | 0.220 | 0.217 | −0.115 | 1.000 | | |
| SAV | 0.638 | 0.677 | −0.121 | 0.649 | 0.288 | 0.102 | −0.269 | 0.675 | 1.000 | |
| URB | 0.499 | 0.514 | −0.189 | 0.777 | 0.259 | 0.058 | −0.109 | 0.579 | 0.489 | 1.000 |

**Table 4**
Baseline regressions result (Fixed-effects).

| Variables | Savings | | | Borrowings | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| NEO | −0.493** | −0.413** | −0.390** | 0.053 | −0.022 | −0.012 |
| | (0.191) | (0.199) | (0.197) | (0.053) | (0.054) | (0.055) |
| INT | | 0.197* | 0.245** | | −0.144*** | −0.163*** |
| | | (0.116) | (0.107) | | (0.031) | (0.031) |
| DAF | | −0.092 | −0.031 | | −0.006 | 0.009 |
| | | (0.105) | (0.102) | | (0.028) | (0.029) |
| GDP | | 0.134 | 0.120 | | −0.058 | −0.059 |
| | | (0.167) | (0.168) | | (0.045) | (0.046) |
| POP | | 1.085** | 0.955* | | −0.018 | −0.064 |
| | | (0.543) | (0.545) | | (0.148) | (0.151) |
| URB | | 0.783 | 0.603*** | | −0.371 | 0.551*** |
| | | (1.145) | (0.227) | | (0.311) | (0.115) |
| REG | | 0.158 | 0.274** | | −0.038 | 0.002 |
| | | (0.122) | (0.107) | | (0.033) | (0.032) |
| CONS | 115.503*** | 40.579 | 29.703** | 22.797*** | 62.244*** | −4.741 |
| | (0.973) | (79.416) | (14.510) | (0.271) | (21.565) | (7.749) |
| Obs | 432 | 431 | 431 | 432 | 431 | 431 |
| R-squared | 0.160 | 0.192 | 0.188 | 0.521 | 0.561 | 0.548 |
| Year Fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | No | Yes | Yes | No |
| Region Fixed | No | No | Yes | No | No | Yes |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively.

significant negative impact on savings behavior.

The coefficient on Neobanking is −0.413 and statistically significant at the 5% level, indicating that an increase in Neobanking adoption is associated with a reduction in the percentage of adult holding savings accounts in traditional financial institutions. This study interprets the findings through two complementary explanations. First, the expansion of Neobanking may prompt digitally literate individuals to shift toward more convenient branchless banking, thereby reducing the potential access to savings accounts in the traditional banks. Traditional institutions, burdened by higher operational costs, face intensifying competitive pressure from branchless banks that operate with leaner cost structures. Second, the cross-country nature of this analysis reveals that while many previously unbanked individuals are opening accounts with Neobanks, they are not necessarily abandoning traditional banks. Instead, users may often maintain existing traditional accounts while adding a Neobank account. Thus, easier access to Neobanks does not always reduce the number of traditional bank accounts; rather, it tends to dilute the share of savings allocated to them. Collectively, these dynamics may capture the relocation of household savings and the broader evolution of financial behavior. Moreover, users typically keep smaller sums in traditional savings accounts since Neobanks prioritize ease of use, inexpensive transaction fees, and payment-focused services. Besides, improved digital payment efficiency may also encourage spending, further slowing the growth of traditional bank savings, especially in the near term.

The result of our study contrasts with that of Demir et al. (2022) regarding savings. Demir et al. (2022) show that FinTech also promotes household financial behavior by encouraging savings among financial institutions. The measure of FinTech is different in their study. Some studies have reached conclusions similar to ours. For instance, D'Acunto et al. (2020) show that FinTech reduces the savings rate by encouraging increased spending through accessible financial payment services. Also, based on the top 16 emerging economies, Lyons et al. (2022) find that although FinTech promotes account access, FinTech lowers the saving rate for users over the last 12 months. More particularly, FinTech reduces informal savings, according to an experiment conducted on 16 of the world's largest emerging economies.

In contrast, the results across all borrowings models indicate that the effect on borrowings is statistically insignificant. This

indicates that Neobanking's influence on borrowings behavior is less clear and may depend on additional contextual or structural factors. Overall, these findings underscore that Neobanking significantly displaces savings from traditional banks, while its effect on borrowings remains inconclusive at the aggregate level, suggesting that displacement is more pronounced on the deposit side of traditional bank intermediation. This result contradicts the output of another study by Demir et al. (2022) on borrowing. They show that FinTech, as measured by the proportion of adults using mobile phones to pay bills, significantly promotes inclusive finance by enabling borrowings from financial institutions.

### 4.3. Robustness and endogeneity treatments

This study conducts several additional tests to assess the robustness of the output from the baseline regression.

#### 4.3.1. Heterogeneous effects

To estimate the average effect of Neobanking on household financial behavior - particularly savings and borrowings - we begin with the FE model as a baseline. FE offers a straightforward method for identifying conditional mean relationships across all observations. However, household financial behavior outcomes are often unevenly distributed across countries. In particular, the impact of Neobanking may differ substantially between countries with low and high baseline levels of savings or borrowing. If such heterogeneity exists, FE may obscure important distributional dynamics.

To address this limitation, we complement the FE analysis with quantile regression (Table 5), which allows us to estimate the impact of Neobanking at different points of the inclusion distribution (25th, 50th, and 75th percentiles). This approach provides a more nuanced understanding of how Neobanking affects low-, middle-, and high-inclusion contexts. Such differentiation is especially relevant in the case of household financial behavior, where digital services may either empower marginalized groups or reinforce existing disparities.

For savings, the Neobanking coefficient is statistically significant at the median (50%) and negative across all quantiles. This implies that countries with moderate savings are most negatively affected by Neobanking, but the effect is smaller and negligible at the lower and upper tails. Regardless of borrowings intensity, the borrowings coefficients are positive but statistically insignificant across all quantiles, suggesting that Neobanking has no substantial impact on borrowings behavior. Neobanking appears to affect traditional savings accounts, especially in nations with median savings rates, but has little effect on borrowing.

This study also tests heterogeneity based on the global digitalization index (Table 6), which classifies countries into frontrunners, adopters, and starters. Consistent with the baseline models, separate fixed-effects regressions are estimated for savings and borrowings within each group. All models include country- and year-fixed effects, allowing comparisons across stages of digital development. The results show that Neobanking has a statistically significant negative impact in frontrunners. This implies that while Neobanking has not yet grown to a size where it can completely replace traditional savings practices in less digitalized nations, it does replace traditional savings accounts in highly digitalized economies. One interesting finding shows that Neobanking significantly reduces borrowings in frontrunner countries and increases borrowings in starter countries, while remaining insignificant for adopters. This suggests that in advanced digital environments, Neobanks may promote more effective financial management and reduce dependency on credit, whereas in early-stage digital economies, where digital financial markets remain less competitive, Neobanking has not yet reached sufficient scale to displace traditional bank borrowings and may instead marginally expand credit access.

The income-based heterogeneity result is presented in Table 7, which divides the output into high-income and other (non-high-income) economies. In high-income nations, Neobanking has a negative and statistically significant effect. In other countries, the coefficient is positive but not statistically significant. This indicates that in developed economies, Neobanking replaces traditional bank savings, but in lower-income nations, the adoption of Neobanking is not yet extensive enough to supplant conventional savings practices.

The effect of Neobanking on borrowings is statistically insignificant in high-income nations, but it is positive and substantial in

**Table 5**
Quantile regressions.

| Variable | Savings | | | Borrowings | | |
|---|---|---|---|---|---|---|
| | 25% | 50% | 75% | 25% | 50% | 75% |
| NEO | −0.254 (0.272) | −0.295* (0.152) | −0.587 (0.421) | 0.018 (0.096) | 0.020 (0.049) | 0.022 (0.082) |
| INT | 0.038 (0.158) | 0.071 (0.089) | −0.117 (0.245) | −0.117** (0.056) | −0.115*** (0.028) | −0.087* (0.048) |
| DAF | −0.138 (0.143) | −0.074 (0.080) | 0.010 (0.222) | −0.031 (0.050) | −0.019 (0.025) | 0.006 (0.043) |
| GDP | 0.094 (0.228) | 0.120 (0.128) | −0.056 (0.354) | −0.010 (0.081) | −0.011 (0.041) | −0.013 (0.069) |
| POP | 0.998 (0.743) | 1.227*** (0.416) | 0.623 (1.152) | −0.142 (0.262) | −0.031 (0.132) | −0.157 (0.225) |
| URB | 0.447 (1.566) | 0.354 (0.876) | −0.792 (2.427) | −0.757 (0.553) | −0.632** (0.278) | −0.647 (0.475) |
| REG | 0.168 (0.167) | 0.189** (0.094) | 0.216 (0.259) | −0.047 (0.059) | −0.060** (0.030) | −0.049 (0.051) |
| CONS | 34.784 (140.585) | 43.441 (78.602) | 146.967 (217.874) | 94.161* (49.629) | 85.647*** (24.988) | 84.964** (42.603) |
| Obs | 431 | 431 | 431 | 431 | 431 | 431 |
| R-squared | 0.887 | 0.870 | 0.878 | 0.913 | 0.924 | 0.947 |
| Year Fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | Yes | Yes | Yes | Yes |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively.

**Table 6**
Heterogeneity based on global digitalization index.

| Variable | Savings | | | Borrowings | | |
|---|---|---|---|---|---|---|
| | Frontrunners | Adopters | Starters | Frontrunners | Adopters | Starter |
| NEO | −0.574** (0.276) | −0.160 (0.398) | 1.254* (0.733) | −0.155** (0.074) | 0.091 (0.151) | 0.205* (0.117) |
| INT | −0.390 (0.389) | 0.462*** (0.161) | 0.187 (0.217) | 0.206* (0.104) | −0.081 (0.061) | −0.043 (0.034) |
| DAF | −0.223 (0.228) | −0.018 (0.116) | −0.412* (0.232) | 0.025 (0.061) | 0.018 (0.044) | −0.089** (0.037) |
| GDP | 1.277** (0.533) | −0.091 (0.224) | −0.051 (0.309) | −0.229 (0.142) | −0.104 (0.085) | 0.026 (0.049) |
| POP | 2.161 (1.470) | −0.258 (0.740) | 1.828* (0.996) | 0.373 (0.392) | 0.193 (0.280) | −0.252 (0.158) |
| URB | 3.982* (2.235) | −7.461*** (1.857) | 4.526** (2.012) | −0.070 (0.597) | −1.695** (0.703) | −0.397 (3.202) |
| REG | 0.906* (0.539) | −0.113 (0.138) | 0.494** (0.229) | 0.007 (0.144) | 0.052 (0.052) | −0.077** (0.036) |
| CONS | −204.249 (193.885) | 606.369*** (126.604) | −190.506 (117.578) | 25.504 (51.747) | 137.602*** (47.904) | 45.809** (18.706) |
| Obs | 132 | 167 | 132 | 132 | 167 | 132 |
| R-squared | 0.213 | 0.459 | 0.277 | 0.735 | 0.567 | 0.619 |
| Year Fixed | Yes | Yes | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | Yes | Yes | Yes | Yes |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively.

other countries. This suggests that in economies with low to moderate incomes, Neobanking may primarily serve to expand credit and access, whereas in high-income economies, borrowings behavior remains largely unchanged. Overall, the results on heterogeneity influenced by digitalization and income level are consistent.

#### *4.3.2. Alternative timing of the dependent variables*

To ensure the robustness of our results and account for potential timing effects in the dependent variable, we estimated an extended model that includes the first and second lags of savings and borrowings as the dependent variable (Table 8). The inclusion of lagged dependent variables allows us to capture timing persistence, a phenomenon commonly observed in macroeconomic and financial indicators. Importantly, our core findings remain consistent in direction and statistical significance, suggesting that the results are not driven by the timing of the outcome variables. The stability of the coefficients across lagged outcomes strengthens the credibility of our baseline FE estimates and reinforces the explanatory power of the main independent variables. This consistency provides strong evidence that the observed relationships are robust to model specification and are not merely artifacts of temporal persistence.

#### *4.3.3. Mechanism testing*

Table 9 presents mechanism tests examining whether Neobanking affects savings and borrowings through digital infrastructure, economic growth, regulatory quality, or digital affordability. When interaction variables are added, the effect of Neobanking on its own is no longer statistically significant. This means that its influence is conditional rather than uniform. Regulatory quality is the most important factor in explaining the suggested mechanisms (model 3 and 5). The relationship between Neobanking and regulatory quality is negative and statistically significant for savings. This means that stronger institutional quality amplifies the displacement effects of Neobanking on savings.

#### *4.3.4. Endogeneity testing*

This study uses 3SLS to address endogeneity and reduce bias in the output. This study follows Kanga et al. (2022) in designing the endogeneity tests in Table 10. Two structural equations are defined. The outcome equation represents household financial behavior, quantified by deposit (SAV) and loan (BOR), as a function of Neobanking adoption and conventional macroeconomic variables. The second equation treats Neobanking adoption (NEO) as endogenous, elucidating it through regulatory policy indicators (POL) and

**Table 7**
Heterogeneity based on income level (High income vs others).

| Variable | Savings | | Borrowings | |
|---|---|---|---|---|
| | Income group (high) | Income group (others) | Income group (high) | Income group (others) |
| NEO | −0.577** (0.253) | 0.364 (0.390) | −0.064 (0.063) | 0.286** (0.115) |
| INT | 0.095 (0.258) | −0.038 (0.152) | −0.050 (0.065) | −0.057 (0.045) |
| DAF | −0.146 (0.165) | −0.182 (0.133) | 0.019 (0.041) | −0.032 (0.039) |
| GDP | 0.515* (0.307) | −0.007 (0.196) | −0.017 (0.077) | 0.016 (0.057) |
| POP | 2.295** (1.006) | 1.346** (0.656) | 0.529** (0.252) | −0.395** (0.193) |
| URB | −0.876 (2.778) | −0.495 (1.262) | −2.007*** (0.696) | 1.033*** (0.371) |
| REG | 0.507** (0.233) | 0.202 (0.143) | −0.010 (0.058) | −0.048 (0.042) |
| CONS | 164.513 (221.859) | 110.391 (73.861) | 193.256*** (55.614) | −42.870* (21.683) |
| Obs | 257 | 174 | 257 | 174 |
| R-squared | 0.142 | 0.409 | 0.662 | 0.465 |
| Year Fixed | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | Yes | Yes |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively.

**Table 8**
Robustness testing with lagged dependent variables.

| Variable | Savings | | Borrowings | |
|---|---|---|---|---|
| | $SAV_{t-1}$ (DV) | $SAV_{t-2}$ (DV) | $BOR_{t-1}$ (DV) | $BOR_{t-2}$ (DV) |
| NEO | −0.623*** (0.204) | −0.893*** (0.246) | 0.001 (0.060) | −0.008 (0.071) |
| INT | 0.243* (0.126) | 0.383** (0.168) | −0.120*** (0.037) | −0.107** (0.048) |
| DAF | −0.084 (0.112) | 0.159 (0.137) | 0.036 (0.033) | −0.034 (0.039) |
| GDP | −0.221 (0.156) | −0.263 (0.160) | 0.027 (0.046) | 0.023 (0.046) |
| POP | 0.989* (0.513) | 1.090** (0.529) | −0.064 (0.149) | 0.072 (0.152) |
| URB | −0.118 (1.373) | −0.206 (1.916) | −0.661 (0.401) | −0.972* (0.551) |
| REG | 0.294** (0.122) | −0.113 (0.143) | 0.002 (0.036) | 0.055 (0.041) |
| CONS | 91.996 (95.660) | 99.447 (134.026) | 75.518*** (27.954) | 97.874** (38.522) |
| Obs | 359 | 288 | 359 | 288 |
| R-squared | 0.203 | 0.140 | 0.530 | 0.462 |
| Year Fixed | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | Yes | Yes |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively.

digital infrastructure interaction factors (INT_DAF and INT_REG) that reflect institutional and technological complementarities. All specifications include country fixed effects to account for time-invariant heterogeneity, and year fixed effects are added where necessary to account for common shocks. The empirical analysis unfolds in two phases. Models (1) to (3) and (7) to (9) provide estimates of baseline specifications wherein Neobanking adoption is incorporated alone into the outcome equation, utilizing POL, INT_DAF, and INT_REG as key instruments. Models (4) to (6) and (10) to (12) implement a more conservative specification by including two or more key instruments together, along with other exogenous variables to directly influence the result equation, effectively separating the exogenous aspect of Neobanking adoption from overarching digital and regulatory development trends. A more specific structure of the exogenous variables set is mentioned in the table notes (See Table 10).

We further assess the adequacy of the 3SLS specifications using standard post-estimation diagnostics. The Wald statistic is statistically significant across all models, confirming the joint significance of the regressors in the structural equations. Instrument strength is supported by the first-stage F-statistics, which exceed the conventional threshold of 10 in Models 1, 4, 6, 7, 10, and 12. In addition, the Sargan (score) and Basmann overidentification tests fail to reject the null hypothesis of instrument validity in most models, indicating that the instruments are uncorrelated with the structural error term. Nevertheless, this study acknowledges potential concerns regarding reverse causality associated with the instrument POL. Specifically, regulatory authorities may respond to observed changes in savings and borrowings patterns by introducing branchless banking–specific policies. Although such reverse causality remains possible, it is considered unlikely in this context. The implementation of these policies typically involves a lengthy legislative and administrative process requiring parliamentary approvals, coordination among multiple government bodies, public consultations, and related regulatory procedures. Consequently, the timing of policy enactment is unlikely to be directly driven by short-term fluctuations in household financial behavior. Overall, the diagnostic results support both the relevance and validity of the instruments employed in the 3SLS estimation. Therefore, POL is considered a valid instrument in this study.

Given that instrument strength and overidentification diagnostics vary across specifications, we treat the fixed-effects estimates as our primary results for both savings and borrowings, with the 3SLS estimates serving as a robustness check.

## 5. Conclusions

We started the investigation with the specific question of whether Neobanking displaces household savings and borrowings from traditional financial institutions, and whether such displacement varies across levels of digitalization and economic growth. To investigate Neobanking's influences on savings and borrowings, this study uses data from 72 panel countries worldwide covering the period 2017 to 2022. The list of countries is mentioned in the appendix. Due to data constraints inherent to emerging financial technologies, the final sample is restricted to 72 countries with comprehensive Neobanking penetration metrics (as tracked by the Global Digitalization and FinTech Indices), with macro-variables sourced from the IMF and World Bank databases.

The findings of this study are quite specific. *First*, using both fixed-effect and pooled OLS estimation, we observe that Neobanking has a statistically significant negative effect on savings held in traditional banks, thereby significantly demotivating people from saving with traditional branch-based financial institutions. This finding supports our first hypothesis that assumes Neobanking may have a negative impact on savings to traditional banks. The negative relationship between Neobanking and savings can be explained by the design of digital-only banks, which initially emphasizes spending over saving. However, once users become accustomed to digital-only banking, they increasingly feel comfortable saving within these platforms rather than with traditional branch-based banks. In most developed countries with well-established FinTech ecosystems, strong regulatory frameworks further enhance trust in digital financial systems. Consequently, consumers tend to prioritize rapid payments, real-time access, and seamless transactions offered by Neobanks over traditional banking channels.

However, H2 receives only partial empirical support. While Neobanking has an insignificant impact on borrowings in the full sample, important differences appear across levels of digitalization and income groups. In highly digitalised frontrunner countries, which typically have strong digital ecosystems, Neobanking significantly reduces borrowings from traditional banks. In contrast, Neobanking does not reduce traditional bank borrowings in early-stage digital economies, suggesting that these markets are not yet

**Table 9**
Mechanism testing.

| Variables | Savings | | | | | Borrowings | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| NEO | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| | −0.576 | −0.393 | 0.762 (0.573) | 0.265 (1.197) | −3.869 (2.941) | −0.468 (0.720) | −0.032 (0.070) | 0.059 (0.157) | −0.311 (0.325) | −0.748 (0.804) |
| | (2.654) | (0.259) | | | | | | | | |
| INT | 0.196* | 0.198* | 0.151 (0.117) | 0.197* | 0.110 (0.120) | −0.145*** | −0.145*** | −0.147*** | −0.145*** | −0.156*** |
| | (0.116) | (0.117) | | (0.116) | | (0.031) | (0.032) | (0.032) | (0.031) | (0.033) |
| DAF | −0.090 | −0.092 | −0.131 (0.106) | −0.088 | −0.108 (0.110) | −0.002 (0.029) | −0.006 (0.028) | −0.009 (0.028) | −0.007 (0.028) | −0.012 (0.031) |
| | (0.107) | (0.105) | | (0.105) | | | | | | |
| GDP | 0.133 (0.167) | 0.141 (0.179) | 0.154 (0.166) | 0.133 (0.167) | 0.121 (0.179) | −0.059 (0.045) | −0.062 (0.048) | −0.056 (0.045) | −0.058 (0.045) | −0.056 (0.049) |
| POP | 1.086** | 1.081** | 1.083** (0.541) | 1.096** | 1.138** (0.543) | −0.015 (0.148) | −0.016 (0.148) | −0.018 (0.147) | −0.023 (0.148) | −0.021 (0.149) |
| | (0.545) | (0.545) | | (0.545) | | | | | | |
| URB | 0.796 (1.165) | 0.788 (1.147) | 0.778 (1.139) | 0.723 (1.151) | 1.167 (1.169) | −0.336 (0.316) | −0.374 (0.315) | −0.372 (0.311) | −0.345 (0.313) | −0.292 (0.319) |
| REG | 0.157 (0.123) | 0.159 (0.123) | 0.252* (0.129) | 0.163 (0.123) | 0.271** (0.130) | −0.041 (0.033) | −0.039 (0.033) | −0.032 (0.035) | −0.040 (0.033) | 0.024 (0.036) |
| NEO * INT | 0.001 (0.028) | | | | 0.057 (0.038) | 0.005 (0.007) | | | | 0.006 (0.011) |
| NEO *GDP | | −0.003 | | | 0.012 (0.028) | | 0.002 (0.007) | | | 0.001 (0.008) |
| | | (0.026) | | | | | | | | |
| NEO * REG | | | −0.014** | | −0.022*** | | | −0.001 (0.002) | | −0.003 (0.002) |
| | | | (0.006) | | (0.008) | | | | | |
| NEO * DAF | | | | −0.008 | −0.003 (0.019) | | | | 0.003 (0.004) | 0.005 (0.005) |
| | | | | (0.014) | | | | | | |
| CONS | 39.681 | 40.032 | 40.237 (78.988) | 44.149 | 13.437 (81.278) | 59.790*** | 62.531*** | 62.220*** | 60.723*** | 57.011** |
| | (80.849) | (79.659) | | (79.735) | | (21.943) | (21.630) | (21.587) | (21.637) | (22.232) |
| Obs | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 |
| R-squared | 0.192 | 0.192 | 0.203 | 0.193 | 0.210 | 0.562 | 0.561 | 0.562 | 0.562 | 0.565 |
| Year Fixed | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Region Fixed | No | No | Yes | No | No | No | No | Yes | No | No |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively. In Models 3 and 8, region fixed effects are nested within, and therefore absorbed by, the country fixed effects.

**Table 10**
Endogeneity treatment with 3SLS.

| Variables | Savings | | | | | | Borrowing | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| NEO | −2.230*** | −1.635*** | −1.356** | −1.130 | −2.098* | −6.273** | 1.4758*** | 0.742*** | 0.845*** | 1.265 (0.960) | 2.005 | 0.095 |
| | (0.575) | (0.578) | (0.523) | (1.134) | (1.154) | (2.803) | (0.184) | (0.186) | (0.183) | | (1.339) | (0.520) |
| INT | | | | 0.189 | 0.044 | 0.117 (0.455) | | | | −0.117* | 0.043 | −0.145* |
| | | | | (0.195) | (0.199) | | | | | (0.064) | (0.064) | (0.081) |
| DAF | | | | −0.048 | −0.084 | 0.307* (0.176) | | | | −0.084*** | −0.023 | −0.015 |
| | | | | (0.096) | (0.097) | | | | | (0.033) | (0.033) | (0.027) |
| GDP | | | | 0.169 | 0.189 | 0.442* (0.242) | | | | −0.116** | −0.124** | −0.065 |
| | | | | (0.153) | (0.156) | | | | | (0.052) | (0.057) | (0.043) |
| POP | | | | 1.083** | 1.327*** | 0.762 (0.962) | | | | −0.030 | −0.309 | −0.008 |
| | | | | (0.516) | (0.523) | | | | | (0.190) | (0.190) | (0.151) |
| URB | | | | 1.114 | 0.091 | 5.829*** | | | | −0.936*** | 0.453 | −0.491 |
| | | | | (1.056) | (1.070) | (1.702) | | | | (0.370) | (0.382) | (0.296) |
| REG | | | | 0.157 | 0.167 | 0.397** | | | | −0.040 | −0.034 | −0.042 |
| | | | | (0.116) | (0.116) | (0.182) | | | | (0.044) | (0.038) | (0.034) |
| CONS | 90.345** | 89.414*** | 88.818*** | −32.102 | 74.345 | −475.43*** | 12.706*** | 13.833*** | 13.710*** | 112.975*** | −29.392 | 72.689*** |
| | (3.308) | (3.367) | (3.251) | (97.689) | (99.120) | (159.795) | (1.096) | (1.085) | (1.136) | (33.703) | (35.172) | (28.775) |
| Obs | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 | 431 |
| R-squared | 0.963 | 0.961 | 0.969 | 0.970 | 0.965 | 0.884 | 0.973 | 0.987 | 0.985 | 0.977 | 0.958 | 0.992 |
| Year Fixed | *Yes | Yes | Yes | *Yes | Yes | *Yes | *Yes | Yes | Yes | *Yes | Yes | *Yes |
| Country Fixed | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Sargan test ($Chi^2$) | 15.54 | 18.49 | 14.528 | 2.421 | 8.967*** | 0.973 | 8.875 | 10.006 | 8.564 | 0.294 | 1.874 | 0.056 |
| Basmann test ($Chi^2$) | 12.98 | 15.55 | 12.105* | 1.955 | 7.351*** | 0.978 | 7.295 | 8.247 | 7.034 | 0.236 | 1.511 | 0.045 |
| Wald Test ($Chi^2$) | 115.00*** | 49.38*** | 55.45*** | 135.400*** | 23.230*** | 126.270*** | 97.37*** | 52.84*** | 61.48*** | 130.03*** | 22.940*** | 122.91*** |
| F-test | 13.44*** | 5.44*** | 6.32*** | 16.88*** | 2.62*** | 16.15*** | 13.44*** | 5.44*** | 6.32*** | 16.88*** | 2.62*** | 16.15*** |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively. In this table, the excluded instruments are: Model 1 and 7: POL, DAF, GDP, INT, POP, REG, and URB. Model 2 and 8: INT_REG, DAF, GDP, INT, POP, REG, and URB; Model 3 and 9: INT_DAF, DAF, GDP, INT, POP, REG, and URB; Model 4 and 10: POL, INT_DAF, GDP, POP, URB, and REG; Model 5 and 11: INT_DAF, INT_REG, GDP, POP, and URB; Model 6 and 12: POL, INT_REG, DAF, GDP, POP, and URB. In all models, the SAV and BOR equations account for unobserved country-specific heterogeneity and common time shocks by including country and year fixed effects. By contrast, the endogenous NEO equation controls only for country fixed effects (i.id) and omits year fixed effects (i. Year) in Models 1, 4, 6, 7, 10, and 12 to ensure proper system identification and prevent rank condition conflicts with the structural parameters. The system is estimated by three-stage least squares (Stata reg3). As reg3 does not report overidentification statistics, the Sargan and Basmann tests are conducted after running instrumental-variable two-stage regressions. '*Yes' refers Year fixed only for outcome equation, 'Yes' refers to year fixed effects in both equations.

competitive enough for substitution to occur. The income-based analysis also supports these findings - Neobanking does not displace traditional bank borrowings in non-high-income countries.

According to the findings, Neobanking should be acknowledged by regulators and policymakers as a structural alternative to traditional savings channels rather than as a supplement, especially in economies with advanced digital infrastructure. To keep depositors who are increasingly moving their savings to digital-only platforms, traditional banks may need to redesign savings products with digital features, behavioral nudges, and seamless user experiences. As savings shift from branch-based institutions to Neobanks, the findings underscore for regulators the importance of maintaining robust supervisory frameworks to safeguard consumer protection and financial stability. According to the heterogeneous borrowings effects, Neobanking can facilitate loan access in low-income, digitally underdeveloped nations where traditional banking penetration remains low. Therefore, authorities in technologically advanced nations should monitor any displacement impacts on traditional bank lending, while policymakers in poorer economies may use Neobanking to increase credit inclusion. This study further suggests that traditional banks should improve their digital payment infrastructure to provide smoother services, which often make Neobanks more popular than traditional banks. For example, traditional banks could offer banking experiences similar to Neobanks by enabling faster payments and transfers, real-time payment settlements, digital wallet integration, smoother foreign currency exchange with minimal charges, as well as the integration of cryptocurrency platforms and buy-now-pay-later services. Many developed countries have already adopted most of these services; however, developing and underdeveloped economies still have a long way to go, particularly where financial inclusion remains a major concern. Nevertheless, offering cryptocurrency-related services still requires substantial regulatory oversight due to security and risk-related issues. All things considered, a distinct regulatory and strategic approach is needed, taking into account the various stages of economic development and digitalization in each nation.

There are several limitations to this study. First, the measurement of Neobanking is limited by the availability of cross-country data and reflects the relative strength of Neobanking dissemination rather than variations in business models, regulatory status, or service scope, which could lead to measurement error in a macro-panel context. Second, the level of technological penetration and digital readiness differs greatly from one country to the next. Fixed-effects estimation reduces time-invariant heterogeneity, and heterogeneity analyses only partially account for cross-country differences. However, these methods cannot fully capture differences in digital access and adoption within a single country. Third, even while alternative specifications such as 3SLS and dynamic panel estimators address potential endogeneity issues, these methods rely on aggregate instruments and lag structures that may not adequately capture how institutions and regulations differ across countries. Consequently, the results ought to be regarded as average inter-country correlations rather than definitive causal pathways, underscoring the necessity for subsequent study employing micro-level data and more detailed institutional metrics. Another limitation is that this study does not directly investigate payment behavior, which is a significant aspect of financial inclusion and a key competitive advantage of Neobanking. Data limitations and cross-country comparability limits hinder a uniform evaluation of digital payment utilization in this investigation. Subsequent research may enhance the existing paradigm by integrating detailed payment and settlement data to assess the impact of Neobanking on transactional inclusion and on savings and credit outcomes. Additionally, this study focuses on displacement effects at the aggregate country level and cannot directly observe whether displaced savings and borrowings represent a welfare gain or loss for individual households, which remains an important avenue for future micro-level research.

## CRediT authorship contribution statement

**Morshadul Hasan:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. **Ariful Hoque:** Conceptualization, Funding acquisition, Supervision, Investigation, Writing – review & editing. **Tanvir Bhuiyan:** Validation, Writing – review & editing. **Mohammad Zoynul Abedin:** Investigation, Project administration, Writing – review & editing.

## Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work the author(s) used generative AI in order to polish language. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

## Appendix

(A) List of the countries used in this study.

Argentina, Australia, Austria, Bahrain, Bangladesh, Belarus, Belgium, Brazil, Bulgaria, Canada, Chile, China, Colombia, Croatia, Cyprus, Czechia, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Japan, Kenya, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Morocco, Nepal, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vietnam, Zambia.

(B) Limited literature (published articles) on Neobanking

In the following table, this study only mentions available articles in Scopus database up to May 2026.

| Documents | Key Theme | Methods | Study Area | Journals |
|---|---|---|---|---|
| Betancourt et al. (2026) | Strategic risks from financial digitalization include cybersecurity and cultural gaps in adaptation, while opportunities lie in modernization and regulatory compliance. | Qualitative; Semi-structured interviews (n = 10 executives) | Colombia | Journal of Risk and Financial Management |
| Jha et al. (2026) | Influencing factors for the adoption and usage of Neobanking services | UTAUT2; PLS-SEM | India | Management Decision |
| Máté et al. (2026) | Interface design quality influences Neobank adoption through ease of use, with trust having stronger effects on behavioral intention among female users. | Quantitative; PLS-SEM; Modified Technology Acceptance Model; Survey (n = 159) | Hungary | Business, Management and Economics Engineering |
| Sidorenko (2026) | Neobanks and traditional banks use distinct multimodal signals on B2B landing pages, with Neobanks emphasizing technology and emotional closeness. | Multimodal discourse analysis; Signal-based positioning; Semiotic analysis (n = 24 landing pages) | Russia & International | Galactica Media: Journal of Media Studies |
| Amon and Jagrič (2025) | A multinomial logit model identifies demographic and behavioral predictors of Neobank adoption across 28 countries. | Multinomial logit model; Cross-national survey (n > 2000) | 28 countries (global) | International Journal of Financial Studies |
| Bhatnagr et al. (2025) | Understanding customer perceptions and sentiments from the use of Neobanking mobile applications. | Quantitative; Machine learning; Data from 330,399 users | | Journal of Modelling in Management |
| Cherian et al. (2025) | Bibliometric analysis maps the evolution of Neobanking research, identifying key themes, trends, and research gaps from the Scopus database. | Bibliometric analysis; Biblioshiny; VOSviewer; CiteSpace | Global (Scopus database) | International Journal of Accounting and Economics Studies |
| Citterio et al. (2025) | European Neobanks underperform traditional peers on financial metrics while showing similar risk levels, with evidence of economies of scale. | Quantitative; Hand-collected non-financial data; Econometric models | Europe (65 Neobanks) | Journal of Financial Services Research |
| Minchan-Wolstrohn and Rodríguez-Serra (2025) | Privacy concerns, user experience, expense control, and service quality are key determinants of Neobank adoption intention in Peru. | Quantitative; PLS-SEM; Theory of Planned Behavior; Survey (n = 154) | Peru | Issues in Information Systems |
| Palos-Sanchez et al. (2025) | Neobanks are gaining traction among young users while older users face cybersecurity and trust barriers. | Text mining; Sentiment analysis; LDA topic modelling; Web scraping; 56,474 Google Play reviews reveals | Global (N26, Revolut, Wise apps) | Sustainable Technology and Entrepreneurship |
| Puente-Cavazos et al. (2025) | Perceived financial security in Neobanks drives customer trust and retention, with trust mediating the relationship with switching costs to traditional bank. | Quantitative cross-sectional; PLS-SEM; Bootstrapping; Online survey (n = 305) | Mexico | Revista Brasileira de Gestao de Negocios |
| Sidorenko (2025) | Neobanks emphasize ‘comfort' and ‘simplicity' in B2B advertising while traditional banks focus on ‘reliability' and 'success', reflecting distinct semiotic communication strategies. | Qualitative; Socio-semiotic analysis; Multimodal discourse; Landing page analysis (n = 12 banks) | Russia & International | Vestnik Moskovskogo Universiteta. Seriya 10. Zhurnalistika |
| Soelasih et al. (2025) | Ease of use, perceived security, and social influence positively predict Neobank adoption intention, with gender moderating trust effects. | Quantitative; SEM-PLS; Paper-based survey (n = 273); Technology Acceptance Model; Unified Theory of Acceptance and Use of Technology (UTAUT); Trust Theory; SEM-PLS | Indonesia | Quality - Access to Success |
| Amon et al. (2024) | Neobanks contribute significantly to environmental, economic, and social sustainability, though risks such as e-waste and cybersecurity require attention. | Systematic literature review; Comparative analysis | Global | Journal of Infrastructure, Policy and Development |

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| Documents | Key Theme | Methods | Study Area | Journals |
|---|---|---|---|---|
| Au (2024) | Neobanks in emerging markets face significant firm-specific and macroeconomic risks, with Nubank potentially overvalued and StoneCo undervalued in Brazil. | Quantitative; Valuation modelling; Financial data analysis; Risk assessment | Brazil | Humanities and Social Sciences Communications |
| Badre (2024) | Neobanks offer North African migrants in Europe significant remittance cost savings and financial inclusion potential, though adoption is constrained by digital literacy and cultural barriers. | Mixed methods; Survey; Interviews (n = 64 migrants) | Migrants from Morocco, Tunisia, and Algeria (North Africa) residing in France, Spain, and Italy (EU). | Scientific African |
| Bhatnagr et al. (2024a) | Association between behavioral intention to use and innovation resistance in Neobanking context. | Structured survey-based questionnaire; Partial Least Squares Structural Equation Modelling | India | Management Decision |
| Bhatnagr et al. (2024b) | Personalisation, service quality, and digital interface design collectively shape online brand experience, customer loyalty, and satisfaction in Indian Neobanking. | Quantitative; PLS-SEM; Survey (n = 421) | India | International Journal of System Assurance Engineering and Management |
| Chanson and Rocchi (2024) | Pragmatic legitimacy, not profitability, is the necessary and sufficient condition for organizational survival of French online banks and Neobanks. | Qualitative; csQCA; Longitudinal case analysis (n = 30 firms, 1994–2022) | France | Finance Controle Strategie |
| Kapliar et al. (2024) | A parametric risk model using SWOT and matrix analysis identifies cybersecurity, operational failures, and digitalization-driven threats as primary risks for Neobanks. | Analytical; SWOT analysis; Parametric modelling; Matrix approach | | WSEAS Transactions on Information Science and Applications |
| Mogaji and Nguyen (2024) | Traditionally-driven Neobanks (TDNBs) employ three branding strategies - aligning with parent brand, reinforcing digital experience, and enhancing brand image. | Qualitative; Case study; Interviews; App store reviews; Thematic analysis | United Kingdom | International Journal of Bank Marketing |
| Molnár et al. (2024) | Trust, perceived usefulness, and ease of use positively drive attitudes toward Neobank use, which in turn determine consumer adoption intention in Hungary. | Quantitative; SEM; Extended TAM; Online survey (n = 475) | Hungary | Statisztikai Szemle |
| Nagy et al. (2024) | Trust, perceived usefulness, and ease of use positively influence attitude, which in turn drives intention to use Neobank services among Hungarian consumers. | Quantitative; SEM; Extended TAM; Online survey (n = 475) | Hungary | Decision Making: Applications in Management and Engineering |
| Rahmatulloh et al. (2024) | Trust, marketplace usage, and UTAUT-3 factors positively shape Neobank behavioral intention and willingness to recommend services in Indonesia. | Quantitative; PLS-SEM; Survey (n = 386); Extended UTAUT-3 | Indonesia | International Journal of Economics and Finance Studies |
| Shanti et al. (2024) | Digital transformation initially reduces but ultimately improves Neobank efficiency in the long term, as confirmed by stochastic frontier and panel ARDL analysis. | Quantitative; Stochastic Frontier Analysis (SFA); Panel ARDL; PMG estimation | Indonesia | Journal of Risk and Financial Management |
| Subramanian and Baby (2024) | ESG-rated Neobanks in India demonstrate a positive linear relationship between ESG commitment and customer effort score, indicating better customer experience. | Text mining; Customer Effort Score; Review analysis (n = 2156) | India | ASEAN Journal on Science and Technology for Development |
| Taneja et al. (2024) | Digital payment adoption experience, combined with trust, risk, security, and green concern, drives behavioral intention to adopt digital-only Neobanks. | Quantitative; SEM; UTAUT; | | IEEE Transactions on Engineering Management |
| Kusnawi and Rahardi (2023) | Support Vector Machine achieves 82.33% accuracy in classifying Neobank user reviews from Google | Machine learning; Support Vector Machine; Sentiment analysis; Text classification (n = 3159 reviews) | | International Journal on Informatics Visualization |

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| Documents | Key Theme | Methods | Study Area | Journals |
|---|---|---|---|---|
| | Play Store as positive or negative sentiment. | | | |
| Banerjee et al. (2022) | Neobanking adoption by traditional UAE banks influences market share through key financial performance indicators including NPL, ROE, and NIM. | Pooled regression; Financial statement analysis (2012–2021) | UAE | International Journal of Professional Business Review |
| Kauflin (2019) | The rise of Neobanks marks a new era in digital banking, with app-based challengers disrupting traditional financial institutions globally. | Journalistic review; Industry analysis | Global | Forbes |

(C) Baseline regressions result (POLS)

| Variables | Savings | | Borrowings | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| NEO | −0.493** | −0.413** | 0.053 | −0.022 |
| | (0.191) | (0.199) | (0.053) | (0.054) |
| INT | | 0.197* | | −0.144*** |
| | | (0.116) | | (0.031) |
| DAF | | −0.092 | | −0.006 |
| | | (0.105) | | (0.028) |
| GDP | | 0.134 | | −0.058 |
| | | (0.167) | | (0.045) |
| POP | | 1.085** | | −0.018 |
| | | (0.543) | | (0.148) |
| URB | | 0.783 | | −0.371 |
| | | (1.145) | | (0.311) |
| REG | | 0.158 | | −0.038 |
| | | (0.122) | | (0.033) |
| CONS | 88.053*** | −1.345 | 14.658*** | 61.300** |
| | (3.473) | (102.762) | (0.967) | (27.905) |
| Obs | 432 | 431 | 432 | 431 |
| R-squared | 0.970 | 0.971 | 0.991 | 0.992 |
| Year Fixed | Yes | Yes | Yes | Yes |
| Country Fixed | Yes | Yes | Yes | Yes |
| Region Fixed | No | No | No | No |

Notes: Standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance level, respectively.

## Data availability

Data will be made available on request.

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