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

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Carlotta Mariotto – Marianne Verdier

**Innovation and Competition in  
Internet and Mobile Banking: an  
Industrial Organization Perspective**



Bank of Finland Research  
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# **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 platforms 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; platform markets.

**JEL Codes:** E42; G21; L96.

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## 1/ Introduction

Over the recent years, the development of Internet banking and mobile banking services has had a considerable impact on competition in retail banking markets.<sup>1</sup> Several companies have started to offer innovative financial services 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.<sup>2</sup> The emergence of these new financial services raises several challenges for regulators and policy makers.<sup>3</sup> In particular, banks start to compete with platforms such as Google and Amazon.

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.

Banks offer mainly two categories of services, those related to deposits and those related to loans.<sup>4</sup> 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.

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) review the literature on the impact of financial innovation on commercial banking, in the broad context of the economics literature on innovation. Our paper distinguishes itself from this work by focusing specifically on competition and regulatory issues raised by recent innovations in Internet and mobile banking. A

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<sup>1</sup> 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.

<sup>2</sup> 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.

<sup>3</sup> See the Final report on the conference organized by the European Commission in November 2014 on Emerging challenges in retail finance and consumer policy.

<sup>4</sup> 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.

number of recent articles have also focused on specific services that emerged, either in developed countries or in developing countries.<sup>5</sup>

**Table 1.** Innovations in Internet and mobile banking

	Types of services	Examples of entrant firms providing these services	Example of innovation
<b>Services related to deposits</b>	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
<b>Services related to loans</b>	Account information	Gemalto, mFoundry	Mobile technologies
	Intermediation	Supplier pay initiative, Alibaba Small Loans, Lending club, OnDeck, FundingCircle	Online platform

The rest of the paper is organized as follows. In section 2, we survey the barriers to entry. In section 3, we analyze entrants’ strategies (start-up companies, large retailers, platforms...). In section 4, we provide an overview of banks’ incentives to innovate and their reactions to the competitive threat posed by entrants. Finally, we conclude.

**2/ Entry costs in the retail banking market**

- **a/ Regulatory barriers**

Regulation of banks’ entry and conduct on the market creates a barrier that needs to be overcome by entrants. First, regulators require that banks obtain a license from the relevant authority and that they implement sound risk management procedures. Second, they monitor closely banks’ conduct to ensure banks’ compliance with regulatory requirements. Table 2 shows the various types of regulations, their scope and the risky activity that they are aimed at regulating.

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<sup>5</sup> See Shy (2012) for a review on account-to-account money transfers in the US, Crowe et al. (2010) for an analysis of mobile payments in the US. Examples of papers on mobile payments developing countries include Jack et al. (2011).

**Table 2.** Types of bank regulations.

<b>Type of regulation</b>	<b>Risky activity</b>	<b>Scope</b>
<i>Solvency regulations</i>		
1) Mandatory insurance of deposits	Transformation activity.	Alleviate liquidity, interest rate, credit risk, operational risk and systemic risk. Avoid inefficient bank runs.
2) Imposing high franchise values, variable capital requirements	Risky investments on the asset side.	Alleviate information asymmetry and moral hazard.
<i>Non-prudential regulations</i>		
1) Conduct of business	Regulation of interest rates charged for banking services, disclosure of contractual terms and conditions, fraud, misuse of personal data.	Enhance consumer protection.

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. In the retail payments market, some regulators have designed new categories of licenses to facilitate the entry of non-banks.<sup>6</sup> 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 it does not offer credit to its consumers, the firm does not need to comply with the full range of regulatory measures applied to banks (e.g., lower initial and ongoing capital requirements). Such lighter regulations also exist in other countries and jurisdictions as shown in table 3.<sup>7</sup>

Other types of regulatory measures include restrictions on investment in risky assets. 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 to enhance consumer protection. They may also impose daily transaction limits (e.g., in Kenya).<sup>8</sup> In the loan market, several regulators

<sup>6</sup> 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.

<sup>7</sup> There are also various examples of regulations of mobile money in developing countries (see for example di Castri, 2013).

<sup>8</sup> This amount may be equal to the exact value of the money issued electronically.

have started to design rules for the provision of loans by alternative financial services providers such as Peer-to-Peer Lending platforms.<sup>9</sup>

**Table 3. Regulations of entry with a different license**

	Law	Resulting regulatory status
Europe	Payment Service Directive (2007, 2015)	Payment Service Provider (PSP)/ Electronic Money Institution (EMI)
USA	Revision of the FinCEN and Financial Action Task Force (2001)	Money Services Businesses (MSBs)
Australia	Revision of the Banking Act (2014)	Authorized deposit-taking Institution (ADIs)

Creating new licenses for non-banks is not the only regulatory option to enhance competition. Indeed, some regulators have recently decided to reduce capital requirements for bank entrants (e.g., the Financial Service Authority in the United Kingdom in 2013).<sup>10</sup>

One last issue concerns the 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 may be the case for virtual currencies.<sup>11</sup>

To conclude, 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).<sup>12</sup> The literature on banking regulation and competition could be enriched by analyzing this trade-off in the context of competition between banks and non-banks for the provision of mobile and Internet banking services.

- **b/ Structural barriers**

<sup>9</sup> 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).

<sup>10</sup> See the document published in March 2013 by the Financial Service Authority.

<sup>11</sup> For an interesting introduction about the regulation of Bitcoin, see Brito and Castillo (2013).

<sup>12</sup> 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 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).

Economies of scale and scope between deposit and lending activities create another barrier to entry. Banks make economies of scale by offering loans and deposits because they are experts in managing liquidity risk and reducing information asymmetries between borrowers and lenders (see Pyle, 1971 or Kashyap et al., 2002). Economies of scope arise if the marginal cost of granting a loan decreases with the volume of deposits and if it is less costly to offer both services. As shown by several authors (Black, 1975, Fama, 1985), banks use the information collected on deposit accounts to evaluate credit risk. The value of this information is particularly important for small borrowers, which cannot credibly signal their quality on the market. In this context, an important unanswered question is whether non-banks can sustain competition with banks without offering both deposit and lending activities.<sup>13</sup>

Switching costs and network effects create another barrier to entry. According to Degryse and Ongena (2008), switching costs are either due to the fixed technical costs of switching banks<sup>14</sup> or to the existence of long-term relationships between banks and customers on the loan market (Sharpe, 1990 and Rajan, 1992).<sup>15</sup> In payment systems, a specific entry cost is related to the presence of adoption externalities between consumers and merchants, as highlighted by the literature on two-sided markets (Verdier, 2011). For example, Apple did not manage to attract enough merchants on its platform when it launched Apple Pay.<sup>16</sup>

- **c/ Strategic barriers to entry**

Incumbent banks may also erect strategic barriers to entry (Bain, 1956), such as overinvestment in ATMs, network capacities (Dick, 2007), bundling, increasing minimum quality standards or denying access to facilities shared by a club (e.g., settlement services). In markets with network effects and switching costs, an incumbent

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<sup>13</sup> See the example of the firm Simple in Section 3 to understand the business model of a firm that takes deposits without offering loans.

<sup>14</sup> 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. 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.

<sup>15</sup> Long-term relationships between banks and customers are also defined as relational banking (See Freixas and Rochet, 2008).

<sup>16</sup> For the full article see <http://www.pymnts.com/news/2014/how-many-consumers-in-apple-pays-bushel-basket/#.VJFnNbQ7V-8>.



firm can also use its installed base of customers to keep a newcomer with a superior technology out of the market (Farrell and Saloner, 1986).

However, entry accommodation may be more profitable than entry deterrence. For example, foreclosing access to a payment infrastructure may deprive banks from interconnection fees paid by entrants.<sup>17</sup> Similarly, overinvestment in ATMs may not be a credible threat since consumers increasingly use electronic payment methods. Entry deterrence may also be more difficult in an oligopolistic industry because of coordination costs (Kovenock and Suddhasatwa, 2005). Finally, in markets with switching costs, larger firms tend to act as less-aggressive “fat cats” (Begg and Klemperer, 1992).<sup>18</sup> Indeed, incumbent banks cannot easily price discriminate between old and new customers. Therefore, they have greater incentives to exploit old locked-in customers and win fewer new unattached customers.

### **3/ Entrants' strategies**

- **a/ Start-up companies**

To overcome regulatory and structural barriers to entry, a first option for start-up companies is to rely on the infrastructure offered by banks. The “partial integration” solution is widely used by start-up companies offering mobile payment services or personal finance management tools. Start-ups can either target either the existing customer base of banks with complementary services or an underserved niche market. In both cases, vertical relationships reduce the risks of failing to reach a critical mass of users. Furthermore, 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 (Farrell and Klemperer, 2006). 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.

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<sup>17</sup> See the Financial Times 12th, September 2014. Some banks agreed to share with Apple the revenues obtained from transactions processed through Apple Pay.

<sup>18</sup> In the terminology of Fudenberg and Tirole (1984) firms act as fat cats when there is strategic complementarity between their strategy and the entrant's strategy in case of entry. In a multi-period oligopolistic model with switching costs, the fat-cat effects means that an incumbent firm prices less aggressively today because it recognizes that if it wins fewer new customers today, its rival will be less aggressive tomorrow.

Most innovations in the area of mobile payments rely on vertical relationships between banks or card platforms and entrants, one exception being PayPal. An interesting example is the case of LevelUp, a solution that enables payments at the Point-Of-Sales on a mobile phone.<sup>19</sup> Level Up relies on a partnership with Bank of America, which receives a fee to process transactions and store financial information. Level Up has dropped the traditional pricing model in which merchants are charged a fee for accepting a payment transaction. Instead, it takes a percentage when consumers see ads through loyalty programs.<sup>20</sup>

Partnerships between banks and entrants are also frequent for personal finance tools. In the United-States, the firm Simple offers online deposit services without holding a banking license. When a consumer opens a checking 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. The firm's 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.<sup>21</sup>

Relationships between start-ups and incumbents are often close to vertical integration, because incumbents own a large share of start-ups.<sup>22</sup> For example, the payment card platform Amex invested in a start-up company "Payfone" in order to offer mobile payment solutions. Banco Bilbao Vizcaya Argentaria acquired the firm Simple in 2014. Since vertical mergers may lead to higher wholesale price for competitors, banks can use vertical mergers to increase entrants' costs (Salinger, 1988).

Lastly, start-up companies may be vulnerable to the terms of access designed by incumbent players. Banks or platforms can even try to foreclose access to their infrastructure in order to restrict competition on downstream markets. For example, the

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<sup>19</sup> LevelUp was launched in 2011 in Boston and operates in the American mobile payment market.

<sup>20</sup> For example, if a store offers \$10 every \$100 spent, LevelUp earns 35 cents.

<sup>21</sup> Interchange fees are fees paid by the merchant's bank to the consumer's bank when a consumer uses a payment card.

<sup>22</sup> For examples of vertical relations between incumbents and entrants, see Appendix 3 of the Working Paper Version of the paper.

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.<sup>23</sup> The literature on market foreclosure is relevant to study banks' incentives to open their infrastructure to entrants (see Salop and Scheffman, 1987, Vickers, 1995). 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).<sup>24</sup> Entrants can also overcome barriers to entry by gradual investment in financial infrastructure.<sup>25</sup>

- **b/ Platforms and large retailers**

Technological evolutions have lowered the entry costs of Internet platforms (Google), large retailers (e.g., Starbucks, Wal-Mart) and online merchants (e.g., Amazon). A common point between these non-bank entrants is their ability to rely on network effects. Amazon, Google, Apple, Groupon and many more online retailers have started to bundle payment transactions with other goods or services. 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. According to the leverage theory, a dominant firm may also have incentives to bundle its core product to a secondary market in order to extend its market power.<sup>26</sup> Edelman (2014) argues that Google used "Google Checkout" to bundle advertising and payment transactions and increase its market share.<sup>27</sup> This business model differs from the one used by banks, which charge merchants with fees for transaction processing. Banks cannot reply to this

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<sup>23</sup> See the consultation document of the Reserve Bank of Australia (2011).

<sup>24</sup> If regulators impose mandatory access to incumbent banks' or payment platforms' infrastructure, 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.

<sup>25</sup> For example, Leetchi, a company that offers online services to collect money, 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.

<sup>26</sup> 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.

<sup>27</sup> 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.

strategy by selling consumers' data to advertisers, because such practices are forbidden in many countries 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 (e.g., Starbucks, Wal-Mart). Indeed, retailers have developed mobile payments apps and prepaid cards to offer rewards to loyal consumers and economize on the cost of bank fees. In that case, bundling can help merchants price-discriminate between heterogeneous consumers (Adams and Yellen, 1976). Furthermore, several mobile payment solutions enable merchants to bundle advertising with payments, which can also increase merchants' ability to price discriminate between consumers.<sup>28</sup>

Finally, several peer-to-peer lending platforms (P2P) have started to exploit social network effects to compete with banks in the lending market. Examples include Zopa in the UK, Pret d'Union in France, Prosper and Lending club in the US. 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 auditing a borrower who fails to meet contractual obligations.<sup>29</sup> The micro-finance literature argues that social networks are able to efficiently select borrowers and estimate their risk level (Freedman and Jin, 2008). 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 increases the probability to pay off loans *ex post* (Freedman and Jin, 2014).

- **c/ Entry as banks**

The last option for entrants is to enter the market as banks, either with horizontal or vertical differentiation (see ch. 3 of Degryse et al., 2009). For example, METRO Bank in the United Kingdom chose horizontal differentiation and opened bank branches.

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<sup>28</sup> 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.

<sup>29</sup> Banks have a comparative advantage in monitoring provided that i) there are scale economies, 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).

However, this entrant bank did not reach profitability.<sup>30</sup> Possible explanations for the difficulties encountered by horizontally differentiated entrants are the presence of adverse selection and price regulations. Because of adverse selection, consumers who switch banks are likely to be less valuable or more risky than other customers.<sup>31</sup> Furthermore, the optimal number of banks in a free-entry equilibrium depends on deposit rates regulation (Chiappori et al., 1995).

Another option for entrants is to offer vertically differentiated services. Banks can be vertically differentiated either by their ATM network, their reputation or their technology. For example, depositors exhibit a higher willingness to pay for banks with a larger ATM network (Knittel and Stango, 2004). However, banks' reputation in the loan market is not necessarily impacted by the size of the ATM network (Kim et al., 2004). While reputation can be a barrier to entry for financial intermediaries (Jeon and Lovo, 2011), entrants may also differentiate themselves from banks by offering a better technology or high-quality services (e.g., Fidor Bank in Germany).

To conclude, entrants trade off between competing with banks or competing with other entrants. An interesting question is the timing at which a firm should acquire a banking license. 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 in the market, as was the case for PayPal.<sup>32</sup>

#### **4/ Banks' reactions to entry threats**

There are several sources of rents in the banking industry that impact banks' incentives to innovate. First, the classical trade-off between the replacement effect and the efficiency effect applies because banks have market power (see Arrow, 1962 and Gilbert and Newberry, 1982).<sup>33</sup> Second, the banking industry exhibits network effects, which are the source of specific trade-offs (Farrell and Klemperer, 2007).

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<sup>30</sup> According to The Telegraph of July 2014, 23<sup>rd</sup>, METRO Bank is not yet profitable despite holding £1.7 trillion of deposits and £1.8 trillion of loans.

<sup>31</sup> Ausubel (1991) has found empirical evidence of adverse selection in the credit card market.

<sup>32</sup> PayPal started as a platform in 1998 in 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.

<sup>33</sup> 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

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

Because of switching costs, a bank must balance the profits earned on its installed base and those earned on new customers. The trade-off between customer retention and customer acquisition is often referred to as the “harvesting versus investing dilemma” (Klemperer, 1995).<sup>34</sup> A bank can 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. A second choice for banks is whether to innovate by themselves or to outsource innovation to entrants. 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. 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.

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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.

<sup>34</sup> A firm must balance the incentives to “harvest” greater current profits against the incentives to “invest” in market share and future profits (see Farrell and Klemperer, 2007).

The trade-off between competition and network effects is also present in banks' incentives to coordinate in joint ventures and alliances. Cooperation for both entrants and incumbents is crucial to reach a critical mass of users to exploit network effects. For example, three French banks created a joint venture for Internet transactions called Paylib. Moreover, joint ventures between banks and entrants are also frequent.<sup>35</sup> 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 and may benefit from a partnership with entrants (see Bourreau and Verdier, 2010, for mobile payments). Specific issues about cooperation arise in retail payment systems because of externalities between consumer and merchant adoption. Bourreau and Verdier (2014) relate the social benefits of cooperation in R&D in two-sided markets to the degree of externalities between the two sides.

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

Banks' strategies may be impacted by the presence of risks associated to the transformation activity and risks occurring at the transaction level.

Innovations offered by entrants can have an impact on the management of liquidity risk, because they impact competition for deposits. 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 et al. (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.

Risks occurring at the transaction level can provide banks with incentives to invest in security standards. Weiner et al. (2007) identify several risks associated to the provision of innovative payment services (credit, settlement, liquidity and operational risk). Banks have incentives to invest in security standards to protect their reputation

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<sup>35</sup> See Appendix 4 of the Working Paper version of the paper for examples of joint ventures.

from the negative externalities that could be triggered by entry (e.g., in case of fraud).<sup>36</sup> 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 agreement between incumbent banks. The issue of whether banks set inefficiently high security standards to discourage entry of non-banks 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, under self-regulation, standards can 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.<sup>37</sup>

## **Conclusion**

In our paper, we have surveyed the issues related to innovation and competition in Internet and mobile banking. Further research is needed to find the right balance between competition and consumer protection. The recent creation of a Payments System Regulator in the United-Kingdom in 2013 shows that financial regulators consider this issue as a priority. In particular, since banks and entrants are often related by vertical relationships or joint-venture agreements for online transactions, regulators need to design rules to enhance consumer protection, such as privacy and data protection regulations, terms of access to consumer accounts and standardization of security requirements. As mentioned in the annual report of the Financial Conduct Authority (2013), regulators could also combine insights from behavioral economics to the traditional analysis of competition and market failures.

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<sup>36</sup> 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). Risk of counterfeit refers to the risk of incurring in a false payment instrument (such as currency reproduced without authorization).

<sup>37</sup> See press release IP/11/1076 on the website of the European Commission.



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