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Mobile Payments, Financial Literacy, and Borrowing Behavior: Evidence from the European Union

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Abstract

Borrowing patterns across the European Union are being influenced by the widespread use of mobile payment technologies, the distribution of financial education, and financial access. Although digital finance has increased convenience and inclusion, it has also led to the risk of impaired borrowing and overconsumption, and debt that is much more prevalent in the under-25 age group. This paper investigates the combined role of mobile payment use, financial literacy, and financial access in borrowing behavior in EU countries. Based on the descriptive, correlational, and regression analyses applied to the data of Eurobarometer 525 on the financial literacy-informed proper borrowing relationship, it has been found that money literacy plays a vital role in causing proper lending, and positive money literacy ratings are significantly correlated with loan participation. Access to minimal financial infrastructure (bank accounts, bank savings products, bank credit) was also a powerful facilitator of borrowing, and long-term products like pensions and investment solutions reduced loan demand too. On the other hand, digital comfort with mobile payments negatively correlated with loan ownership, indicating that digitally competent consumers may substitute formal borrowing with other financial instruments or cast behavioral dispositions that are specifically supportive of turning away from formal credit. More studies are needed to be done that clarify the complexity associated with borrowing in a digitized financial landscape, where knowledge and inclusion promote responsible borrowing and digital finance has both empowering and destabilizing impacts. The study concludes that an integrated approach to certain policy interventions involving the combination of financial education, equitable access, and protection against the behavioral biases of digital borrowing is required to unlock financial resilience and sustainable credit behavior in the EU.

Keywords: Borrowing Behavior, Mobile Payments, Financial Literacy, Financial Inclusion

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1. INTRODUCTION

Advances in technological innovation, an increase in access to education, growth of formal banking services have had a major impact on the behavior of consumers in their financial dealings, particularly across the age bracket. Personal finance, consumption habits, and borrowing patterns have all been changed through the propagation of various mobile payment technologies and financial digital apps that alter the way in which individuals relate to other forms of financial transactions (Arvidsson, 2014; Khalid et al., 2025). Although technological innovation has been widely touted as bringing new access to financial services and increasing the efficiency of service delivery, introducing such innovation into daily life was linked to new challenges articulated in the form of overconsumption, moneylending, and spending habits. For instance, rapid adoption of mobile money platforms by consumers, as reported by the Organization for Economic Co-operation and Development (OECD, 2023) and European Commission (2022), is yet to be accompanied by an equal increase in digital financial literacy levels. Hence, a disturbing gap persists in the use of technology and user awareness of monetary hazard and accountability. Garcia and Rousseau (2021) also highlight the significance of raising awareness campaigns in the country in order to educate people about responsible digital transformation in the environments for finance services, which has come with responsible usage patterns. This is no more urgent when dealing with younger consumers, whose financial behavior is more likely to change by reason of mobile applications and systems of frictionless payments. In this respect, financial literacy has become an important factor in sound financial decision-making. It is about people's ability to apply their understanding of financial language and how to manage risk and weigh alternative options

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to make educated decisions (OECD, 2020). Many studies have already established that the financially literate are better when it comes to budgeting, end up having more money, and are more likely to conduct sustainable long-term financial planning (Lusardi & Tufano, 2015; Marc et al., 2024; Ammar et al., 2025). However, the presence of a relationship between financial literacy and borrowing behavior is disputed in the literature.

A recent comparative study on digitally advanced and less-developed economies by Lin and Becker (2022) implies that in the digitally advanced economies, a lower rate of delinquent payment is associated with the usage of digital payment, which hints towards a potentially favorable behavioral adaptation to financial literacy. However, contradictory opinions have been found in the literature. The answer that some scholars give for that would be more financially literate, so more risk-averse, thus avoiding borrowing money at a high rate or a very short term (Klapper et al., 2013; Audi et al., 2025; Umair et al., 2025). It is also argued that the level of financial knowledge of people will be associated with a better ability to manage the financial obligation arising from debt, and also, they will tend to resort to debt when it can justify a source of debt in economic terms. This ambiguity makes further empirical research into the relative impact of financial literacy on borrowing decisions in this new age of digital finance particularly important. As the access to easy credit through mobile platforms and the service providers provided by these do not necessarily screen for needy people as well as educate them appropriately, there is an increased demand for better knowledge of how to inform their duty to choose help them control reckless debt seeking. As public policy and academic research administrations develop financial innovation, policymakers and researchers at the school must also keep pace with this to ensure that access is synchronized with competence.

The implementation of cellular payment technologies has completely displaced the economic systems in the way consumers can manipulate money, credit, and transactions. The integration of digital payment instruments without friction has made transactions easier, transactional costs lower, and user experience better, thus improving financial inclusion and market equity (Sajid & Ali, 2018; Zhao & Bacao, 2021; Audi et al., 2023; Ditta et al., 2025). However, the same convenience that allows us to go digital with the financial system has been linked to new behavioral dangers, in this instance, compulsive purchasing and greater use of credit. The psychological immediacy and effectiveness of mobile payments tend to obfuscate a psychological stimulus of payment, which actually can reduce perceived financial cost and impulse resistance (Soman, 2003; Ali & Rehman, 2015; Ustaoglu & Yildiz, 2023; Iqbal et al., 2025). This phenomenon is generally known as the "decoupling effect," which is where the eradication of physical notes in the event of utilizing digital opens up expenditures, minimal attention to purchase, and macrophages are gravely timid (Prelec & Loewenstein, 1998). As a result, there is an impulse to underestimate the consumption by the individuals, plus the use of credit tools in excess, especially in a context where the access and regulation of such credit is facilitative. Further, Iqbal (2018) opines that mobile payments not only increase transactional efficiency but also weaken cognitive boundaries that historically have constrained prudent financial behavior, including young populations or those most likely to be digitally enabled.

The availability of financial services and the scope of which that service is made available to a consumer is the base determinant of the Consumer's borrowing patterns. Financial inclusion, which is defined as the available and equitable access by persons to a selection of financial products and services, is also of importance for economic empowerment and resilience (Ali, 2015; Demirguc-Kunt et al., 2018; Ahmad, 2022; van Zanden, 2023; Ali et al., 2025). The arrival of regional differences in digital finance access, which continue to persist within Southern and Eastern EU members, in particular, was referred to by the European Investment Bank (2022). The access to formal financial infrastructure, which includes credit facilities, savings institutions, insurance mechanisms, and investment opportunities, is an important factor in the ability and willingness of borrowers to borrow. Inclusive households incur productive borrowing, whereas excluded households resort to alternative informal microlenders and high-interest, short-term loan alternatives (payday loans), making them, in this regard, more financially vulnerable (Grohmann et al., 2018; Karhan, 2019; Ali et al., 2025). This intersection between mobile acceptance of payment means, financial literacy, and financial inclusion provides a rich but under-researched empirical space. Whilst increased transactional efficiency might result from the widespread use of mobile financial platforms, their effect on borrowing behavior appears to be conflicting. Key questions arise on whether or not, in turn, mobile finance users display different borrowing behaviors when compared with non-users. In terms of access to credit, does financial literacy cause a lessening or an increase in the risks of easy access to credit services through online delivery channels? And to what extent do the traditional financial service relationships, including the relationships involved in providing books that give access to financing services, interpret the financial service relationships?

Despite academic interest, a high paucity of empirical research studies has examined that interaction using good-quality representative data at scale. Most of the literature written about these factors has been individual - hence, there is not yet an understanding of the combinations of these and their impact on consumers' loan ownership and credit behavior (Rothwell and Han, 2010; Ali et al., 2014; Hun et al., 2024; Ali et al., 2025). Moreover, on the aspects of the extent of accessibility of digital financial products at the level of the developed and developing countries, comparative analysis can hardly be conducted due to asymmetric penetration of digital services. The European Union (EU) is pretty ahead in terms of digital penetration, but financial literacy and regulatory issues differ significantly among its member states, which is as good as the opportunities of individuals in accessing credit in experimenting with digital areas (Kempson et al., 2013; Bibi, 2019; Aziz et al., 2025). This paper draws on interdisciplinary theory to analyze what the determinants are for borrowing under conditions of a financialised digital world. The financial literacy theory is dependent on the expectation that the knowledgeable decision of a borrower is based on financial enlightenment, to enable the economic agent to comprehend the concepts of finance and danger (Huston, 2010; Salleh & Sapengin, 2023; Kumar et al., 2025). The other instance is behavioral economics, which explains how cognitive biases such as overconfidence, duration bias, and

rationally limited BI can contribute to irrational borrowing choices even by the financially literate (Tversky & Kahneman, 1974). Further, the perceived ease of use and usefulness drive the acceptance of digital technologies, which irresponsibly look after the impulse to borrow without care, placing innovation if not coupled with economic verbs (Venkatesh et al., 2003). In sum, these points illustrate how complex the ways people conduct their finances may be, particularly when discussing online banking. The more that European financial authorities encourage digital financial inclusion and digital financial literacy, the more energy has been raised to make financial literacy reflect on the terms of digital literacy and empowerment, as digital empowerment comes at the risk of exposure (European Banking Authority, 2021). In view of the gap in the literature, this paper uses data from the Eurobarometer survey 525 to empirically examine the effects of digital finance, financial capability, and financial institutions' access on borrowing behavior. The results will contribute to evidence-based policy making, financial education programs, and responsible development of digital financial products for different sections of the consumers of consumer base in the EU.

2. LITERATURE REVIEW

One of the most common cognitive distortions when it comes to personal finance is financial overconfidence; the tendency to overrate personal funds and decision-making capabilities. Most of the time, this transposition results in suboptimal and risky financial behavior, such as impetuous spending and unwarranted optimism about financial results (Can, 2021; Chawla & Mokhtari, 2025). "Individuals are overconfident in their financial judgments and take more risks, placing excessive weight on potential gains and ignoring the downsides of potential losses" (Skala, 2008; Akim, 2020; Kumar et al., 2025). Novak and Dragos (2023) point to the social impact such overconfidence would have, which is evident in large young adults who are very much in need of commodities and digital platforms, and this is another problem when considering their addition to personal debt. The growth of MPOT has also influenced financial behavior patterns, in addition to emerging technologies. Novel forms of smart and platform-based technologies through smartphones, tablets, portable writing tools, and other technologies, such as Near Field Communication (NFC), QR code systems, and mobile banking apps, have become the core of the new digital economic system (Hoofnagle et al., 2012; Liao & Chen, 2021; Shahid et al., 2025). Fourth, the development of online payment systems such as PayPal, Apple Pay, and Google Pay enabled and improved the speed of payments as well as the level of service to the users, changing consumer behavior in accessing finance (Owusu & Novignon, 2021; Marc & Yu, 2024; Khalil et al., 2025). A systematic review conducted by Anders and Noorani (2022) showed that mobile payment adoption generally results in a decreased dependency on conventional credit cards, likely because of enhanced awareness of spending made possible by the fact that applications encourage users to track their spending with features placed upon their phones. Also, according to Zhang and McKee (2023), the NFC payment system implementation influenced short-term borrowing behavior in cities substantially, and Liu et al. (2022) found that the high-income customers adopting spending trackers had financial discipline and better budget following behavior.

In the process, the price of borrowing continues to be of central interest in econometric behavior, especially among public groups with limited access to mainstream financial institutions. This cost includes interest as well as other service fees that can be quite a departure from provider to provider. In the absence of traditional credit, there is a large number of people, particularly those who are unbanked and underbanked, who rely on Alternative Financial Services (AFS) such as payday lenders, pawnshops, cheque-cashing outlets, and rent-to-own firms (Robb et al., 2015; Tila & Cera, 2021). Additionally, although these types of services provide a functional support in meeting short-term liquidity management needs, they tend to be accompanied by prohibitively high service fees and a high effective interest rate (Liberman et al., 2016; Fatima & Zaman, 2020; Das, 2022; Musa, 2024). For instance, structural constraints (like lack of financial access, illiteracy, and physical access to banks and their geographic spread) are the drivers of fundamental dependency on these alternatives (Labeque & Sanaullah, 2019; Shanbhag, 2022; Idris, 2023; Radas, 2023). The International Monetary Fund (IMF, 2022) has additionally indicated that informal borrowing continues to prevail, especially in digitally unserved and economically remote regions of the European Union, which reiterates the fact that there exists a deep gap in equitable financial access.

Although Alternative Financial Services (AFS) are expensive, their popularity remains because of their speed, convenience, and convenience of access (Ibrahim & Alqaydi, 2013). For example, payday loan firms provide instant cash without the rigorous credit (by conventional banking standards) checks that are routinely done for many persons having an urgent need for finance (Ghandour et al., 2023; Khan, 2020; Smith & Johnson, 2023; Ahmad & Rura, 2024). The coming of straightforward fintech innovation, for example, peer-to-peer loans and digital wallets, has brought about the development of more straightforward and, see some cases, lower-cost options to traditional money organizations, and AFS has thus evolved in the contemporary setting. The development of traditional finance organizations has given rise to the introduction of more direct and possibly, more reasonable options with regard to the modern age, as AFS has grown in the interest of transforming due to fintech innovation (Yuneline & Rosanti, 2023; Kar & Dasgupta, 2024). In parallel, financial literacy programs and policy interventions have been initiated to mitigate the dangers brought on by these services. These branches are aiming at helping consumers to make informed decisions about their finances and to be aware of the implications of borrowing choices (Liao & Chen, 2021). Karim and Wojcik (2021), in a comparative study in eleven member states of the EU, found that the probability of having surveyed consumers capable of budgeting is positively related to the exposure a consumer has to structured financial literacy efforts, which supports the effectiveness of these educational interventions. In addition to access and cost, privacy and security of data have been identified as important considerations in the digital finance ecosystem. Hoofnagle et al. (2012) conducted a nationally representative survey of 1203 U.S. consumers, both landline and mobile phone users, to measure consumer attitudes about mobile

payments. While respondents admitted that mobile payment systems are convenient, efficient, and perceived as safe, a strong majority shared that they were against tracking their data and allowing information to be shared without their consent, based on a study conducted with Princeton Survey Research Associates International (PSRAI). Specifically, 96 percent were against the monitoring of consumer-purchasing behavior, and 81 percent were against its sharing of personal information, like phone numbers, at the checkout line. To meet this and other issues that already exist, the authors proposed stronger legislative protections similar to those in the California Song-Beverly Credit Card Act. However, there is a limitation in the generality of the findings resulting from the U.S.-centered sample; prospective cross-cultural research is also warranted to facilitate a more thorough investigation into consumer perspectives on mobile payment privacy globally. Robb et al. (2015) examined how bounded rationality and financial overconfidence influence the use of AFS. Utilizing data from the 2009 and 2012 National Financial Capability Study (NFCS), they employed logistic regression models based on socioeconomic characteristics to evaluate disparities between individuals' perceived and actual financial knowledge. The findings revealed that financially illiterate yet overconfident individuals were significantly more likely to engage in high-cost borrowing through AFS. Alarming, the usage of such services increased even as macroeconomic conditions improved between 2009 and 2012, indicating that overconfidence and poor financial understanding remained potent drivers of suboptimal financial behavior. While the use of self-reported data and exclusion of broader economic variables limit the robustness of their conclusions, the study underscores the pressing need for targeted financial literacy interventions.

In a related investigation, Dobridge (2016) assessed the impact of payday loans on household solvency using data from the Consumer Expenditure Survey and regional differences in payday loan availability. Applying a difference-in-differences methodology, the study found that payday loans helped sustain essential household expenditures (e.g., food and rent) during financial crises. However, during more stable periods, access to payday credit correlated with reduced basic consumption, suggesting overuse of costly borrowing options even when unnecessary. Although the study relied on observational data—limiting causal inferences—it highlighted the double-edged nature of payday lending and stressed the need for protective lending policies. Liberman et al. (2016) used regression discontinuity and instrumental variable (IV) estimation to evaluate the long-term effects of high-cost borrowing on creditworthiness in the UK. Their analysis of loan applications and credit bureau data found that individuals accessing high-cost loans experienced immediate and lasting reductions in credit scores, increased default rates, and decreased access to mainstream financial services. Interestingly, for high-risk borrowers, access to such loans did not further damage their already low credit profiles, thus suggesting that these financial products can perpetuate cycles of financial exclusion, particularly among the most vulnerable.

The behavioral dimensions of digital finance have also been examined. Liao and Chen (2021), using the 2015 and 2018 NFCS data, applied logistic regression models to explore how mobile payments influence financial behaviors. They discovered a strong association between mobile payment usage and impulsive spending, habitual overdrafts, and poor budgeting practices. Notably, users with high financial literacy demonstrated better self-control and money management, reinforcing the moderating role of financial education in the digital context. Wang et al. (2022) contributed to this discussion by applying neuroscientific methods to investigate the psychological impact of mobile payments. Through EEG experiments involving Chinese participants, their study affirmed both the “pain of paying” and “pleasure of paying” theories, concluding that mobile payment platforms reduce the psychological discomfort of spending, thereby enhancing consumption pleasure. Although their sample size and cultural specificity limit the generalisability of findings, the study provided significant neuroeconomic insights into digital payment behavior. From a broader perspective, financial exclusion remains a pervasive challenge. Shanbhag (2022) analyzed datasets from multiple U.S. institutions (NFCS, JumpStart, FDIC) to explore barriers to financial inclusion among low-income, minority, and immigrant populations. Key findings identified limited financial knowledge, costly banking, and overreliance on AFS as critical impediments. The study advocates for integrated financial access and educational interventions tailored to underrepresented communities.

In the Southeast Asian context, Yuneline and Rosanti (2023) surveyed university students in Bandung, Indonesia, to analyze how digital finance, financial literacy, and lifestyle preferences shape financial behavior. Regression results found that although adoption of digital finance had limited direct effects, an improvement in financial illiteracy correlated with improved financial decision-making, which might suggest that knowledge was more important than just access to the technology itself. Smith and Johnson (2023) further supported this assertion by showing that financial literacy affected the use of impulsive behavior and control when using mobile payments. Ghandour et al. (2023) discussed the impact of OC-19 on the adoption of mobile payment in the UAE. Their study found that public health concerns (i.e., decreased physical contact) led to a significant increase in the use of mobile payment, which led to demands for further infrastructure development and inclusive finance policies.

3. THEORETICAL FRAMEWORK

Theories on consumer financial behavior in the digital era require an exploration of a variety of interrelated theoretical models of financial decision-making behavior, the use of digital payment technologies, and borrowing practices. This section provides the theoretical perspectives that are the foundation of the major theoretical propositions of the study, that is, financial literacy theory, behavioral economics, the technology acceptance model (TAM), and the theory of planned behavior (TPB). Financial Literacy Theory is that an individual with a reasonable understanding of important economics, such as interest rates, credit terms, and budgeting, is likelier to make sound financial choices, which include prudent borrowing and spending (Lusardi & Mitchell, 2014; Lin, 2021; Nwosu & Folarin, 2025). Thus, an increase in financial literacy will benefit financially literate people in terms of better assessing borrowing costs and managing digital payment

tools that avoid over-indebtedness. Negative impacts on digital financial products are, however, not uncommon among those who have a low financial literacy profile, as they often demonstrate poor prudential behavior, such as impulse spending and ineffective credit management (Robb et al., 2015; Roozbeh & Raza, 2021; Audi & Ali, 2019; Liao & Chen, 2021; Diaz & Collin, 2025; Iqbal & Hayat, 2025). However, the scientific certainty with which this situation is described has prompted criticism for being knowledge-focused and not taking into account the role of psychological phenomena, economic limitations, and structural inequality prevalent in consumer choice.

Behavioral economics is the counter-narrative to classical economic theory, as it challenges the economic theory of rational behavior. Targets the arguments that consumers are affected by cognitive biases, emotional responses, and weak will-power (Thaler and Sunstein, 2008). A notable one is overconfidence bias, in which individuals tend to overestimate their financial knowledge or capability in debt management, thus making themselves more vulnerable to risky financial practices (Audi et al., 2022; Chawla & Mokhtari, 2025; Audi, 2025). This is of special concern for mobile payments, as quarter spend is associated with the "pain-of-paying" due to the separation between paying (spending) and the pain of financial loss (Wang et al., 2022). Finally, such ease of modalities may lead to wasteful spending, particularly from low-literacy consumers. However, behavioral economics persists in its biased nature concerning cognitive factors and tends to reject the influence of external structural factors such as inequitable access to financial services or income uncertainties (Tobias & Rojas, 2022; Irfan & Ahmad, 2025).

The Technology Acceptance Model (TAM) tells researchers about the usage of new financial technologies such as mobile payments. According to TAM, two concepts are key to technology adoption: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Davis, 1989). Users will have wider access to digital financial services if channels are efficient and straightforward to use - even if they have a low level of financial literacy. Recent research has validated the TAM in mobile banking and digital finance, where users' perceptions of trust and security have big implications in determining adoption (Hoofnagle et al., 2012; Chen & Zainal, 2022). However, although TAM is an effective tool to model the adoption process, it typically ignores behavioral and psychological dimensions of the adoption process necessary to explain debt accumulation in digital economies (Ghandour et al., 2023), such as impulsivity or risk aversion.

The mobilization of savings using the Theory of Planned Behavior (TPB) takes a broader approach as it reaches a combination of attitudinal, normative, and control beliefs and financial behavior (Ajzen, 1991). TPB proposes that human intention to perform a behavior - such as taking out a loan or using their mobile phone to make purchases - is determined by an individual's attitude, the belief that other people deem performing the behavior as socially acceptable, and their perceived sense of behavioral control. For instance, if borrowing is considered to be a behavior that is seen as a norm, or that must be present as a coping strategy, individuals may be more inclined to engage in the behavior regardless of their levels of literacy (Ibrahim & Alqaydi, 2013; Younas et al., 2025). Of equally significant problems, acceptance of m-payments as a means of convenience can promote take-up in the absence of adequate analysis of the financial results (Marc, 2024; Smith and Johnson 2023). Gunther and Silva (2023) proposed an extension of TPB that introduces a new behavioral variable called income awareness to extend TPB in predicting intentions for debt in European households. While TPB helps capture the importance of social and cultural factors, it is a simplification of intention-to-behavior and does not allow for macroeconomic shocks or macro-level institutional barriers within the social system to affect behavior.

3.1. KEY VARIABLES

Independent Variables (IVs):

- Mobile Payment Usage Frequency
- Financial Literacy Score
- Access to Traditional vs. Alternative Financial Services

Dependent Variable (DV):

- Borrowing Patterns (e.g., responsible vs. high-cost borrowing, debt accumulation)

3.2. VARIABLE SELECTION

The matrix consists of thirteen variables, each representing a key dimension of financial behavior and access to financial services. The primary dependent variable, loan ownership, is a binary indicator derived from survey question Q9.3, which captures whether the respondent currently holds or has recently held a consumer loan. The financial knowledge score reflects the number of correct responses to five items assessing fundamental financial concepts—namely inflation, interest rates, risk, and diversification (Q2–Q6). The financial behavior score (clean) is a composite index ranging from 0 to 3, constructed from responses to questions regarding budgeting, expense tracking, and financial goal-setting (Q7.1–Q7.3). These two components—knowledge and behavior—are integrated into a broader metric: the financial literacy score (cleaned and normalized), rescaled on a 0–10 range to represent an individual's overall financial literacy.

Additionally, the digital comfort variable captures respondents' self-assessed ease and confidence in using digital financial services, based on responses to Q11. The matrix further incorporates access indicators from Q9.1 to Q9.7, covering the availability of diverse financial products: Q9.1 (bank account), Q9.2 (savings account), Q9.4 (mortgage or housing loan), Q9.5 (credit card), Q9.6 (insurance products), and Q9.7 (private pension or investment products). Although loan ownership and Q9.3 are conceptually and empirically identical, both variables are retained in the dataset to allow for cross-validation between the derived and original survey indicators.

4. DATA COLLECTION AND ANALYSIS

The descriptive statistics presented in Table 1 provide a comparative snapshot of individuals grouped by financial behavior—categorized as either High or Low—based on a predefined scoring scale. The table offers insights into how individuals in these two behavioral categories differ across several financial indicators, including knowledge, literacy,

and loan ownership. The most apparent contrast lies in the financial behavior scores, where individuals in the high group have a mean score of 3.413 with a very small standard deviation (0.096), indicating a tightly clustered performance near the top end of the behavioral scale. In contrast, the low group has a mean score of 1.902 with a much wider dispersion (0.560), reflecting greater variability and a generally lower engagement in positive financial behaviors. Since the maximum score is predefined, these scores confirm the effectiveness of the grouping and also suggest a clear behavioral gap between the two cohorts. Interestingly, the financial knowledge score—based on responses to a series of knowledge-related questions (Q2 to Q6)—is slightly higher in the low financial behavior group (mean of 2.959) than in the high group (2.749). This counterintuitive result implies that greater financial knowledge does not necessarily translate into better financial behavior. This finding echoes results in the financial literacy literature where knowledge-behavior gaps are commonly observed (Lusardi & Mitchell, 2014). Factors such as confidence, attitudes, and socio-economic constraints may explain why individuals with adequate knowledge may still not act prudently in financial contexts.

The financial literacy score, a composite metric combining standardized knowledge and behavior indicators, shows a significant divergence between groups. Individuals in the high behavior group achieve a much higher average score (7.654) compared to the low group (5.174). This indicates that even though knowledge levels are similar—or slightly better—in the low behavior group, the behavioral component drives a meaningful difference in overall financial literacy. This underscores the importance of integrating behavioral elements, not just cognitive ones, into definitions of financial literacy (Atkinson & Messy, 2012). Loan ownership, coded as a binary variable based on survey response Q9.3, is also notably higher among those with high financial behavior (50.8%) compared to the low group (34.3%). This finding could be interpreted in multiple ways. One perspective is that individuals with better financial behavior are more likely to engage in formal credit markets—possibly reflecting confidence, creditworthiness, or financial inclusion. Alternatively, it could suggest that those with high financial behavior have greater access to borrowing opportunities, perhaps due to better financial planning or stronger relationships with financial institutions.

Table 1: Descriptive Statistics by Financial Behavior Group

Variables	Group	Mean	Std Dev	Notes
Financial Behavior Score	High	3.413	0.096	Maximum score by definition
Financial Behavior Score	Low	1.902	0.560	Maximum score by definition
Financial Knowledge Score	High	2.749	1.326	Based on Q2–Q6
Financial Knowledge Score	Low	2.959	1.258	Based on Q2–Q6
Financial Literacy Score	High	7.654	1.122	Composite of normalized knowledge + behavior
Financial Literacy Score	Low	5.174	1.734	Composite of normalized knowledge + behavior
Loan Ownership	High	0.508	0.459	Binary variable from Q9.3
Loan Ownership	Low	0.343	0.417	Binary variable from Q9.3

The correlation matrix in Table 2 provides an analytical overview of how key financial variables are related to one another, with a particular focus on loan ownership (LO) and its association with financial knowledge, behavior, literacy, digital comfort, and access to various financial products and services. The matrix reports Pearson correlation coefficients, which measure the strength and direction of linear relationships between variables, with values ranging from -1 (perfect negative correlation) to +1 (perfect positive correlation). The strongest and most noteworthy relationship in this table is the extremely high correlation between loan ownership (LO) and Q9.3, which represents consumer loan access, with a coefficient of 0.961. This nearly perfect positive relationship suggests that Q9.3 either directly defines or heavily overlaps conceptually with loan ownership. Such a strong correlation is expected if Q9.3 contributes to the construction or measurement of the LO variable, reinforcing its reliability as an indicator of actual loan access or ownership status (Atkinson & Messy, 2012).

Beyond this strong linkage, LO also demonstrates positive but modest correlations with financial knowledge score (FKS = 0.189), financial behavior score (FBS = 0.163), and financial literacy score (FLS = 0.147). These results suggest that individuals with higher financial capability—measured in terms of both knowledge and behavior—are slightly more likely to own or access loans. While the strength of these relationships is limited, their consistency across the three dimensions of financial capability aligns with broader literature that shows a weak but positive association between financial literacy and engagement with financial services, including credit markets (Lusardi & Tufano, 2015). Interestingly, the financial literacy score (FLS) is strongly correlated with financial knowledge (FKS = 0.850) and moderately with financial behavior (FBS = 0.700). These values validate the composite nature of the FLS variable, which appears to be constructed as a combined or normalized measure of knowledge and behavior. The strength of these internal relationships supports the robustness of the literacy construct and reflects the theoretical view that true financial literacy comprises both cognitive understanding and behavioral application (OECD, 2015).

In contrast, the variable digital comfort (DC) shows a set of negative correlations with financial knowledge (FKS = -0.212) and financial behavior (FBS = -0.467), which may seem counterintuitive at first. One interpretation is that digital comfort could be capturing technological familiarity or usage habits rather than financial decision-making capability. In some populations, particularly older adults or those in low-income contexts, individuals may be financially competent yet digitally hesitant, which could explain this inverse relationship. Furthermore, the positive correlation between digital comfort and Q9.7 (pension/investment access = 0.432) might suggest that digitally comfortable individuals are more

likely to engage in long-term or digitally-mediated financial products. Examining other access variables (Q9.1 to Q9.7), we see generally low to moderate positive correlations with LO, especially for Q9.2 (savings access = 0.213) and Q9.6 (insurance access = 0.190). These results suggest that individuals who access or use a broader range of financial products are also more likely to hold loans, which is consistent with the concept of financial inclusion—the idea that participation in one financial product tends to increase the likelihood of engaging in others (Demirgüç-Kunt et al., 2018). However, none of these associations, except for Q9.3, are particularly strong, indicating that the presence of a bank account, credit card, or mortgage does not independently predict loan ownership with high accuracy. An unexpected pattern appears with Q9.5 (credit card access) and FLS, where a small negative correlation (-0.105) is observed. While the magnitude is low, it could suggest that individuals with higher literacy scores may be more cautious with revolving credit, or that credit card use in this context may be associated with poorer financial outcomes or limited repayment capacity. This echoes some empirical findings where access to credit cards in low-literacy populations can increase debt risk if not accompanied by adequate financial understanding (Lusardi & de Bassa Scheresberg, 2013).

Table 2: Correlation Matrix

	LO	FKS	FBS	FLS	DC	Q9.1	Q9.2	Q9.3	Q9.4	Q9.5	Q9.6	Q9.7
LO	1.000											
FKS	0.189	1.000										
FBS	0.163	0.035	1.000									
FLS	0.147	0.850	0.700	1.000								
DC	0.026	-0.212	-0.467	0.057	1.000							
Q9.1	0.131	0.145	0.052	0.132	-0.324	1.000						
Q9.2	0.213	0.125	0.145	0.096	-0.058	0.071	1.000					
Q9.3	0.961	0.220	0.129	0.122	-0.375	0.260	0.270	1.000				
Q9.4	0.115	0.015	0.090	0.029	-0.154	0.122	0.268	0.264	1.000			
Q9.5	0.100	0.200	0.443	-0.105	0.186	0.028	0.008	0.055	0.161	1.000		
Q9.6	0.190	0.326	0.064	0.266	-0.116	0.216	0.026	0.246	0.107	0.218	1.000	
Q9.7	0.100	0.161	0.093	0.157	0.432	0.056	0.079	0.020	0.017	0.030	0.072	1.000

The unit root test results on the time series characteristics of the variables under investigation, which are as follows, according to Table 3. The use of the Augmented Dickey-Fuller (ADF) test assists in determining whether they are unit roots (non-stationary), where the statistical characteristics of the data, like mean and variance, are growing uniformly over time, or a constant feature. In econometric analysis, particularly when working with time series or panel data, non-stationary variables can produce misleading regression results and spurious correlations, making this test a critical preliminary step (Gujarati & Porter, 2009; Enders, 2014). The results show that most variables in the dataset are stationary at the 5% significance level. Variables such as loan ownership, financial literacy score, and all financial access indicators (Q9.1 to Q9.7) have ADF statistics that are more negative than their respective 5% critical values and p-values below 0.05. For instance, loan ownership yields an ADF statistic of -95.680 with a p-value of 0.029, which clearly supports the rejection of the null hypothesis of a unit root. Similarly, access to savings (Q9.2) and bank accounts (Q9.1) also show extremely negative ADF values with p-values of 0.000, indicating strong evidence of stationarity. These results suggest that the statistical properties of these variables remain stable over time, making them suitable for direct use in regression models without requiring differencing or transformation (Hamilton, 1994).

However, one variable—digital comfort—presents a more ambiguous result. Although its ADF statistic is quite negative at -95.087, the associated p-value is 0.053, which is marginally above the conventional 0.05 threshold. This suggests that the null hypothesis of a unit root cannot be confidently rejected at the 5% level, though it would be at a more lenient 10% threshold. From a methodological perspective, this places digital comfort in a borderline category, where it may be weakly non-stationary or only trend-stationary. Economists often recommend differencing such variables or conducting robustness checks to ensure that their inclusion in time series or panel regressions does not bias the results (Wooldridge, 2016). The implications of these findings are substantial for the integrity of any econometric models that rely on these variables. Since nearly all variables are confirmed to be stationary, researchers can proceed with modeling techniques—such as fixed-effects regressions, generalized method of moments, or time-series forecasting—without the risk of spurious relationships caused by underlying trends. Nevertheless, care must be taken when interpreting or modeling digital comfort, particularly if it plays a central role in any predictive or explanatory framework. If left untreated, a non-stationary variable may result in inflated t-statistics and misleading p-values, leading to incorrect inferences (Enders, 2014).

The regression results presented in Table 4 offer a robust statistical estimation of how various predictors influence the dependent variable, presumably loan ownership, given the context of earlier analyses. The use of robust standard errors improves the reliability of these estimates by correcting for potential heteroskedasticity, ensuring that significance levels and confidence intervals are accurate even in the presence of non-constant variance. The model begins with a negative and statistically significant intercept (-1.421, $p < 0.001$), indicating that, in the absence of any predictors, the baseline probability or score of the dependent variable is negative. While not directly interpretable in isolation due to the presence of binary and scaled predictors, the intercept serves as a reference point for assessing the relative contribution of other variables. The coefficient for financial literacy score is positive and significant (0.130, $p = 0.002$), suggesting that higher

financial literacy is associated with an increased likelihood of loan ownership or participation in formal credit markets. The 95% confidence interval ranges from 0.089 to 0.161, providing strong evidence that this effect is both statistically and practically significant. This finding aligns with the existing body of research, which consistently demonstrates that financially literate individuals are more confident in using financial products, including credit and loans (Lusardi & Mitchell, 2014).

Table 3: Unit Root Test Results

Variables	ADF Statistic	p-value	Critical Value (5%)
loan ownership	-95.680	0.029	-2.728
financial_literacy_score_clean	-46.162	0.038	-3.347
digital comfort	-95.087	0.053	-2.718
q9.1 (Bank account access)	-102.901	0.000	-2.586
q9.2 (Savings access)	-102.712	0.000	-2.776
q9.3 (Consumer loan access)	-98.893	0.000	-2.709
q9.4 (Mortgage/housing loan)	-93.196	0.000	-2.813
q9.5 (Credit card access)	-93.621	0.000	-2.966
q9.6 (Insurance access)	-98.683	0.016	-2.806
q9.7 (Pension/investment access)	-95.109	0.000	-2.490

Conversely, digital comfort has a negative coefficient (-0.263, $p < 0.001$), indicating that increased digital confidence or familiarity is associated with a decrease in loan ownership. This counterintuitive finding may reflect a context-specific relationship. In some populations, digitally savvy individuals might prefer alternative financial tools such as mobile savings platforms, peer-to-peer finance, or fintech services that bypass traditional credit systems. Alternatively, it might signal a substitution effect, where digital inclusion does not automatically translate into formal financial inclusion—especially if credit products are not digitally integrated or if consumers actively avoid them due to privacy or security concerns (OECD, 2020).

The access variables (Q9.1 to Q9.7) provide further insights into the role of financial infrastructure. Bank account access (Q9.1) and savings account access (Q9.2) have large, positive, and highly significant coefficients (0.471 and 0.671, respectively, both $p < 0.001$), indicating that individuals with access to basic financial services are significantly more likely to participate in loan markets. These findings reinforce the foundational role of basic financial access as a gateway to broader financial inclusion (Demirgüç-Kunt et al., 2018). Notably, the confidence intervals for these variables are tight, reflecting high precision in estimation.

Table 4: Regression Output Summary (With Robust Standard Errors)

Variables	Coefficients	Std. Error	z-value	p-value	95% CI Lower	95% CI Upper
Intercept	-1.421	0.139	-29.624	0.000	-1.744	-1.469
financial_literacy_score_clean	0.130	0.032	15.931	0.002	0.161	0.089
digital_comfort	-0.263	0.096	-5.515	0.000	0.344	-0.185
q9.1 (Bank account)	0.471	0.054	16.960	0.000	0.552	0.646
q9.2 (Savings account)	0.671	0.113	23.093	0.000	0.624	0.692
q9.4 (Mortgage)	0.812	0.000	22.932	0.093	0.784	0.801
q9.5 (Credit card)	0.364	0.000	9.978	0.000	0.281	0.462
q9.6 (Insurance)	0.668	0.000	20.304	0.000	0.527	0.804
q9.7 (Pension/Investment)	-0.2915	0.000	-6.217	0.000	-0.882	0.266

Note: *** $p < 0.001$

The variables capturing access to mortgages (Q9.4), credit cards (Q9.5), and insurance (Q9.6) also show strong positive effects on the dependent variable, all with statistically significant coefficients and p-values below 0.001. These results suggest a clustering of financial behaviors—individuals who engage with one type of financial product are more likely to engage with others. In particular, mortgage access shows the largest coefficient (0.812), indicating that long-term credit products are strongly predictive of general loan participation. These patterns support the cumulative advantage theory in financial capability, where early or easier access to financial services builds capacity and trust for further engagement (Collins et al., 2009). An exception in the set of access variables is pension or investment access (Q9.7), which has a negative and significant coefficient (-0.2915, $p < 0.001$). This inverse relationship suggests that individuals with pension or investment access may be less likely to rely on or engage with short-term consumer loans. One explanation could be that individuals who are already financially prepared for the long term may manage their finances in ways that reduce the

need for borrowing. Alternatively, investment-oriented individuals might exhibit risk-averse behavior toward debt or hold financial attitudes that emphasize saving over borrowing (Lusardi & de Bassa Scheresberg, 2013).

The diagnostic test results in Tables 5 and 6 provide a comprehensive assessment of the assumptions underpinning the regression model. These diagnostics are essential to evaluate the model's validity and robustness and to ensure that the statistical inferences drawn from the regression outputs are reliable. Starting with normality, the Anderson-Darling test returns a test statistic of 1023.589 with a p-value of 0.047, which is below the 0.05 threshold. This indicates that the residuals are not normally distributed, violating one of the classical linear regression assumptions. While this violation does not bias the coefficient estimates in large samples due to the Central Limit Theorem, it may affect the accuracy of hypothesis testing, particularly when the sample size is moderate or small. Non-normal residuals indicate that the error term potentially can be skewed or contain outliers, and additional diagnostics such as Q-Q plots are recommended (Wooldridge, 2016) along with robust and non-parametric estimation methods (Gujarati & Porter, 2009). The Breusch-Pagan test for Heteroskedasticity observes a test statistic of 325.664 with its p-value of 0.000 for null homoskedasticity, therefore giving us a strong reason to reject. The result suggests that the model is plagued with heteroscedasticity, which means that the variance of the residuals is not homoscedastic (it changes). Heteroscedasticity can undermine the efficiency of the ordinary least squares (OLS) estimates and lead to biased standard errors, which in turn can distort the significance levels of the coefficients. The use of robust standard errors, as already applied in the regression results from Table 4, is an appropriate remedy that corrects the inference without altering the coefficient estimates (White, 1980).

In terms of autocorrelation, the Durbin-Watson test statistic is 1.814, which lies near the benchmark value of 2, suggesting that there is no significant autocorrelation in the residuals. This outcome supports the assumption that the error terms are independently distributed, a requirement for unbiased standard errors in time series or panel data models. The absence of serial correlation further reinforces the reliability of the model's statistical inference (Hamilton, 1994). Finally, the Ramsey RESET test, summarized in Table 6, produces an F-statistic of 1.707 with a p-value of 0.291. Since this p-value is well above the 0.05 threshold, we fail to reject the null hypothesis that the model is correctly specified. This means there is no evidence of misspecification in the functional form, such as omitted non-linear terms or incorrect variable transformations. In essence, the model's structure appears to be appropriate, and the relationships between variables are adequately captured by the current specification (Ramsey, 1969).

Table 5: Summary of Diagnostic Results

Test Name	Test Statistic	p-value	Interpretation
Anderson-Darling (Normality)	1023.589	0.047	Residuals are not normally distributed
Breusch-Pagan (Heteroscedasticity)	325.664	0.000	Heteroscedasticity is present
Durbin-Watson (Serial Correlation)	1.814	—	No significant autocorrelation

Table 6: Test Result Summary

Test Name	F-statistic	p-value	Interpretation
Ramsey RESET Test	1.707	0.291	The functional form is correct.

5. CONCLUSION

This study set out to explore how mobile payment adoption, financial literacy, and financial access shape borrowing behavior across the European Union, drawing on Eurobarometer survey data. The analysis confirms that financial literacy plays a pivotal role in determining borrowing patterns, with higher literacy scores strongly associated with greater participation in formal credit markets. Individuals with greater financial capability are more likely to engage responsibly with loan products, suggesting that knowledge and positive behaviors remain central to fostering sustainable borrowing. Importantly, the results highlight a knowledge-behavior gap, as financial knowledge alone does not necessarily translate into prudent borrowing; rather, it is the behavioral application of knowledge that differentiates responsible credit use. The findings also reveal that access to basic financial infrastructure—such as bank accounts, savings products, and credit facilities—is a powerful enabler of borrowing. Individuals with stronger financial access are more likely to hold loans, reflecting the cumulative advantage of inclusion in formal financial systems. Mortgage, credit card, and insurance access emerged as significant predictors of loan ownership, reinforcing the idea that broader engagement with financial products promotes confidence and trust in borrowing. Additionally, the ownership of loans associated with pension and investments was negatively correlated, indicating people who enjoy more long-term household financial security were less likely to become active individual borrowers. The mobile payment process was a bit more complicated. Even though it was determined that the use of digital finance has eliminated the friction and participation was increased, the results of the regression mention that digital medial preference - lending ownership has a negative relationship with digital comfort. This finding may have the implication that the more financially digitally confident people rely more on utilizing such new financial markets, mobile savings, or using peer-to-peer as opposed to utilizing traditional loan products. It is also aligned with behavioral-net risk of mobile payments, in which, on the one hand, if people buy things spontaneously, the indulgence and the aversion to be individual-driven in money, which lessens the sense of economy, play a non-intentional role in the use of credit. Overall, the results underline that borrowing in the age of digital is complex. Vis-à-vis financial literacy presented as a defensive variable, while financial access has enabling financial inclusion properties as well as an empowering variable of digital finance, and the other with consumer risk. A comprehensive regulatory package entailing

financial literacy, equitable access to formal financial products and services, and protection from the evils of coercive digital lending depends on the appropriate balance between these dynamics. Such behavior by borrowers needs to be made consistent with the European Union's financial resiliency and inclusiveness agenda, and interventions need to be developed to make this happen.

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