

Innovation and competition in Internet and mobile banking: an industrial organization perspective*

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Abstract

Over the recent years, the development of Internet banking and mobile banking has had a considerable impact on competition in the retail banking industry. In some countries, the regulatory framework has been adapted to allow non-banks to operate in retail payments and compete with banks for deposits. Several Internet Service Providers or large retailers have started to offer innovative financial products to their customers. In this paper, we survey the issues related to innovation and competition in Internet banking and mobile banking and discuss some perspectives for future research.

Keywords: bank competition; bank regulation; non-banks; payment systems; Internet banking; mobile banking.

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Over the recent years, the development of Internet banking and mobile banking services has had a considerable impact on the industrial organization of the retail-banking sector, both in developed and developing countries.¹ Several merchants and start-ups have started to offer financial products traditionally offered by banks, such as stored-value payment cards, mobile payment apps providing consumers with tools to manage their accounts, or loans offered through peer-to-peer lending platforms. A number of press articles have argued that non-banks could threaten banks' market power², while venture capitalists have started to discuss the possible strategies to build a "disruptive bank".³ On the Eurobarometer released in 2012, the European Commission found that, on average, nearly half of the European population makes use of online banking, with a peak of 87% of the population for Denmark, Sweden and Finland citizens.

The purpose of this paper is to survey the issues related to innovation and competition in Internet and mobile banking and to offer perspectives for future research.

In Freixas and Rochet (2008), a bank is defined as an institution whose current operations consist in granting loans and receiving deposits from the public. There are mainly two perspectives to study the role of banks in the microeconomics literature on banking. A first approach is taken in the literature on financial intermediation, which focuses on explaining why banks emerge as intermediaries between depositors and borrowers. A second approach is taken in the literature on industrial organization, which studies the strategic behavior of banks, using tools derived from game theory. In this strand of the literature, banks are modeled as multiproduct firms offering loans and deposit services. Our purpose is to survey how the industrial organization literature can help in the analysis of the links between innovation and competition in Internet and mobile banking.

¹ In our paper, we define retail banking as the cluster of products and services that banks provide to consumers and small businesses through branches, the Internet, and other channels. Freedman, 2000, defines e-banking as the provision of access devices (ATMs and home banking by computer), stored-value cards and prepaid software products.

² See in the Economist (May 10th-16th 2014) an article entitled "Payments: the end of a monopoly".

³ Christensen (1997) defines a disruptive innovation by two characteristics. Initially, the technology performs worse than alternatives on performance criteria that mainstream customers care about. But a potentially disruptive technology that improves fast can become actually disruptive and drive the incumbents out of the market.

A first issue is to give a precise definition of innovation. Frame and White (2009) define a financial innovation as something new that reduces costs, risks, or provides an improved product/service/instrument that better satisfies financial system participants' demand. Our paper focuses on service innovations that can be used for Internet or mobile banking. We simplify our study by assuming that banks offer mainly two categories of services, those related to deposits and those related to loans. Services related to deposits include storing monetary value, withdrawing money, paying, enabling consumers to invest in assets by subscribing to savings products, or to obtain information on their account. Services related to loans include obtaining information on when to pay interests, and intermediation services for customers unable to access financial markets. Table 1 below provides a summary of the simplified view of innovative banking services that we will use throughout our paper.⁴

Table 1. Innovations in Internet and mobile banking

	Types of services	Examples of entrant firms providing these services	Example of innovation
Services related to deposits	Store monetary value	Starbucks, Apple	Stored-value card
	Savings	Paypal	Personal finance tools apps
	Withdrawal	CommBank	Mobile technologies
	Payments	Apple pay, Alipay, Stripe and Square, Transferwise, Forex, Kantox	Touch ID, NFC, and Bluetooth technologies and cross border transactions
Services related to loans	Account information	Gemalto, mFoundry	Mobile technologies
	Intermediation	Supplier pay initiative, Alibaba Small Loans, Lending club, OnDeck, FundingCircle	Online platform

Understanding the links between innovation in Internet and mobile banking and competition on banking retail markets is relevant to enrich the literature on financial innovation, which highlights its importance for economic growth and efficiency (e.g., Levine, 1997 and Tufano, 2003). Therefore, an in-depth analysis of strategic interactions

⁴ For more details about the products and the firms mentioned in table 1, see Appendix 1. The usual distinction between product and process innovation is not easy. For example, Stored-Value cards can be classified as a product innovation. However, personal finance tools apps could be classified both as a product and a process innovation because they enable banks to economize on the costs of informing consumers.

between banks and entrant innovators can help policy-makers and regulators design the appropriate market conditions to favor the diffusion of innovations.

To our knowledge, our paper is the first to offer a general perspective on the issue of competition and innovation in Internet and mobile banking. Frame and White (2009) also review the literature on the impact of financial innovation on commercial banking, in the broad context of the economics literature on innovation. Berger (2003) examines the effect of technological changes on the productivity and the profitability of the banking industry. Our paper distinguishes itself from these two works by focusing specifically on the most recent innovations in Internet and mobile banking. Furthermore, our survey is centered on competition and regulatory issues.⁵ A number of articles have focused on specific services that emerged on the market, either in developed countries or in developing countries. For example, Shy (2012) reviews recent developments in online banking in the United-States and discusses policy issues related to account-to-account money transfers. Crowe, Rysman and Stavins (2010) focus on the development of mobile payments in the United-States. There is also a growing literature on the role of mobile banking in developing countries (e.g., Jack, Suri & Townsend, 2010). Our paper does not address the issue of whether mobile banking can improve financial inclusion in developing countries, as our focus is competition and regulatory issues.

The rest of the paper is organized as follows. In the first section, we survey the entry costs and barriers to entry⁶ faced by entrants. In the second section, we relate the various strategies that have been used by entrants (start-up companies, large retailers, platforms...) to the industrial organization literature. In the third section, we provide an overview of banks' reactions to the competitive threat posed by new entrants and analyze their incentives to innovate. Finally, we conclude.

⁵ Moreover, Frame and White (2009) in their definition of financial innovation include product, process and organizational innovations. We only focus on service innovations for Internet and mobile banking. Therefore, subprime mortgages, ACH networks and credit scoring innovations are out of the scope of our paper.

⁶ Bain (1956) defines as a barrier to entry anything that allows incumbent firms to earn supranormal profits without threat of entry. Von Weizsäcker (1980) uses a definition based on cost asymmetries between incumbent firms and entrants.

1/ Entry costs and barriers to entry in retail banking

In this section, we survey the literature on entry costs in retail banking and illustrate it with empirical observations.

- **a/ Regulatory barriers**

The retail banking industry is one of the most regulated industries in the economy. First, regulators impose barriers to entry on the market by requiring banks to obtain a license from the relevant authority and to implement sound risk management procedures. Second, banks' conduct is closely monitored by supervisors to ensure banks' compliance with regulatory requirements.

There are several justifications to banks' regulation (See Rochet, 2008, for a survey).⁷ First, banks transform deposits that can be withdrawn at any time into loans with a longer maturity and credit risk. Because of this transformation activity, banks are exposed to several risks, including liquidity risk, interest rate risk, credit risk, operational risk and systemic risk.⁸ In particular, in a fractional reserve system, banks keep only a fraction of depositors' funds in reserve to invest in long-term illiquid assets. Therefore, if the amount of early withdrawals exceeds the amount of short-term investments, banks need to sell illiquid assets, which is a source of liquidity risk (see Diamond and Dybvig, 1983). The banking sector is also vulnerable to bank runs, when depositors all withdraw their funds at the same time. Bank runs can be efficient, when they provoke the failure of an insolvent bank. However, most bank runs are inefficient, because they threaten "illiquid" banks that are solvent in the long run. To eliminate inefficient bank runs, in most countries, regulators have implemented mandatory insurance of deposits.⁹ This regulatory measure may limit considerably the ability of

⁷ The justifications for banking regulation are surveyed by Rochet (2008) in the introduction of the book "Why Are There So Many Banking Crises?," MIT Press.

⁸ The liquidity risk occurs when there is a maturity mismatch between the asset and liability side of a bank's balance sheet. The interest rate risk is generated by the transformation of fixed rate liabilities into variable rate assets (and vice versa). The credit risk occurs when a borrower is unable to repay a debt. Operational risk is due to fraud, information system failures and human errors. Systemic risk occurs when the risk taken by a financial institution impact other financial institutions.

⁹ Implementing deposit insurance schemes also increases moral hazard, because depositors have fewer incentives to monitor their banks when their funds are protected (see Kareken and Wallace 1978 or Dotham and Williams, 1980).

non-banks to compete with banks for deposits, unless, as we shall see later, they can form a partnership with a deposit-insured institution.

Another source of market failure stems from the excessive risks taken by banks on the asset side. Indeed, a bank's investment in risky activities cannot be monitored perfectly either by depositors or by other financial institutions. This information asymmetry is a source of moral hazard, as banks do not perfectly internalize the impact of their behavior with respect to risks on depositors and on the financial system. There are mainly two regulatory measures that mitigate banks' incentives to take risks: imposing high franchise values to banks and requiring them to hold variable capital amounts correlated to their level of risk. Basically, banks' incentives to take risks can be reduced as follows. First, higher franchise values increase banks' losses in case of failure (see Hellmann, Murdock and Stiglitz, 2000 or Matutes and Vives, 1996). Second, variable capital requirements provide banks with incentives to reallocate their portfolio in favor of less risky investments (Furlong and Keeley, 1989). In several countries, since the first Basel agreement (1988), banks have had to comply with solvency regulations, requiring them to hold a minimum capital level as a percentage of their risk weighted assets. Solvency regulations have evolved over time, to incorporate interest rate and market risk, and to correct the various regulatory failures that have been revealed by the subprime crisis (see Caprio, 2013 for a survey).

The recent innovations in Internet and mobile banking raise the issue of how to adapt the existing regulatory framework to non-banks, such as Internet Service Providers, platforms or large retailers. These new regulations impact both the deposit market (and a fortiori the payments market) and the market for loans. On the retail payments market, some regulators have designed new categories of licenses to facilitate the entry of non-banks.¹⁰ For example, in Europe, a firm can offer payment services either by becoming a Payments Service Provider (PSP), or an Electronic Money Institution (EMI). As long as the firm does not offer credit to its consumers, it does not need to comply with the full range of regulatory measures applied to banks. In particular, these new players have to meet lower initial capital requirements than banks, and the ongoing capital requirements are simpler than the regulations imposed by the

¹⁰ Bradford, Davies, and Weiner (2003) organize non-banks operating in retail payments into six groups: cheque conversion; electronic bill presentment and payment (EBPP); electronic invoice presentment and payment (EIPP); stored-value instruments; person-to-person (P2P) and person to business (P2B); contactless payments.

Basel agreements. Such lighter regulations also exist in other countries and jurisdictions as shown in table 3.¹¹ Another table in Appendix 2 shows the current minimum capital requirements in France and in Europe for different types of institutions. While these new regulations can facilitate innovation and entry, they can also constitute a significant barrier for entrant firms. For example, in Europe, the capital required to become an Electronic Money Institution has been lowered in the second Directive on Electronic Money in 2011 because of insufficient entry.

Table 3. Regulations of entry with a different license

	Law	Resulting regulatory status
Europe	Payment Service Directive	Payment Service Provider (PSP)/ Electronic Money Institution (EMI)
USA	FinCEN and Financial Act Task Force	Money Services Businesses (MSBs)
Australia	Banking Act (1959 and revised in 2014)	Authorized deposit-taking Institution (ADIs)

Other types of regulatory measures include ongoing capital requirements, and restrictions on investment in risky assets. Such prudential measures are meant to prevent these new players to take on excess leverage and become insolvent. In general, non-banks offering Internet and mobile payment services are not allowed to engage in the transformation activity that is performed by banks. Furthermore, regulators often require entrants to hold liquid assets in a bank account when they issue electronic money.¹² This is the case in Afghanistan, Democratic Republic of Kongo, Kenya, Philippines, and WAEMU. This measure can enhance consumer protection, especially when the money is kept in a deposit-insured institution. The regulator can also impose on entrants several daily, monthly or annual transaction limits like in Namibia, Pakistan and the Philippines.

Some regulators are also currently considering implementing rules for the provision of loans by alternative financial services providers operating on the Internet such as

¹¹ There are also various examples of regulations of mobile money in developing countries (see for example di Castri, 2013, “Mobile Money: Enabling Regulatory solutions”).
¹² This amount may be equal to the exact value of the money issued electronically.

Peer-to-Peer Lending platforms or payday loans companies.¹³ For example, in April 2014, in the United Kingdom, the Financial Conduct Authority published a policy statement on its regulatory approach to firms operating online Crowdfunding platforms (prudential requirements, protections in case of firm failure, disclosure rules, dispute resolutions).

Creating new licenses for non-banks is not the only regulatory option to enhance competition in retail banking markets. Indeed, it is interesting to note that some countries have recently decided to reduce capital requirements for firms entering with a bank license. These reforms have sometimes been accompanied by the design of new rules for the resolution of bank failures. For example, the Financial Service Authority and the Prudential Regulation Authority in the United Kingdom have decided in 2013 to reduce capital requirements at authorization, to reduce liquidity requirements for all new banks, and to remove barriers to expansion.¹⁴

There are also non-prudential requirements to regulate the operational aspects of a financial institution, including conduct of business. In particular, the regulator sets rules that aim at enhancing customer protection, including limits on the interest rates charged for banking services, disclosure of contractual terms and conditions, liability regimes for fraud, measures to protect their personal data. Such rules may impede entrants from accessing banks' existing infrastructure to offer innovative services.¹⁵

To conclude, the literature on banking regulation and competition could be enriched by analyzing the impact of the regulation of non-banks on competition, both from a theoretical and an empirical perspective. This strand of literature shows that regulators face a trade-off between lowering barriers to entry to allow the development of competition and increasing barriers to entry to protect the stability of the financial sector (see Carletti, 2008, for a survey).¹⁶ Finally, one last issue concerns the

¹³ According to Stegman (2007), a payday loan is a short-term loan made for 7 to 30 days for a small amount, and their core demand originates from households with a poor credit history and that are highly credit constrained.

¹⁴ See a review of requirements for firms entering into or expanding in the banking sector, March 2013 by the Financial Service Authority. In particular, the regulator in the United Kingdom has decided to drop the scalars applied to capital requirements because the firm is new.

¹⁵ An interesting example is the case of third-party payment providers (TPPs), which act as interfaces between Internet merchants and the banking payment infrastructuring by forwarding payment data or legitimating access to customers' accounts. In Germany, third-party providers can have access to customers' accounts with little limitations. In contrast, in France, the payment service provider needs to be approved by the supervisory body (See article L.522-6 of the "Code Monétaire et Financier").

¹⁶ The literature concludes that the relationship between competition and stability in the banking industry is not clear. On the one hand, a higher franchise value increases' banks' market power and reduces their

interactions between the regulated and unregulated sectors when an innovation occurs outside the banking industry. In this case, regulators need to understand the channels through which risks may flow back into the banking system, as can be the case for virtual currencies.¹⁷

- **b/ Structural barriers**

In this subsection, we analyze barriers to entry that are due to the particular structure of costs in the banking industry.

Cost functions of banks are characterized by economies of scale and scope between deposit and lending activities. Banks economize on costs by bundling both services because they reduce information asymmetries between depositors and lenders, and thanks to their expertise in managing liquidity risk (see Pyle, 1971 or Kashyap, Rajan and Stein, 2002). To understand why there are economies of scale between both services, it is useful to see depositors as a coalition of investors investing in risky loans. If a fixed fee is associated with any financial transaction, investors will tend to form coalitions in order to divide transaction costs. Also, because of indivisibilities, a coalition of investors will be able to hold a more diversified portfolio than the ones individual investors would hold on their own. Economies of scope arise when the marginal cost of granting a loan decreases with the volume of deposits, and the total cost of producing both services separately is higher than the cost of producing them together. As shown by several authors (Black, 1975, Fama, 1985, or Nakamura, 1984), banks can use the information collected on the deposit account of their customers to evaluate their credit risk. The value of this information is particularly important for small firms and small customers, which cannot credibly signal their quality on the market. In this context, an important unanswered question is whether entry could occur on the deposit market separately from the loan market. In other words, no paper has studied whether other firms can sustain competition with banks, given the economies of scope between deposit and loan services.

incentives to take risks (see Hellmann et al., 2000). On the other hand, higher interest rates on loans may induce firms to take more risks, resulting in more risky bank portfolio and less stability (See Boyd and De Nicolo, 2005).

¹⁷ For an interesting introduction about the regulation of Bitcoin, see Brito and Castillo (2013).

Other barriers to entry are due to the presence of switching costs and network effects in the retail banking industry. According to Degryse and Ongena (2008), switching costs are either due to the fixed technical costs of switching banks¹⁸ or can be explained by the existence of long-term relationships between banks and customers on the loan market (see James, 1987, Sharpe, 1990 and Rajan, 1992).¹⁹ In payment systems, a specific entry cost is related to the presence of crossed externalities and network effects between consumers and merchants, as highlighted by the literature on two-sided markets (see Verdier, 2006 and 2011). To successfully enter the market, entrants need to reach a critical mass of users and to solve the “chicken and egg dilemma” by incentivizing both buyers and sellers to use and accept the payment innovation, respectively. For example, Apple-Pay did not manage to bring many merchants on its platform, as in December 2014, only 220.000 merchant locations were enabled with Apple-Pay.²⁰

- **c/ Strategic barriers to entry**

In this section, we review the barriers to entry that can be strategically erected by incumbent banks. Bain (1956) suggested that incumbents might adapt their behavior when they face an entry threat. There are several strategies that could be used by banks to raise the entrants’ costs, among which overinvestment in ATMs and network capacities, bundling products to offer lower prices, increase minimum quality standards, investment in reputation, or denial of access to facilities shared by a club (such as settlement services). For example, in an industry with network effects and switching costs, an incumbent firm an incumbent firm can use its installed base of customers to keep a newcomer with a superior technology out of the market (Farrell and Saloner, 1986). Competitors can also be deterred from entering the market by strategic investment in quality. Dick (2007) found on a sample of U.S banks that the level of bank

¹⁸ The fixed technical costs of switching banks include the search costs a depositor incurs when looking for another bank branch, the opportunity cost of her time for opening a new account, transferring the funds, closing the old account. Kim and al. (2003) estimate switching costs in the market for Norwegian loans at 4.12% of the customer’s loan. Shy (2002) argues that the cost of switching between banks varies from 0 to 11% of the average balance in the Finnish market for bank accounts.

¹⁹ In the economic literature, long-term relationships between banks and customers are defined as relational banking (See Freixas and Rochet, 2008).

²⁰ For the full article see <http://www.pymnts.com/news/2014/how-many-consumers-in-apple-pays-bushel-basket/#.VJFnNbQ7V-8>.

quality investments increases in market size and that dominant banks offer higher quality (ATM networks, branches, branding expenses) than fringe banks.

However, it is not obvious that deterring entry increases banks' profits with respect to entry accommodation. For example, in retail payments, foreclosing access to existing infrastructure may deprive banks from interconnection fees paid by entrants on large transaction volumes. According to the Financial Times, banks even agreed to share revenues from card transactions processed through Apple Pay with Apple, which receives a 0.15% fee for each transaction. Indeed, banks will benefit from the reduction of the cost of cash caused by an increased use of electronic payment methods.²¹ Similarly, overinvestment in ATMs may not be a credible threat since consumers increasingly pay electronically or perform financial transactions online. Another point is that entry deterrence may be more difficult in an oligopolistic industry than in a market dominated by a monopoly, because multiple incumbents need to coordinate their investment decisions to deter entry (see Kovenock and Suddhasatwa, 2005). Finally, as shown by Begg and Klemperer (1992), in markets with switching costs like the retail banking industry, larger firms tend to act as less-aggressive "fat cats".²² Because they cannot easily price discriminate between old and new customers, incumbent banks have greater incentives to exploit old locked-in customers by choosing a high price and win fewer new unattached customers.

2/ Entrants' strategies

In this section, we analyze several examples of strategies that have been used by various types of entrants (start-up companies, Internet giants, banks...) to overcome barriers to entry and offer Internet and mobile banking services.

- **a/ Start-up companies**

To reduce entry costs, a first option for start-up companies is to rely on the infrastructure offered by banks to offer complementary or differentiated products. As

²¹ See the Financial Times 12th, September 2014.

²² In the terminology of Fudenberg and Tirole (1984) firms act as fat cats when there is strategic complementarity between their level of investment and the entrant's investment in case of entry, that is, if the incumbent's investment increases, the entrant's investment increases.

we shall explain below, the “partial integration” solution is widely used by start-up companies offering mobile payment services or personal finance management tools. The rationale for building a vertical relationship with incumbent players in the retail-banking sector can be twofold. First, a start-up may decide to target banks’ existing customer base by providing additional complementary services. Second, a start-up may decide to serve a niche market that is not served by banks, such as unbanked customers. In both cases, building a vertical relationship with an incumbent firm reduces the risks of failing to reach the critical mass of users and to become profitable. Furthermore, as surveyed by Farrell and Klemperer (2006), in markets with switching costs, the “fat cat effect” may make small-scale entry very easy when firms cannot price discriminate between old and new customers. Since incumbent firms choose high prices to extract profits from their old customers, this creates a price umbrella under which entrants can profitably win new customers, such as unbanked customers or young consumers who have a taste for technology.

To understand how a vertical relationship can be built between a bank or a group of banks and an entrant firm, we focus on innovations for mobile payment services. Most innovations in the area of mobile payments rely on an existing payment method that is already accepted by merchants, one exception being PayPal. An interesting example is the case of LevelUp, a solution that enables payments at the Point-Of-Sales via a QR code and a downloadable consumer app on the mobile phone.²³ Level Up relies on a partnership with Bank of America, which receives a fee to process Level Up’s transactions and to store financial information. Level Up has dropped the traditional pricing model in which merchants are charged a fee for accepting a payment transaction. Instead, LevelUp takes a percentage when consumers see ads through loyalty programs.²⁴ This is an interesting example of a successful entry with a pricing strategy that differs from the traditional ones used by banks. Industrial organization models can be particularly useful to analyze such strategies.

Partnerships between banks and entrants are also frequent for personal finance tools. In the United-States, the firm Simple (previously BankSimple) offers online deposit services without having a banking license. When a consumer opens a checking

²³ LevelUp was launched in 2011 in Boston and operates in the American mobile payment market.

²⁴ For example, if a store offers \$10 every \$100 spent, LevelUp earns 35 cents.

account, its funds are kept by the Bancorp, which is insured by the Federal Deposit Insurance Corporation, the deposit insurance mechanism that exists in the United-States. The consumer can also withdraw money without paying surcharges thanks to a partnership with the ATM network Allpoint. In contrast with traditional banks, this entrant has no physical branches. Consumers only have access to their bank online through the firm's website or a mobile app. On its website, Simple explains that its revenues come from an agreement with the Bankcorp to split the interest rates collected on the customer's account and the revenues from interchange fees on card payments.²⁵

Incumbent firms (banks, financial service providers, telecommunication and Internet companies) may opt for vertical relationships with innovative start-ups or for vertical integration. Several examples in the retail banking industry show that the relationships between start-ups and incumbents are closer to vertical integration than vertical relations, because incumbent firms often own a large share of innovative start-ups' capital.²⁶ For example, the payment card platform Amex decided to invest in a start-up company "Payfone" in order to expand to other markets. Payfone uses a white label for service model in which it licenses its mobile payment solutions to merchants. The firm Simple that we mentioned previously has been acquired in 2014 by Banco Bilbao Vizcaya Argentaria, which opted for a vertical merger. As shown by Salinger (1988), vertical mergers may lead to higher wholesale price for competitors. Therefore, vertical mergers can be used as tools to increase the rivals' costs. This implies that banks' or platforms' acquisition of entrant firms can increase their market share.

Lastly, start-up companies are vulnerable to the terms of access designed by incumbent players when the latter remain separated. Incumbent firms can even try to foreclose access to their infrastructure in order to restrict competition on downstream markets. For example, the Reserve Bank of Australia has expressed concern that the requirement to be a deposit-insured institution to access payment card systems like Visa and MasterCard could be too restrictive.²⁷ The industrial organization literature on market foreclosure is particularly relevant to study banks' incentives to open their infrastructure to entrants. This literature studies whether a vertically integrated firm has an incentive to foreclose the downstream market to its rivals, either by raising its

²⁵ Interchange fees are fees paid by the merchant's bank to the consumer's bank when a consumer uses a payment card.

²⁶ For examples of vertical relations between incumbents and entrants, see Appendix 3.

²⁷ See the consultation document of the Reserve Bank of Australia (2011).

rival's cost (see Salop and Scheffman, 1987, or Vickers, 1995) or by degrading the quality of service offered to the entrant (see Economides, 1998). Studying market foreclosure in retail payments amounts to modeling foreclosure in a two-sided market, which has not yet been studied in the literature.

Finally, no paper has studied whether a regulatory intervention could improve efficiency by forcing incumbent banks to open their infrastructure to entrants, or by regulating the terms of access. Regulators face the same kind of trade-off in the retail banking industry as in the telecommunication industry between service-based and facility-based competition (see Bourreau et al. 2010). If regulators force incumbent banks or payment card platforms to open their infrastructure to entrants, they run the risk of destroying entrants' incentives to build an alternative infrastructure. While service-based entry promotes competition in the short run, facility-based entry promotes competition in the long run. It is interesting to note that some entrants have started to acquire gradually some elements of the banking infrastructure to improve their services. A company as Leetchi, which offers services on the Internet to collect money to make gifts, started as a small start-up in France. Then it decided to build its own transaction platform and to leverage funds to obtain the payment service provider status granted by the Payment Service Directive in Europe. It now uses its platform as a white label service for smaller start-ups like PayPlug in France. From a theoretical perspective, the issue of efficient access to banking platforms cannot be exactly compared to the regulation of access to telecommunications networks because of the presence of financial risks.²⁸

- **b/ Platforms and large retailers**

Technological evolutions have lowered the costs of entering the market for loans and Internet and mobile payment transactions, especially for Internet platforms, large retailers and online merchants. A common point between these non-banks entrants is the role that network effects play on their strategic behavior.

A first example is the area of Internet and mobile payments. Several merchants such as Internet platforms (Google), large online merchants (e.g., Amazon, Apple) or retailers that already rely on a large physical distribution network (e.g., Starbucks, Wal-Mart)

²⁸ See our last section for a discussion on access and financial risks.

have started to bundle payments to their products or services.²⁹ Because of network effects, online retailers may have incentives to strategically bundle their core product or service to the payment transaction. Furthermore, large online retailers can rely on their installed base of consumers to market innovative payment methods. Both services (product or service and transaction) can be seen as imperfect complements, because without an electronic payment method, the customer is unable to buy online. However, the consumer can still substitute his online purchase for a physical purchase of the same product or use another payment method. This explains why Amazon, Google, Apple, Alipay, Groupon and many more online retailers issue their own payment methods. The purpose of bundling, in this case, is to increase consumer loyalty and to increase the firm's market share. According to the leverage theory, debated in the industrial organization literature, a dominant firm may have incentives to bundle its core product to a secondary market in order to extend its market power when some precise conditions are met.³⁰ Edelman (2014) argues that Google used a payment mechanism "Google Checkout" to bundle advertising and payment transactions and increase its market share.³¹ This business model differs from the strategy used by banks, which charge merchants with fees for transaction processing. Banks cannot reply to this strategy by selling consumers' data to advertisers, because such practices are forbidden by existing regulations on consumer protection.

Bundling of payments and products by merchants is also a common practice used by brick and mortar retailers that own a large distribution network. Indeed, several retailers (e.g., Starbucks, Wal-Mart, Abercrombie & Fitch Stores) have started to develop mobile payments apps and prepaid cards to offer rewards to loyal consumers and economize on the cost of bank fees. In this case, bundling can be a way to price-discriminate between heterogeneous consumers (see Adams and Yellen, 1976 or Schmalensee, 1984). Furthermore, several mobile payment solutions enable merchants

²⁹ Bundling is often mixed bundling, because consumers are not forced to use the payment method offered by the merchant. Mixed bundling refers to a situation in which consumers can buy the products either bundled or separated.

³⁰ In particular, bundling has a strategic effect on entry if i) it is irreversible and products are not perfect complements (Whinston, 1990), entry is uncertain on the secondary market (Choi and Stefanadis, 2001), iii) there are cost externalities between both markets (Carlton and Waldman, 2002). One could argue that some of these conditions could be satisfied in the market for retail payments.

³¹ Google Adwords advertisers who agreed to use Google Checkout can obtain free credit card processing if they spend 10% of their gross revenues on Adwords, an advertising service offered by Google.

to bundle advertising with payments, which can also increase merchants' possibility to price discriminate between consumers.³²

Finally, several peer-to-peer lending platforms (P2P) have started to exploit social network effects to compete with banks on lending intermediation services. Examples include Zopa in the UK, which is an online market place matching lenders and borrowers, Smava in Germany, Boober in the Netherlands, Trustbuddy in Sweden, Pret d'Union in France, Prosper and Lending club in the US and Alibaba Small Loans in China. An unanswered issue is how competition between P2P platforms and banks impacts loan rates for individuals and small firms. Both types of firms do not rely on the same monitoring technology. According to Diamond (1984), banks have a comparative advantage in monitoring loans that is, screening projects, preventing opportunistic behavior of a borrower, or punishing or auditing a borrower who fails to meet contractual obligations.³³ The micro-finance literature argues that social networks are able to efficiently select borrowers and estimate their risk level (See Freedman and Jin, 2008, for empirical evidence on the American P2P lending group Prosper). Essentially, social networks are informative either because friends on the social platforms are also able to observe the type of borrowers *ex ante* or because the monitoring of these networks provides a stronger incentive and increases the probability to pay off loans *ex post* (Freedman and Jin, 2014). In some cases, P2P lending offers lower interest rates than the banks and thus represents an alternative service for the unbanked population.³⁴ Even though P2P is a tool to bypass banks, in the past year several banks bought stakes in P2P lending platforms.

- **c/ Entry as banks**

The last option for entrants is to enter the market as banks. A first strategic choice that could be analyzed using industrial organization frameworks is the degree of

³² Varian (1980) and Robert and Stahl (1993) see advertising as a substitute to costly information acquisition by consumers. It generates a differentiation between informed and an uninformed consumer, which enables firms to price discriminate.

³³ The presence of banks generates an economy in the monitoring costs, provided that i) there are scale economies in monitoring, ii) investors have small capacities, iii) the cost of delegation is low (i.e., the cost of monitoring the bank itself is less than the surplus gained from exploiting scale economies in monitoring projects).

³⁴ Lending Club's website (one of the leading P2P lending platforms in the United-States) claims the rate offered is 6.78% as against an average of 11.41%.

differentiation with respect to other competitors. Indeed, the empirical literature has proved that there are elements of horizontal and vertical differentiation in the competition for deposits and in the loan market (see chapter 3 of Degryse et al., 2009). An entrant firm can choose to compete with existing banks in a horizontal dimension and not to differentiate itself by a better technology. For example, METRO Bank decided to establish itself in the United Kingdom and to open bank branches. It outsourced its IT system to a Swiss Banking system provider to lower its entry cost. However, this new bank did not manage to reach profitability.³⁵ Indeed, entrants' prospect of profitability can be constrained by the presence of adverse selection or by existing regulations of interest rates or deposit rates. For instance, because of adverse selection, consumers who switch banks are likely to be less loyal, less valuable, or more risky.³⁶ Furthermore, the optimal number of banks in a free-entry equilibrium depends on deposit rates regulation (see Chiappori, Perez-Castrillo and Verdier, 1995).

Another possibility for entrants is to compete with existing banks by offering vertically differentiated products. Several authors argue that vertical differentiation between banks is due to reputation and network effects. For example, depositors exhibit a higher willingness to pay for banks with a larger ATM network (Knittel and Stango, 2004). However, banks' reputation on the loan market is not necessarily impacted by the size of the ATM network (Kim, Kristiansen and Vale, 2004). While reputation can be a barrier to entry for financial intermediaries (see Jeon and Lovo, 2011), entrants may also differentiate themselves from banks by offering a better technology. When consumers have heterogeneous tastes for technology, entrants can successfully enter by selling high quality services to consumers who have a high valuation for online banking services. This strategy has been used by Fidor Bank, which obtained a banking license from the German regulator. This bank offers many innovative products that enable customers to manage their accounts online.

To conclude, the literature could be enriched by analyzing a firm's decision to enter as a bank on the market if other regulatory statuses are available. Indeed, entrants have to trade off between competing with banks or competing with other entrants that have the same regulatory status. Finally, an interesting question is the timing at which a firm

³⁵ According to The Telegraph of July 2014, 23rd, METRO Bank is not yet profitable despite holding £1.7 trillion of deposits and £1.8 trillion of loans.

³⁶ Ausubel (1991) or Callem and Mester (1995) have found empirical evidence of adverse selection on the credit card market.

should acquire a bank license on the market. A firm can decide to start as a platform, and then to obtain the status of bank when it has gained significant experience and reputation on the market, as was the case for PayPal.³⁷

3/ Banks' reactions to entry threats

There are several sources of rents in the banking industry that impact banks' incentives to innovate. First, banks have market power. Therefore, their incentives to innovate depend on the classical trade-off identified in the industrial organization literature between the replacement effect and the efficiency effect (see Arrow, 1962 and Gilbert and Newberry, 1982).³⁸ Second, the banking industry exhibits network effects, which are the source of specific trade-offs that we analyze in this section (see Farrell and Klemperer, 2007 for a general perspective).

- **a/ The role of switching costs**

Because of switching costs, a bank must design a strategy that balances the profits earned on its installed base and the profits earned on new customers. Therefore, it faces a trade-off between customer retention and customer acquisition, which is often referred to as the "harvesting versus investing dilemma" (see Klemperer, 1995).³⁹ An incumbent firm can decide to charge a high price to its installed base to recoup its investment expenditure. However, this harvesting strategy must be balanced against the opportunity cost of losing new customers who will make valuable repeat-purchase in the future (investing). For example, when Bank of America launched the BankAmericard, it made a \$20 million loss. However, this innovation became profitable in the long run (investing). The issue of whether large banks with a higher installed base innovate more than small banks has not been investigated in the empirical literature. A

³⁷ PayPal started as a platform in 1998 on the American market of online payments and was acquired in 2002 by eBay. It settled in 2007 in Europe and received a license to operate as a credit institution from the Commission de Surveillance du Secteur Financier (CSSF) in Luxembourg. In 2014, PayPal split from eBay.

³⁸ The replacement effect means that monopolistic banks have fewer incentives to innovate than competitive firms because they "replace themselves" when they innovate. The efficiency effect implies that, when competition reduces profits, a monopolist's incentive to remain a monopoly is greater than an entrant's incentives to enter a market as a duopoly.

³⁹ A firm must balance the incentives to charge a high price to "harvest" greater current profits against the incentives to lower its price to invest in market share and future profits (see Farrell and Klemperer, 2007).

second choice for banks is whether to innovate by themselves or to outsource innovation to entrants and start-ups. From a theoretical perspective, Good (2006) shows that switching costs may lead an incumbent firm to prefer to delay innovation and instead rely on new entrants to introduce new products which the incumbent can then imitate. From an empirical perspective, Chakravorti and Kobor (2003) find from the interviews they performed to market participants that the choice to rely on in-house development of innovative payment solutions is different for small and large banks.

b/ Compatibility and cooperation decisions

Network effects may provide banks with incentives to make their products compatible when they innovate. For example, Matutes and Padilla (1994) show that banks trade off between competition and network effects when they choose to share their ATM networks. On the one hand, banks are able to offer lower deposit rates when their ATMs are compatible because depositors can withdraw cash more easily in a larger network. On the other hand, a large ATM network increases competition (and thus deposit rates), because banks become more substitutable. Incentives to make products compatible depend on firms' installed base of customers. In particular, Katz and Shapiro (1986) show in a Cournot duopoly setting with network externalities that the firm that has the largest installed base of customers has fewer incentives to choose product compatibility than the firm that has initially no customers. However, a firm may let rivals into its network, trading-off the higher value of its network due to its increased size against the sharing of the profits with its rival (Katz and Shapiro, 1985).

The trade-off between competition and network effects is also present in banks' incentives to coordinate in joint ventures and alliances. In the area of Internet and mobile payments, there are two types of joint ventures: between banks, and between banks and entrants. Cooperation for both entrants and incumbents is crucial to raise acceptance and usage of the innovative product, and thus to reach a critical mass of users to exploit network effects. One example of joint ventures between banks can be found with the French company Paylib, which is a new payment system that three French banks created for Internet transactions. Joint-ventures between banks and

entrants are also frequent.⁴⁰ As a matter of fact, entrants do not always offer traditional bank functions, such as cash management, risk control or short-term loans, which involve significant fixed costs. On the other side, banks do not always have the know-how to develop innovations in their core business and may benefit from a partnership with entrants. Bourreau and Verdier (2010) analyse more specifically the various degrees of cooperation that can emerge between banks and entrants for the development of mobile payment solutions. Specific issues about cooperation arise in retail payment systems because of externalities between consumer and merchant adoption. In an extension of d'Aspremont and Jacquemin (1988), Bourreau and Verdier (2014a) relate the social benefits of cooperation in R&D in two-sided markets to the degree of externalities between the two sides. Bourreau and Verdier (2014,b) also study whether interchange fees can improve banks' incentives to cooperate.

- **c/ The impact of risks on banks' strategies**

Banks' strategies are also impacted by the presence of risks, which can be classified into two broad categories: risks associated to the transformation activity, and risks occurring at the transaction level for payments or loans.

Innovations offered by entrants can have an impact on banks' liquidity risk. Indeed, since entry impacts competition for deposits, it can affect banks' reserve management strategies. An interesting direction for future research would be to analyze how competition with a non-bank entrant affects the interest rates on loans and deposits, according to the various liquidity requirements that can be imposed on an entrant. For example, Prisman, Slovin and Sushka (1986) study how the cost of reserve management affects the interest rate on deposits and the interest rate on loans in a setting where a bank is a monopoly. Shy and Stenbacka (2007) have studied the impact competition between banks offering different types of accounts (perfectly liquid or partially liquid) on interest rates. However, no paper has studied competition for deposits between banks and non-banks, subject to different liquidity requirements.

Risks occurring at the transaction level can provide banks with incentives to invest in security standards. For example, Weiner et al. (2007) identify several risks associated

⁴⁰ See Appendix 4 for examples of joint ventures between platforms, banks and other firms in order to provide a more customized service.

to the provision of innovative payment services (credit risk, settlement risk, liquidity risk, and operational risk). To understand how the presence of risks can impact banks' strategies, we focus on the category of operational risks, related to internal or external events that result in monetary losses (e.g. data security risks, fraud risks, risk of counterfeit, human error...).⁴¹ Banks have incentives to invest in security standards to protect their reputation from the negative externalities that could be triggered by entry. The report of a study conducted by the World Bank reveals that 63% of innovative payment services are subject to operational security standards and data integrity. These standards can be set either by a regulator, or by a collective self-regulatory agreement between incumbent banks. The issue of whether banks set inefficiently high security standards to discourage entry of non-banks on the market for retail payment services has not yet been studied in the literature. In its seminal paper, Leland (1979) shows that minimum quality standards can increase welfare in markets with asymmetric information when set by a regulator. However, if quality standards are set by an industry itself, it is likely that the standards will be too high. This issue is a policy concern for antitrust authorities and financial regulators. For example, in 2011, the European Commission opened an antitrust investigation into the standardization process for payments over the Internet undertaken by the European Payments Council. The Commission undertook a careful examination of the standardization process to ensure that competition was not restricted, for example, through the exclusion of new entrants who are not controlled by a bank.⁴²

Conclusion

In our paper, we have surveyed the issues related to innovation and competition in Internet and mobile banking. We have shown how the existing models of the industrial organization literature could be enriched by designing tools, that will help policy makers find the right balance between competition and financial stability on the retail banking market.

⁴¹ Data security risk involves unauthorized modification or disclosure of sensible data. Fraud risk occurs when, for example, the payee does not have a legitimate claim on the payer because a wrongful or a criminal deception is in place (such as cloning of cards), and may be a consequence of data security risk. Risk of counterfeit refers to the risk of incurring in a false payment instrument (such as currency reproduced without authorization).

⁴² See press release IP/11/1076 on the website of the European Commission.

Further research on the impact of innovations on competition in retail banking is essential from a policy perspective. The recent creation of a Payments System Regulator in the United-Kingdom in 2013 to oversee competitiveness in the United-Kingdom payments industry shows that financial regulators consider this issue as a priority.

Appendix 1. Examples of innovations in retail banking

DEPOSITS AND TRANSACTIONS

1) **Stored-value products:** Several merchants such as Starbucks or Apple have started to issue their own stored-value cards. They work as prepaid cards and users upload an amount of money on them. These cards are often closed system prepaid cards in the sense that customers may use them exclusively at the merchant's shop. As it is for the Starbucks prepaid card, usually customers must own one of these cards to accede loyalty programs and favorable treatments.

<https://www.starbucks.com/card>

2) **Savings products:** Paypal, together with other payment services, offers to its customers the possibility to deposit and save money on a PayPal account and to reinvest these deposits into risky assets. Also the online payment affiliate of Alibaba, Alipay, now allows users with money stored online to invest in a fund fixed to corporate debt and government bonds.

<https://www.paypal.com/fr/webapps/mpp/home>

3) **Withdrawals:** Cardless Cash is Australia's first cardless cash service, and enables customers to use the CommBank app to withdraw cash without a card across CommBank's national ATM network.

<https://www.commbank.com.au/about-us/news/media-releases/2014/commbank-launches-australian-first-innovations-to-continue-its-lead-in-the-mobile-banking-and-payments-space.html>

4) **Payments:** Apple just released the new Apple Pay that permits customers to make a payment transaction with their mobile phones exploiting NFC, Touch ID and Bluetooth technologies. Apple Pay technology is also meant to decrease fraud risk as for each payment a unique Device Account Number will be automatically assigned and encrypted, avoiding customers to write online their actual credit and debit card numbers.

<https://www.apple.com/apple-pay/>

5) **Account information:** With a banking apps users can manage several accounts and cards without having to go to the different banking sites. As well as those offered by the banks themselves, independent providers also offer banking apps (iOutBank,

Starmoney, Quicken, iControl, Subsembly...). The user downloads the app/software onto their smartphone and enters its account details and online access data. With mFoundry users are able to review transactions, check their account balances, transfer funds, pay bills and find the closest banks and ATMs exploiting their mobile device.

<http://www.fisglobal.com/products-mobilefinancialservices>

LOANS:

6) **Information:** A platform like Lending Club ranks small businesses 'A' (low-risk) through 'G' (high risk). Investors learn about the risk of businesses and choose who and how much to invest.

<https://www.lendingclub.com/>

7) **Intermediation:** With the Peer-to-peer lending, intermediation takes place on virtual marketplaces where individuals or companies invest in small businesses. For example, the e-commerce Asian leader Alibaba exploited the full use of Internet and the customer base that amounted at the end of 2012 at 700 million people- only counting Alipay subscribers-, to improve the efficiency of loan approval and the issuing of Alibaba Small Loans, which are between 50 and 1000 thousand Yuan. Moreover, it launched credit products of different levels. It was possible for Alibaba to control bad loan risk thanks to its long history of customer rating records and sophisticated data mining (Financial Times).⁴³

<http://blogs.hbr.org/2014/02/banks-new-competitors-starbucks-google-and-alibaba/>

<http://www.iresearchchina.com/views/4823.html>

⁴³ <http://www.ft.com/intl/cms/s/0/3f507a32-4530-11e3-b98b-00144feabdc0.html#axzz3D0qFuGCZ>

Appendix 2. Capital requirements in France and in Europe. Source: ACPR –France

Credit institutions in France	Minimum capital requirements in Euros
Banks, Mutual and Cooperative Banks, Savings Banks, Specialized Financial Institutions, Municipal Credit Banks that carry out all types of operations	5,5 millions
Municipal Credit Banks whose Articles of Association: <ul style="list-style-type: none"> • Allow them to grant loans secured by pledge or loans to natural persons • Do not authorize them from receiving funds from the public 	2,2 millions
Municipal Credit Banks whose activity is confined to granting loans secured by pledge	1,1 million
Financial Companies other than those mentioned hereafter	2,2 millions
Financial Companies whose authorization is confined to the provision of guarantees or leveraged spot scriptural exchange services	1,1 million
Payment institutions in France	
Transmission services of funds and of manual exchange	38.000
Payment Services, 6 th article L.314-1	20.000
Others	125.000
Initial capital requirements in Europe	
Payment institutions	125.000
Electronic money institutions	350.000
Banks	5 millions

Appendix 3. Examples of vertical integration between incumbents and entrants

Bank	Entrant	Type of agreement	Partners' activity	Date
MasterCard	DataCash Group	Acquisition of DataCash Group to increase e-commerce penetration.	Payment Service Provider for e-commerce merchants.	2010
Visa	Cybersource	Visa acquired Cybersource to provide directly new services to merchants related to back-office processing.	Gateway company. Creation of an open software platform for developers using Authorize.Net.	2010
American Express	Revolution Money	Amex acquired Revolution Money	Platform to exchange money.	2010
MasterCard	I Zettle	MasterCard invested in I Zettle	Mobile payments company	2011
MasterCard	Paybox	MasterCard invested in Paybox	Present in e-commerce market as virtual electronic payment	2012

			terminal.	
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Appendix 4. Examples of joint ventures between incumbent payment platforms and entrants

- Partnerships between banks and entrants:

Banks	Entrants	Type of agreement	Partner's activity	Date
MasterCard	Accor Services	Joint venture to pursue opportunities in prepaid and acquirer processing.	Prepaid processing.	2009
	Smart Hub	Joint venture for the development of a payment processing platform in Brazil and around the world.	Mobile Phone Operator.	2010
	Smarty Pig	Partnership with MC	Online social banking service	2013
	Monitise	Partnership	Deployment of mobile wallets and digital payment solutions	2014
Visa	Monitise	Strategic alliance (Visa has a participation in Monitise).	Financial technology services provider (e.g. mobile services).	2009
	Kiva.org	Partnership to design specific offers for small businesses.	Personal micro-lending website.	2010
BNL	Vodafone and Three	Partnership with Vodafone Italia and Three Italia	Paypass credit application onto SIM cards	2013

- Partnerships between banks:

Banks	Type of agreement	Partnership's activity	Date
BNP Paribas, Société Générale and La Banque Postale	Partnership between banks.	New payment system Paylib.	2013
ABN Amro Bank N.V., ING Group N.V. and Rabobank Group and KPN N.V., Vodafone Group PLC and Deutsche Telekom AG's T-Mobile	Partnership between both banks and new actors.	Joint venture to support NFC mobile payments at the point of sale.	2013

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