

Understanding the Future of Banking: Scale & Scope Economies, and Fintech

— CHAPTER 25

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1. Introduction

Structural changes are expected in the financial services industry. The recent focus on fintech — basically, new technology-oriented players entering the financial services industry — is one manifestation of the impact that information technology is expected to have on the industry.

This chapter will focus on the structure of the banking industry going forward. We will try to draw lessons from the (older) literature on scale and scope economies in banking, and relate these insights to the 'modern' world of information technology and fintech.

The impact of information technology on the industry is already going on for years. An important manifestation is the impact of the proliferation of information technology on financial markets. It has deepened financial markets and via changes in the business models of

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1 banks strengthened the link between markets and financial institutions.
2 The latter runs for example via securitization and other forms of asset
3 sales that remove assets from a bank's balance sheet allowing those
4 assets to become tradeable. This could amplify the impact of financial
5 market conditions on banks (Shin, 2009).

6 Apart from providing all kinds of benefits (e.g., diversification, liquid-
7 ity), a more negative view is that the enhanced opportunities to trade
8 assets invites 'excessive changeability' and possibly more opportunistic
9 behavior in banks that could undermine their stability (Boot, 2014). The
10 linkages to the financial market facilitate a proliferation of transaction-
1 oriented banking (trading and financial market) activities possibly at the
2 expense of more traditional relationship banking activities.

3 In this context also the ownership structure of banks is important.
4 The traditional partnership model in investment banking may have con-
5 tained opportunistic behavior in that partners had their personal wealth
6 tied up in the business, and could not easily leave and liquefy their own-
7 ership claim. In a sense, the marketability of their own involvement
8 (human capital) was severely constrained which may have countered the
9 fluidity of banking activities itself. Also here information technology and
20 the deepening of financial markets may have been instrumental in creat-
1 ing a more fluid ownership structure based on a stock market listing.

2 We will discuss these developments, and subsequently address —
3 what *The Economist* has called — the fintech revolution.¹ Can we draw
4 insights from the extensive literature on scale and scope economies in
5 banking? We will argue that only limited insights are available. Most
6 recent empirical work identifies some scale economies, yet faces bigger
7 difficulties in identifying real scope advantages. And what is particularly
8 missing in the literature, is the impact that information technology may
9 have on the industry. 'Fintech considerations' have not been part of this
30 literature.

1 The organization of the paper is as follows. In Section 2 we focus
2 on the impact of information technology and the deepening of finan-
3 cial markets on the transaction- versus relationship-orientation of
4 banks. Section 3 discusses ownership structure issues. Scale and scope
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36xy ¹'The Fintech Revolution', *The Economist*, May 9, 2015.

economies are discussed in Section 4. Section 5 focusses on the impact of fintech on the banking industry. Concluding observations are made in Section 6.

2. Information Technology and Transaction Orientation²

An arguably not much contested observation is that banks have become more transaction oriented. As *The Economist* put it over 20 years ago in the context of the experience of securities firms:

“Perhaps the worst feature of the 1980s — which has subsequently returned to haunt the securities firms — was the abandonment by most of them of the old relationships with their customers. [...] “The aim was to do a deal, any deal”, remembers one manager who prefers not to be named” (*The Economist*, April 15, 1995, Special section: A survey of Wall Street, p. 13).

While this quote was made over 20 years ago, it is interesting to note that when financial markets prosper they appear to push financial institutions away from their relationship banking franchise. As the consultancy BCG puts it (explaining the surge in transaction oriented activities in 2004–2007): “... Amid surging economies, low loan losses, and readily available cheap capital, it did not really matter whether a bank had top- or bottom-quartile capabilities [...]. All that mattered were workable sales processes” (BCG, 2010).

The modern world of information technology and deepening of financial markets has clearly induced banks to become more heavily exposed to the financial markets. Doing transactions has become easier, and hence market-linked activities like securitization and proprietary trading have become more prominent. At a more fundamental level, what this points at is the scalability of transaction-oriented activities (Boot & Ratnovski, 2016). Subject to available capital, banks can quickly increase their exposure to those activities. Relationship-based activities are more constrained as they depend on employing human

²This section follows in part Boot (2011) and Boot & Ratnovski (2016).

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1 capital and engaging with potential clients. Thus transaction-oriented
2 banking is not only more susceptible to a sudden spur in momentum,
3 but also the feasibility of financial institutions to quickly mobilize
4 resources and give in to such opportunities seems greater than for rela-
5 tionship banking activities.

6 The competitive dynamics plays an important role. When financial
7 markets are exuberant, banks that abstain from, for example, trading
8 activities — one of the financial market activities that can be expanded
9 quickly — may look less profitable and might feel 'left behind' in the
10 earnings game vis-à-vis other banks. This is precisely what happened with
1 UBS, one of the bigger victims in the 2007–2009 crisis. An internal inves-
2 tigation in 2008 — following massive losses on subprime investments —
3 discovered that its troublesome subprime investments were undertaken
4 following pressure from external consultants that pointed at its fixed
5 income activities that were lagging those of competitors. To fill this gap
6 UBS was advised "to close key product gaps" which explicitly referred to
7 subprime investment vehicles (UBS, 2008, p. 11).

8 A more subtle concern is that opportunistic trading may undermine
9 relationship banking. Boot and Ratnovski (2016) show that banks may
10 allocate too much capital to transaction-oriented activities and in doing
1 so have insufficient risk-bearing capacity for relationship banking.
2 Banks may also underestimate the risks involved, and implicitly subsi-
3 dize the transaction-oriented activities at the expense of relationship-
4 oriented activities. More specifically, proprietary trading might be
5 granted an artificially low cost of capital. Other — mainly relationship-
6 oriented activities — are then implicitly taxed and appear less profitable
7 than they really are. Thus, proprietary trading could undermine a
8 bank's competitive edge in its relationship banking business.

9 A related mechanism is that such transaction-oriented activities ini-
10 tially appear very profitable (as long as the boom lasts), and that during
1 that time those departments — and the individuals involved in them —
2 will gain power. What this might do is that power shifts from people
3 engaged in more prudent relationship banking activities to those
4 engaged in transaction activities. This may affect the overall balance of
5 power in an institution via promotions in the corporate hierarchy, and

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may tilt power away from its relationship banking franchise. As a consequence relationship banking may suffer.³

The extensive work in the field of financial intermediation points at the distinct value of relationship banking. While we continue to believe in the importance of relationship banking, information technology, the way information can be obtained from data analysis (Big Data), and, for example, the proliferation of social media will have an impact on how relationship banking can add value. In particular, payment systems and distribution channels are changing rapidly, and this will affect the business of banking and the competitive positioning of banks as distinct financial institutions. We will come back to this when we discuss fintech, and particularly the disaggregation of the value chain that it may entail.

3. Ownership Structure: Partnerships, Stability and Institutional Franchise Value

As stated, the deepening of financial markets and information technology in general may have caused excessive 'changeability' and tradeability in the industry. We pointed at the opportunistic behavior that this may cause. An important link can be made to the ownership structure and stability of investment banks versus commercial (relationship oriented) banks.

Traditional relationship-oriented banks seem incentivized to build up institutional franchise value. Individuals are part of the organization as an entity, and the continuity of the organization and lasting relationships with its clientele defines its value. The value cannot be transferred and cannot readily be assigned to individual stars. In other words, the value created is an integral part of the organizational entity and not portable as part of individuals.

³ These 'power' considerations deserve more attention in research. Much of the focus has been on remuneration contracts, while incentives running via promotion opportunities and power might arguably be as important or even more important.

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1 Investment banks on the other hand, particularly their trading and
2 transaction activities,⁴ seem more based on the individual star concept
3 with high marketability of individuals. As a consequence, less institu-
4 tional franchise value is built up; individual franchise values dominate.
5 If this is the only difference, then a relationship banking institution has
6 substantial implied franchise value, while the investment bank has little
7 implied value, and hence Keeley's (1990) analysis would suggest that an
8 investment bank would take lots of risk, while the franchise value of a
9 commercial bank would help curtail its risk taking.

10 Historically investment banks have solved the marketability problem
1 — and the potential lack of institutional franchise value — by having
2 partnerships. The partnership structure has two dimensions that could
3 help jointly resolve the marketability problem, and related opportunistic,
4 risky behavior (and star phenomenon):

- 6 • a partnership means that bankers have their personal wealth tied up
7 in the business –they own the equity claim of the business;
- 8 • the partnership structure is such that the equity is not (optimally)
9 marketable.

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1 The latter implies that stars cannot take their money out, or only at
2 a reduced value. Implicitly, this means that non-portable franchise value
3 is created, and this value is transferred over time to future partners.
4 Interesting examples exist where institutions have made changes that
5 have destroyed this structure. For example, with a go-public transfor-
6 mation (converting a partnership in a listed shareholder owned com-
7 pany) the current partners effectively expropriate all franchise value that
8 has been built up over time.⁵ Even worse, once the partnership is gone,

9 ⁴Activities of investment banks often are (were) relationship based, more recently
30 trading dominates, which is not. In recent times, traders appear to have gained
1 power within investment banks, e.g., more recent leaders of Goldman Sachs came
2 from the trading side. In any case, we do not see the distinction between commercial
3 banking and investment banking as an absolute dichotomy.

4 ⁵ Morrison & Wilhelm (2007, 2008) analyze the decision of major U.S. invest-
5 ment banks to go public. Investment banks were initially organized as partnerships.
36xy The opacity of partnerships and illiquidity of their shares allowed for successful
mentoring and training in tacit non-contractible human skills, such as building

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stars may no longer be 'under control.' Their financial interest is no longer tied to the firm. This may elevate risk and reduce stability.⁶

In commercial banking the enhanced marketability — and with it, transaction focus — may have opened the door for some type of star phenomenon as well. In a sense, it may have brought commercial banking closer to investment banking, and similar issues might be at play. This may have induced opportunistic behavior particularly because partnership structures in commercial banking never have been very common.

In any case, partnerships among major financial institutions are rare. The important point however is that via enhancing marketability the demise of partnerships could have undermined stability. As a caveat, all this does not mean that there might not be distinct benefits associated with these developments as well. What we have stressed is the potential downside. We are however prepared to conclude that the financial crisis has made us look more favorably at alternative ownership structures like mutuals and cooperative banks (e.g., Credit Agricole in France). It may well be that also with our thoughts about the type of ownership structure we should be more open to diversity. After all, one of the problems of the increasing intertwined nature of banks and markets is that it might make banks look more alike, and that could induce systemic risk. Diversity in ownership structures might help counter this.⁷

4. Scale and Scope Economies in Banking

What drives financial players in choosing their scale and scope of operations? This question is important because the size and particularly the complexity of financial institutions is a concern to regulators and

relationships, negotiating M&A deals and advising clients. They have argued that IT technology necessitated heavy investments and that that necessitated investment banks to go public. Potentially confirming this is that wholesale-oriented investment banks such as Morgan Stanley for which tacit human capital was more important than IT technology went public later than retail oriented investment banks such as Merrill Lynch.

⁶Publicly listed firms sometimes use restricted stock to create some fixity in the ownership structure, and continued loyalty of key personnel.

⁷See Berger Klapper, Martinez Peria & Zaidi (2008).

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1 supervisors. More recently, the question is what impact fintech and
2 information technology will have on bank business models, and the
3 scale and scope of banks. Research on this remains rather inconclusive,
4 in the words of Richardson, Smith, and Walter (2010): "Indeed, the
5 recent studies mirror the findings [...] some 15 years earlier [...] there
6 was no predominance of evidence either for or against economies of
7 scale in the financial sector." This precedes the fintech revolution, so it
8 is not clear whether this remains true.

10 4.1. Observations on Scale and Scope

1 A first observation is that banks like to *combine* many different activi-
2 ties. This distinguishes banks from many of their competitors, e.g., non-
3 banking financial institutions like mutual funds and finance companies.
4 The latter often choose to specialize and therefore are much more trans-
5 parent. Banks generally choose to diversify their activities. Although few
6 would readily deny that some degree of diversification is necessary,
7 banks seem to engage in a very broad variety of activities.

9 Particularly in Continental Europe, the size (and scope) of banks is
20 enormous. One explanation could be that implicit or explicit govern-
1 ment guarantees and too-big-to-fail (TBTF) concerns give artificial
2 competitive advantages to size (Feldman, 2010). Universal banks, while
3 not particularly efficient, might have sufficient 'protected' revenues to
4 compete with more focused players.⁸

6 ⁸Indeed, this is one of the complaints of more focused investment banking institu-
7 tions. Universal banks can leverage their balance sheet (read: cross subsidize) to
8 secure investment banking business (e.g., *Financial Times*, March 21, 2011, page 17:
9 "U.S. banks face fresh scrutiny on lending"). Some evidence exist on TBTF benefits.
30 Jagtiani and Brewer (2013) find that investors are willing to pay a premium when
1 an acquisition would create a bank with assets over \$100 billion. Rime (2005) finds
2 that banks above some threshold tend to have higher credit ratings and Baker &
3 McArthur (2009) show that banks that have more than \$100 billion in assets have
4 lower costs of capital. Beccalli, Anolli & Borello (2015) show that scale economies
5 are larger for banks that are designated as systemically relevant by the European
Commission.

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Scale and scope economies are often cited as rationale for why financial institutions tend to growth in size and complexity (scope) over time. But are scale and scope economies truly present? Sources of scale and scope economies include (see Boot, 2003; Walter, 2003): (i) information-technology related economies; (ii) reputation and marketing/brand name related benefits; (iii) (financial) innovation related economies; and (iv) diversification benefits. Information technology related economies particularly refer to back office efficiencies and distribution-network related benefits. Transaction processing offers distinct scale economies. And information technology developments facilitate an increasing array of financial products and services to be offered through the same distribution network, and thus allow for cross selling. Reputation and brand name/marketing related economies may be present in the joint marketing of products to customers. Brand image is partially marketing related, but is also related to the notions of 'trust' and 'reputation'. (Financial) innovation related economies particularly refer to large(r) institutions that might be in a better position to recoup the fixed costs of those innovations.

Diversification benefits are (at first sight) more controversial. In many cases, conglomeration may lead to a valuation discount which could point at (anticipated) inefficiencies. This is in line with corporate finance theory that tells us that investors can choose to diversify and that this does not need to be done at the firm level. However, key to the business of banking is risk processing and absorption. And confidence in a bank requires it to be safe. Diversification is then needed to be able to absorb risks and be safe. Observe also that several bank activities benefit from a better credit rating, which suggests that diversification at the level of the bank has value.⁹

⁹For many guarantees or contracts and activities that involve recourse, the credit standing of the guarantor is crucial for the credibility of the contract. Mester (2008) emphasizes that bank production decisions affect bank risk. Scale and scope related decisions have via diversification an effect on risk, and that in turn may affect choices about risk exposure.

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4.2. Are Scale and Scope Benefits Real?

Scale and scope economies in banking have been studied extensively. In an over 15 year old survey paper Berger, Demsetz, and Strahan (1999) conclude that, in general, the empirical evidence cannot readily identify substantial economies of scale or scope. Illustrative is also Saunders (2000). He cites 27 studies, 13 of which found diseconomies of scope, 6 found economies of scope, and 8 were neutral.

An important caveat is that this research mainly involves U.S. studies using data from the 70s and 80s. Apart from potential methodological shortcomings, the results therefore do not capture the dramatic structural and technological changes in banking that have taken place since then. Furthermore, they reflect the historic fragmentation of the U.S. banking industry due to severe regulatory constraints on the type of banking (banks could engage in commercial banking or investment banking, but not both) and the geographic reach of activities (limits on interstate banking) that were present till the deregulation in the 90s (see Calomiris & Karceski, 1998).

Some more recent studies examine the existence of a diversification discount for financial institutions. Laeven & Levine (2007) confirm the existence of a diversification discount in banks that combine lending and non-lending financial services, and suggest that the potential economies of scope in financial conglomerates are not large enough to compensate for potential agency problems and inefficiencies associated with cross-subsidies.¹⁰ Rajan, Servaes & Zingales (2000) emphasize that, even though conglomerates trade at a discount on average, 39.3% of the conglomerates trade at a premium. They show that the interrelation between activities within the conglomerate is of crucial importance. Diversified firms can trade at a premium if the dispersion between activities low. High dispersion induces inefficiencies which point at the importance of focus within the conglomerate. In particular, one should

¹⁰ Schmid & Walter (2009) confirm the Laeven & Levine (2007) results, and verify that this discount is indeed caused by diversification, and not by inefficiencies that already existed before the diversification. Chevalier (2004) shows that controlling for the pre-conglomeration performance of businesses is important: inefficiencies measured after a merger often already existed prior to the merger.

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look at what type of mergers and acquisitions involve scale and scope benefits. Recent research suggests that mergers with both a geographic and activity focus are most value enhancing. Similarly, in analyzing scope and scale issues, one should focus on the type of activities. What are the scale economies in each activity? And what product-mix offers true scope economies?

DeLong (2001) looked at the shareholder gains — more specifically, the immediate announcement effect on share prices — from focused versus diversifying bank mergers in the U.S. between 1988 and 1995. She found that focused mergers, both on the level of activity and geography, have positive announcement effects. Moreover, focus in activities was shown to be more important than geographical focus, albeit the latter was important as well. Activity-diversifying mergers had no positive announcement effects. These results point at the presence of scale rather than scope economies.

The typical result in these earlier studies was, however, that even scale economies were exhausted at relatively small bank sizes. Later evidence points at more persistent scale economies. Wheelock & Wilson (2009) and Feng & Serletis (2010) find increasing returns to scale and Elsas, Hackethal & Holzhäuser (2010) find increasing returns to scope also for larger financial institutions. Substantial scale economies are found when it comes to back-office activities and payments.¹¹ Apart from methodological issues (see Mester, 2010), this might be driven by information technology developments that might only have showed up in more recent data.

In this spirit, researchers have looked at whether there are scale economies in investments in IT as suggested by Boot (2003) and Walter (2003). The evidence is somewhat mixed. Erber & Madlener (2009) find no significant relationship between IT capital investments and bank productivity at the country level. Beccalli (2007) even finds a negative relationship between bank efficiency and investment in hardware and software, but a positive relationship between bank efficiency and country-level bank spending on IT consulting services. Koetter & Noth

¹¹See Hughes & Mester (2015), Davies & Tracey (2012), and DeYoung (2010).

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1 (2013) find that merely increasing IT investment does not lead to higher
2 profitability, but that the efficiency in employing IT matters.

3 The impact on IT on bank business models has so far not really been
4 empirically investigated. One could envision that on the demand side,
5 the proliferation of savings products and their link to pensions, mutual
6 funds and life insurance clearly pushes for joint distribution, and sug-
7 gests economies of scope. IT developments might have made it possible
8 to better exploit potential scope economies with multiple product offer-
9 ings to a particular customer group, using new direct distribution chan-
10 nels with relatively easy access to (formerly) distant customers. But the
1 value chain might be broken up. A question is who will have the cus-
2 tomer interface.

3 4 **5. The impact of Fintech on the Banking Industry**

5 A key manifestation is that fintech may lead to the disaggregation of the
6 value chain. Interfaces (may) come about that help bundle the product
7 offerings of specialized providers, thereby becoming a substitute for an
8 integrated provider. The distribution related economies that we eluded
9 to may actually lead to such disaggregation of the value chain.

1 2 **5.1. Online Platforms and Disaggregation¹²**

3 Online platforms will be developed that could disrupt existing financial
4 institutions. Disaggregation of the value chain could follow from online
5 platforms becoming the preferred customer interface. Online platforms
6 could offer a supermarket type model facilitating access to various prod-
7 ucts and services of disparate providers along with record keeping.
8 Technology firms such as Google, Facebook, Amazon or Apple may use a
9 payments solution such as Apple Pay as a platform and gain direct cus-
10 tomer interface for related products and services. Legacy financial institu-
1 tions then might be relegated to serving as the back office to the platform.

2 The disruptive forces affecting banking — information technology
3 and fintech in particular — may also offer new opportunities for other
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36xy ¹²Our observations follow in part Greenbaum, Thakor & Boot (2015).

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businesses that have tried to enter banking. For example, Tesco, a large UK supermarket chain provides banking services to its customers under its own brand. There is also no reason why a platform should be limited to offering only financial services. A life-style oriented focus could integrate financial and non-financial offerings. The financial services platform might act as a market place where people interact directly and financial institutions serve the limited role of an advisor or broker. P2P lending has parties transacting directly without the benefit of a financial intermediary (except possibly for back office services).

New specialized lenders have arisen that seek to replace relationship lenders and traditional credit scoring with sophisticated algorithms based on Big Data mining. While still in its infancy, such analysis predicts creditworthiness by analyzing buying habits, memberships, reading proclivities, lifestyle choices and all manner of opportunistic demographic correlates. Similarly, the growing availability of inexpensive information allows for public certification of creditworthiness similar to the trustworthiness scores on eBay, or the client satisfaction scores on TripAdvisor. One could envision similar developments enabling P2P lending as well. Whether society will accept the widespread use of these data is a different matter. In any event, more and more potentially sensitive personal information can already be obtained with a few mouse clicks. Big Data may also facilitate crowdfunding, another form of direct lending involving multiple lenders and a singular borrower.

At the consumer level, we may see a (re)emergence of more community oriented arrangements. As P-2-P lending and crowdfunding suggest, customers may take matters in their own hands; empowerment thus. Local arrangements may emerge where communities organize their financial affairs directly.

5.2. Payments

An area with substantial developments is payments. This core area of banking is being coveted by technology firms and payment specialists like Google, Apple, and PayPal. Thus far, banks have maintained their central role in payments. Also, the payments innovators are not typically independent of banks, but have developed in joint ventures or other

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1 types of alliances with traditional banks. In some countries, banks them-
2 selves have managed to offer the leading online payments solution.¹³

4 5.3. *And Banks?*

6 What role will banks play in these developments? They may face chal-
7 lenges. As a recent report by McKinsey & Co, a consultancy, puts it:
8 "Digitization often lowers entry barriers, causing long-established
9 boundaries between sectors to tumble. At the same time, the "plug and
10 play" nature of digital assets causes value chains to disaggregate, creat-
1 ing openings for focused, fast-moving competitors. New market
2 entrants often scale up rapidly at lower cost than legacy players can, and
3 returns may grow rapidly as more customers join the network" (Hirt &
4 Millmott, 2014).

5 This does not mean that banks are doomed. In the past, banking insti-
6 tutions have shown remarkable resilience, despite questions about their
7 viability. As far back as 1994, economists John Boyd and Mark Gertler
8 commented on the predicted demise of banks in a well-known study
9 titled, "Are Banks Dead? Or Are The Reports Greatly Exaggerated?"¹⁴ At
20 that point, the discussion was about the banks' role in lending. In particu-
1 lar, the question was whether securitization would undermine the
2 banks' lending franchise. They concluded that while securitization made
3 banks less important for the actual funding of loans, the core functions
4 of banks in the lending process — origination (including screening),
5 servicing and monitoring — would be preserved, as would the centrality
6 of banks. Also, banks would typically play a role in the securitization
7 vehicles by providing back-up lines of credit and guarantees of the com-
8 mercial paper that funds many of the vehicles.

9 The message of that article might still have some relevance today.
30 Banks will respond and try to be players in the fintech world. And they
1 may have some competitive advantages.¹⁵ Banks benefit from the anx-
2 iety of people about the safety of their liquid wealth. The financial crisis
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4 ¹³ See Oliver Wyman (2014) and BIS (2014).

5 ¹⁴ Boyd & Gertler (1994) and Samolyk (2004).

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of 2007–2009 may have created anxiety about the stability of banks, but banks are still seen as the place where money is safe.¹⁶ Whatever the popularity of Apple, will people trust technology companies in safeguarding their money? Being a bank with a license and an implicit guarantee from the government has value. Nevertheless, there are reasons to envision a potential decline. New competitors and the disaggregation of the value chain will put pressure on existing players.¹⁷

6. Conclusions

Information technology plays a leading role in the transformation of banking. Developments in information technology and the related deepening of financial markets have pushed banks to more transaction-oriented activities, including trading, at the expense of relationship banking. Banking has become more fluid, and possibly opportunistic as a result. Financial markets also facilitated investment banks in moving away from the more stable partnership model to a more fluid shareholder owned public listing.

The latest incarnation of information technology has led to a ‘fintech revolution’ where banks face new competitors with different — more specialized — business models forcing a disaggregation of the value chain. With technology-driven solutions they offer alternatives to key banking services including payments and lending. An important question is to what extent existing financial institutions can be leading. Can they be at the forefront of new developments? For example, by absorbing fintech players and their innovations? Or will they fade away, with new technology-linked players assuming prominence in the financial sector? Many questions, few answers.

¹⁶Vatanasombut, Igbaria, Stylianou & Rodgers (2008) highlight that trust plays a key role in the retention of customers with online banking. They also find that perceived security reinforces trust.

¹⁷Much attention is devoted to the so-called blockchain technology that potentially allows for a decentralized system of record keeping and transactions. A payment system based on crypto currencies (e.g., bitcoin) is the most well known application (Nakamoto, 2008; Bank of England, 2014).

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1 Also from a financial stability point of view, the fintech revolution
2 is challenging. We just do not know what the future structure of the
3 industry will look like.¹⁸ The extensive literature on scale and scope
4 economies in banking offers little guidance on what to expect in this
5 'new' world.

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2 ¹⁸The Bank of England has formulated the question whether "...the distress of failure
3 of a technology-enabled alternative finance provider have implications for financial
4 stability" (Bank of England, 2015). The Dutch central bank has identified not just
5 risks in the (new) fintech type operations and players, but also stability risks coming
36xy from existing institutions that could lose out in the technology race (DNB, 2016).

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