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THEORETICAL FOUNDATIONS OF ONLINE BANKING DEVELOPMENT IN THE INTERNATIONAL FINANCE CONTEXT

Abstract: Online banking has evolved from a supplementary electronic delivery channel into a core institutional component of contemporary banking and international finance. The relevance of this topic is determined by the rapid diffusion of mobile banking, open banking, instant payments, platform-based financial ecosystems and data-driven financial services. The article examines the economic essence of online banking, its role in the modern banking system, its place within international financial relations, the principal models of digital banking, and current global trends in banking digitalisation. The study is based on qualitative analysis of academic literature, regulatory documents and reports of international financial institutions, including the Bank for International Settlements, the Basel Committee on Banking Supervision, the Financial Stability Board, the International Monetary Fund, the World Bank, the European Central Bank and the OECD. The results show that online banking preserves the fundamental economic functions of banks as financial intermediaries while changing the channels, cost structure, information intensity and competitive logic of banking. It also strengthens the connection between domestic banking markets and international financial relations through cross-border payments, data flows, financial inclusion and platform competition.

Key words: online banking; digital banking; international finance; open banking; financial ecosystems; cross-border payments; banking digitalization.

Introduction: The banking sector is undergoing a structural transformation in which digital channels have become central to financial intermediation. Online banking, understood as the provision of banking services through internet-based channels, now includes mobile and web banking, digital payments, remote account management, online lending, card controls and personal finance services. In its advanced forms, it is closely connected with open banking, embedded finance, digital ecosystems, artificial intelligence, cloud technologies and APIs.

The relevance of this topic is determined by the shift in customer behavior toward permanent digital access, the need for banks to reduce transaction costs and personalize services, and the growing competition from fintech firms, payment institutions and Big Tech companies. In addition, the internationalization of payments, e-commerce and remittances has made online banking an important element of international financial relations.

The research problem lies in the fact that online banking is often studied through separate dimensions, such as financial intermediation, payment systems, competition, cybersecurity or financial inclusion. However, these aspects are deeply interconnected. Online banking transforms both the traditional functions of banks and the institutional boundaries of the financial system.

The purpose of this article is to systematize the theoretical foundations of online banking development in the context of international finance. The article clarifies the economic essence of online banking, examines its role in international financial relations, classifies the main digital banking models and identifies current global trends in banking digitalization.

Methods and Research: The study applies a qualitative analytical and comparative research design aimed at synthesizing academic literature and institutional reports into a theoretical framework. The research is based on conceptual analysis, comparative institutional analysis and functional classification. Conceptual analysis is used to define online banking and

distinguish it from digital banking, fintech, open banking and embedded finance. Comparative institutional analysis examines how online banking develops across different market and regulatory models, including incumbent banks, digital-only banks, open banking frameworks, platform ecosystems and BigTech finance. Functional classification connects online banking with the core functions of financial intermediation, such as payments, liquidity provision, risk management, customer data processing and transaction-cost reduction.

Results and Discussion: The economic essence of online banking can be understood through the transformation of how banks perform their traditional functions. Classical banking theory identifies banks as institutions that provide liquidity, transform maturities, monitor borrowers and organise payments. Diamond explains banks as delegated monitors that reduce the duplication of monitoring costs between lenders and borrowers [1]. Diamond and Dybvig show that banks perform liquidity transformation, although this function also creates vulnerability to coordination problems among depositors [2]. Online banking does not replace these functions. Instead, it changes their technological and organizational form by making them remote, automated, data-intensive and scalable.

In its narrow meaning, online banking is a digital channel through which customers can access bank accounts, obtain information and conduct transactions. Early research on electronic banking already emphasized that banking services are information-intensive and therefore suitable for electronic delivery [3]. In the contemporary banking system, however, online banking is more than a channel. It has become part of the bank's operating model, because customer acquisition, payments, onboarding, credit scoring, fraud detection, product recommendations and service communication are increasingly mediated through digital interfaces.

From an economic perspective, online banking reduces both transaction costs and information costs. Transaction costs decline because customers can

execute routine operations without visiting branches, while banks can process large volumes of standardized transactions at low marginal cost. Information costs decline because digital channels generate structured data on customer behavior, income flows, payment habits and product use. Boot et al. argue that recent fintech development accelerates the use of hard information and reduces dependence on physical proximity in financial intermediation [5]. This is one of the most important theoretical effects of online banking: the customer relationship becomes measurable, algorithmic and continuously updated.

The place of online banking in the modern banking system is therefore dual. At the operational level, it is a distribution and service channel. At the strategic level, it is a basis for the redesign of the banking business model. Digital interfaces allow banks to maintain frequent interaction with customers, especially through payments and daily money management. This changes the relative importance of banking products. Products that generate frequent digital contact, such as payments, cards and account notifications, become central to customer engagement, even if traditional profitability still depends heavily on lending, deposits and fee income.

Digitalization also changes competition. Vives characterizes banking as moving toward a more customer-centric and platform-based model as a result of technological disruption [6]. In this model, competitive advantage depends not only on balance-sheet capacity and regulatory trust but also on user experience, data analytics, speed of innovation, cybersecurity and ecosystem integration. Incumbent banks retain advantages in licensing, deposits, risk management and trust, but they face pressure from fintech firms and Big Tech companies that compete through superior interfaces, specialized services and platform reach.

At the same time, online banking creates new risk channels. The Basel Committee’s early principles for electronic banking already identified operational, legal, reputational and strategic risks related to electronic delivery [7]. In the current environment, these risks are amplified by dependence on

cloud providers, APIs, third-party service providers, mobile operating systems, biometric authentication and artificial intelligence. Therefore, the development of online banking requires not only technological investment but also operational resilience, cybersecurity, third-party risk management and clear governance.

Online banking within the system of international financial relations

Online banking has become embedded in international financial relations because digital banking channels mediate cross-border payments, remittances, foreign exchange transactions, international e-commerce and the remote use of financial services. International finance is traditionally associated with capital flows, currency markets, international payment systems, correspondent banking, multinational banks and financial regulation. Online banking adds a customer-facing layer to this system: individuals and firms can initiate international transfers, manage multi-currency accounts, use cards abroad, receive remittances and interact with foreign merchants through digital interfaces.

The most direct link between online banking and international finance is cross-border payments. A customer may initiate a transfer through a mobile application, but the payment often depends on correspondent banks, messaging standards, payment system interoperability, foreign exchange settlement, compliance screening and domestic payment rails. The Financial Stability Board notes that the G20 Roadmap for enhancing cross-border payments aims to make payments faster, cheaper, more transparent and more accessible; however, its 2025 progress report concludes that policy efforts have not yet produced sufficient tangible improvements for end-users at the global level [15]. This demonstrates that online banking can improve the front-end customer experience while the underlying international payment infrastructure remains complex.

Online banking also supports financial inclusion. The World Bank's Global Findex 2025 reports that 79% of adults globally now have an account

and that 84% of adults in low- and middle-income countries own a mobile phone, with three billion owning smartphones [18]. These figures show why digital banking is important for development finance: mobile and internet-based channels can reduce geographical barriers, lower the cost of account access and support digital payments, savings and remittances. Nevertheless, digital access does not automatically mean equal financial inclusion. Exclusion may persist because of limited internet access, low digital literacy, weak identity systems, gender gaps, affordability constraints and cybersecurity risks.

In foreign exchange relations, online banking increases transparency and accessibility. Customers can compare exchange rates, convert currencies, hold multi-currency balances and make international card payments through bank applications. For firms, online banking supports treasury management, invoice payments, supplier settlement and export-import operations. These services connect retail and small-business clients with international financial markets that were previously more accessible to corporations and wholesale institutions.

Another international dimension is data governance. Online banking relies on the processing and transfer of personal, transactional and behavioural data. When banks use foreign cloud providers, international payment processors, fraud analytics vendors or group-level data platforms, financial data may cross national borders. Open banking intensifies this issue because customer-permissioned data may be shared with third-party providers. The Basel Committee defines open banking as the sharing and leveraging of customer-permissioned data by banks with third-party developers and firms to build applications and services [8]. This creates potential benefits for innovation but also demands coordination among financial regulators, competition authorities, data protection authorities and cybersecurity bodies.

Anti-money laundering and countering the financing of terrorism also become more complex in online banking. Remote onboarding, instant transfers and cross-border digital transactions create opportunities for faster service

delivery, but they also create risks of identity fraud, mule accounts, sanctions evasion and transaction layering. Online banking must therefore be supported by reliable digital identity, strong customer authentication, transaction monitoring and international supervisory cooperation. The international nature of these risks explains why digital banking is increasingly addressed by global standard setters rather than only by national regulators.

Online banking models and digital banking ecosystems

The development of online banking has produced several models that differ by institutional form, ownership of the customer interface, regulatory status and degree of ecosystem integration. The first model is the traditional bank with digital channels. In this model, a licensed bank retains the full banking value chain but transfers customer interaction from branches to web and mobile interfaces. The advantage of this model is institutional trust, deposit funding and supervisory experience. The challenge is the presence of legacy IT systems, slower organisational change and the cost of maintaining both physical and digital infrastructure.

The second model is the digital-only bank or neobank. Such institutions conduct business primarily in the online space and do not rely on traditional branch networks. The European Central Bank reported that, as of year-end 2024, about 60 banks in the euro area were identified as digital-only, seven of which were subsidiaries of traditional banks; it also reported that their market share increased from 3.1% of total assets in 2019 to 3.9% in 2024 [19]. This example shows that digital-only banking has become a recognised regulated model, although not yet dominant in terms of assets. Digital banks compete through faster onboarding, lower operational costs, mobile-first interfaces and targeted customer propositions. However, they may face profitability constraints, high acquisition costs, limited product depth and deposit funding risks.

The third model is open banking. It is based on customer-permissioned data sharing, normally through APIs. Open banking changes the structure of

banking because the customer's account-holding bank may no longer control all digital services around the account. Third parties can provide account aggregation, payment initiation, budgeting tools, credit comparison and other services. The Basel Committee notes that open banking can support faster and easier payments, financial transparency, account services and cross-selling opportunities, but it also creates challenges related to liability, cybersecurity, data protection and supervision [8]. The European PSD2 framework illustrates a regulatory approach to opening payment account access and increasing competition in retail payments [24].

The fourth model is Banking-as-a-Service. In this model, a licensed bank provides regulated infrastructure through APIs, allowing fintech firms, marketplaces or software companies to embed banking products into their own platforms. The bank may hold the licence, accounts and compliance responsibility, while another company owns the customer interface. This model reflects the modularisation of banking. It can create new revenue streams for banks but also raises questions concerning responsibility, consumer communication, outsourcing and third-party governance.

The fifth model is embedded finance. Financial services are integrated directly into non-financial customer journeys, such as e-commerce checkout, merchant platforms, travel applications, payroll systems or accounting software. In this model, the customer may not consciously enter a bank's digital channel; the financial service appears at the point of need. Embedded finance therefore challenges banks to decide whether they will remain the visible customer-interface owner or become a regulated infrastructure provider behind non-financial platforms.

The sixth model is the platform banking ecosystem. A banking ecosystem integrates financial and sometimes non-financial services around customer needs. The economic logic is based on economies of scale, economies of scope, network effects and data-driven personalisation. The European Banking

Authority observes rapid growth in digital platforms that bridge customers and financial institutions and warns that platformisation creates new financial, operational and reputational interdependencies [20]. This is a central theoretical point: as banking becomes platform-based, risk is distributed across banks, fintech firms, data providers, cloud companies and non-financial digital platforms.

The seventh model is BigTech finance. BigTech firms enter financial services from a strong position in data analytics, user networks and existing digital ecosystems. The BIS describes BigTech finance through the interaction of data analytics, network externalities and interwoven activities [11]. These characteristics allow technology companies to scale payment, credit, insurance and investment services quickly. However, BigTech participation in finance also creates competition, concentration, data governance and financial stability concerns. For banks, BigTech finance is not only a competitive threat but also a potential source of partnership and technological dependency.

These models show that the banking value chain is becoming less vertically integrated. The key analytical question is no longer whether a bank has an online application. It is who owns the customer relationship, who holds the licence, who controls the data, who processes the transaction, who bears the risk and who captures the economic value. Online banking therefore becomes a mechanism through which banking shifts from institution-centred intermediation to networked financial service provision.

Current global trends in banking digitalisation

Several global trends define the current stage of online banking development. The first is mobile-first banking. Mobile applications have become the primary point of interaction between banks and customers in many countries. The importance of mobile access is reinforced by the World Bank's evidence on global account ownership and mobile phone diffusion [18]. Mobile-first banking increases convenience and inclusion but also creates dependence

on smartphones, telecommunications infrastructure, application security and digital literacy.

The second trend is the expansion of instant and real-time payments. Customers increasingly expect immediate transfers, real-time notifications and instant confirmation of financial operations. This trend changes fraud management and liquidity management because faster payments reduce the time available for manual intervention. It also supports new payment forms such as account-to-account transfers, request-to-pay services and cross-border linkages between fast payment systems. The FSB's 2025 report emphasises that domestic payment infrastructure modernisation and interoperability are important for cross-border payment improvement [15].

The third trend is the transition from open banking to open finance. Open finance extends data portability beyond payment accounts to a broader set of financial products, potentially including insurance, pensions, investments and mortgages. The OECD argues that open banking and data portability create opportunities for competition and innovation but require careful coordination with privacy, competition and financial regulation [21]. This trend suggests that online banking will increasingly be part of broader data-sharing frameworks rather than isolated bank-controlled applications.

The fourth trend is the use of artificial intelligence and machine learning. AI is applied to credit scoring, fraud detection, anti-money laundering monitoring, chatbots, customer segmentation, product recommendations, document processing and operational risk management. The Basel Committee identifies artificial intelligence and machine learning, APIs, distributed ledger technology and cloud computing among the technologies transforming the banking value chain [10]. These technologies can increase efficiency and personalisation, but they also raise issues of explainability, bias, model risk, data quality and accountability.

The fifth trend is cloud adoption and third-party dependency. Cloud infrastructure can improve scalability and flexibility, but it also creates concentration risk if many financial institutions depend on the same technology providers. This is why operational resilience has become a prudential priority. The Basel Committee's principles for operational resilience emphasise that banks must be able to withstand, adapt to and recover from operational disruptions [9]. Online banking therefore requires not only front-end innovation but also robust continuity planning, incident response and vendor oversight.

The sixth trend is cybersecurity. The International Monetary Fund reports that cyberattacks have almost doubled since before the COVID-19 pandemic and that nearly one-fifth of cyber incidents affect financial firms [16]. This evidence is particularly relevant for online banking because digital channels increase the attack surface of financial institutions. Cybersecurity is not only a technical issue but also a macrofinancial concern: a major cyber incident can damage trust, disrupt payments, generate liquidity pressure and transmit stress across interconnected institutions.

The seventh trend is tokenisation and the search for new settlement architectures. The Financial Stability Board notes that tokenisation initiatives may involve financial assets such as tokenised money, securities, bank deposits or real assets, although current adoption remains limited [14]. The BIS argues that a next-generation monetary and financial system could involve tokenised central bank reserves, commercial bank money and government bonds on unified ledger-type platforms [12]. For online banking, these developments may eventually affect settlement, collateral management, securities services and cross-border payments. However, they also raise questions of legal finality, interoperability, liquidity, custody, monetary sovereignty and regulatory oversight.

The eighth trend is continued exploration of central bank digital currencies. The IMF's CBDC Virtual Handbook presents CBDCs as a policy

area requiring analysis of financial stability, payments competition, monetary policy, financial integrity, legal design and operational resilience [17]. CBDCs are not the same as online banking, but their development may reshape the monetary infrastructure within which online banking operates. If central bank digital money becomes widely used, commercial banks may need to adapt their deposit, payment and customer-interface strategies.

The ninth trend is the platformisation of financial services. Banks increasingly compete not only by offering individual products but by organising ecosystems of payments, deposits, lending, investments, insurance, loyalty programmes and partner services. Platformisation can increase customer engagement and diversify revenue sources, but it also intensifies third-party risk, data governance challenges and supervisory complexity. The future of online banking is therefore likely to be hybrid: banks will remain regulated financial intermediaries, but their competitive position will depend on technological capability, customer trust, data governance and the ability to manage ecosystem partnerships.

Conclusion

Overall, the results show that online banking is a structural transformation of banking rather than a simple replacement of branches by applications. Its theoretical significance lies in the simultaneous transformation of intermediation, payments, customer data, competition and regulation. Within international finance, online banking links domestic banking systems to cross-border payments, digital platforms, global data flows and international standard-setting. Its further development will depend on the ability of banks and regulators to balance innovation, inclusion, efficiency, resilience and trust.

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