Digital Disruption and Bank Lending

by Jean Dermine[27] [28]

Abstract

The paper assesses the threat posed by digital banking as seen in the context of a long series of financial and technological innovations in the banking sector. It focuses on the economics of banking services and banks' two main functions – as providers of liquidity and loans – and analyzes whether these could be displaced by peer-to-peer and marketplace lending.

Digital Banking and Market Disruption

Over the past three years, analysts of the banking industry have met a new terminology: P2P, crypto-currencies, blockchain decentralized ledger technology, robo-advisors, chatbots, big data, millennials, sandbox, API… Fintech – the application of digital technology to finance – is disrupting banking markets. New payments systems have proliferated such as PayPal, Venmo, M-Pesa, ApplePay, and Alipay. TransferWise and WorldRemit are competing with the incumbent Western Union and MoneyGram for international transfers and remittances. On the credit side, Lending Club, Prosper and SoFi in the US, the British Zopa and Funding Circle, the French Prêt d'Union or Alibaba in China are competing with established banks in the

unsecured consumer loan and small and medium size entreprises (SME) markets as well as in the residential lending market. London-based Prodigy Finance platform offers loans to international postgraduate students attending top universities. The scale of the threat to the banking industry is summed up in the following:

"*The aim is to inflict death by a thousand cuts. Fintech start-ups are nimble piranhas, each focusing on a small part of a bank's business model to attack*" (Financial Times, 14 October 2015).

The cataclysmic predictions of the slow death of banking reminds me of similar gloomy forecasts made over the past 35 years. When telephone banking was introduced in the 1980s, there were fears that telephone companies would enter the banking industry and displace the incumbent players. But that did not happen – the banks themselves started to offer telephone based services.

When in the 1990s, capital markets – bonds and equity markets – were deregulated, it was predicted that direct finance would replace costly and inefficient indirect finance and financial intermediation. But the prediction turned out to be wrong: banking assets-to- GDP ratios grew in both developed and emerging economies.

At the turn of the millennium, as the internet bubble went up, bankers were terrified that Microsoft would enter their industry and enable customers to navigate online from one bank to another – such transparency of prices and product offers seemed set to undermine revenues. As of October 2017, this company does not offer banking services.

After 35 years of impending doom, it seems appropriate to ask whether digital banking will bring market disruption, or is it simply a fad?

The objective of this paper is to analyze the sources of market disruption brought by digital technology with a specific focus on lending. It is divided into five sections. In the first section I review six fundamental services offered by banks. In the second, I attempt to identify the major changes in technology, and in the third how they may disrupt the offering of banking services. The case of a highly visible digital lender, Lending Club, is analyzed in Section Four. In the final section, I argue that shadow banking enlarges the menu of credit-related assets offered to investors who will choose according to their appetite for credit and/or liquidity risk.

Section 1. Economics of Banking Services: Six Main Functions

In financial markets, economic units holding surplus funds, be they households or firms (or more rarely, governments) can finance directly economic units that are short of funds, such as other firms, households, or governments. Savers can buy bonds or shares issued by deficit units directly on the financial markets. This is referred to as *direct finance*. Where there is an intermediary between the units with surplus and those with a deficit, we refer to *indirect finance*. A bank is one example of a financial intermediary, collecting deposits and granting loans. Others include insurance companies, pension funds, and investment funds, such as mutual funds or hedge funds. Shadow banks, such as structured investment vehicles (SIVs) or money market funds, were at the source of the global financial crisis. They are legal structures that perform credit intermediation and maturity transformation.

Although the services provided by banks in financial markets are interrelated, we can distinguish six categories of increasing complexity (Dermine, 2015 and 2017): underwriting and placement, portfolio management, payment (transmission) services, monitoring or information-related services, risk sharing, and advisory services.

Underwriting and placement: A first service provided by banks is to bring together savers and borrowers. Underwriting and placement of securities – bonds or shares – helps borrowers (corporate firms or public institutions) to meet surplus units, and structure or customize the type of securities that meet the risk/return requirements of borrowers and lenders. In this function, the underwriter is involved not only in designing the security, but also in the valuation of assets and the pricing of securities to ensure that the terms of the issue are competitive. As investors may wish in the future to transform these claims into cash, consumption or other securities, they need to be exchanged. Brokers/dealers or market makers provide these services to ensure secondary trading and liquidity. In a pure underwriting and placement service, it is assumed that the return and risk of the securities can be properly defined, so that there is no major problem of asymmetric information (agency problem) between lenders and borrowers. In this case, monitoring is not an issue. With the underwriting and placement service, the end-investor holds directly the claims on deficit units.

Portfolio management: Investors can acquire at a low cost a diversified portfolio of securities issued by deficit spending units. Mutual funds and UCITS supply a diversified portfolio to the holders of its shares. The income derived from the financial assets is paid to shareholders less a fee paid to the fund manager. These funds exist for three reasons: To reduce the divisional costs incurred in issuing many securities, to provide a diversified portfolio to investors, and to delegate asset management to specialists who can assess economic prospects.

Payment system: A third function of financial markets is the management of the payment system, i.e. to facilitate and keep track of transfers of wealth among individuals. This is the bookkeeping activity of banks realized by debiting and crediting accounts on centralized ledgers.

Monitoring and information-related services: Private information held by borrowers leads to contracting problems, because it is costly to assess the solvency of a borrower or to monitor his/her actions after lending has taken place (Stigliz and Weiss, 1981). Sometimes, it is useful to package these claims in a portfolio, and banks perform a useful function in reducing the costs of screening and monitoring borrowers. The delegation of screening and monitoring to banks has been shown to be an efficient mechanism (Diamond, 1984). This fourth category is linked to the first (underwriting and placement) but listed here as a separate service as it corresponds to those cases where significant information asymmetries make it difficult to issue financial claims traded on securities markets. While the second service (portfolio management) refers to the management of liquid assets, this fourth function refers to the management of an illiquid loan portfolio, often the largest part of a bank's balance sheet. It concerns primarily lending to consumers and small and medium size enterprises (SMEs).

Risk-sharing service: An increasingly important function of banks is to make the market more complete, i.e. to provide some form of insurance against multiple sources of risk. First, banks not only supply diversified assets, but also organize efficiently the distribution of risky income earned on the asset pool. The debt holders receive a fixed payment while the shareholders receive the residual income. Other insurance services include interest rate insurance (floating rate lending with various ceilings on interest rates called *caps or floors*), and liquidity insurance, i.e. option for a deposit holder or the holder of a line of credit to withdraw cash quickly at its face value (Diamond and Dybvig, 1983; Farhi and Tirole, 2017).

Advisory services: Advisory services to corporations and individuals are a significant source of fee income. Advices on mergers & acquisitions or risk management to corporations, as well as on asset management, tax or succession planning to individuals are all services offered by banks.

In the next two sections, we identify technological innovations and evaluate how digital technology could disrupt the offering of bank services.

Section 2. Disruptive Technology in Banking, a Historical Perspective

The following sections review briefly the technological innovations and their impact on the banking industry: electronic processing of data, telephone banking, internet, smart-phones, blockchain decentralized ledger technology, cloud computing, and applications of artificial intelligence with robo-advisors.

Electronic processing of data. A major breakthrough that affected the payment system was the move from manual entry of debit/credit in a centralized book ledger, to machine-readers of checks, and subsequently electronic payments. The payment business relies on the mastering of electronic data processing with debit and credit of accounts. In this area, banks have no source of competitive advantage vis-à-vis tech firms such as telephone or internet companies, as illustrated by the proliferation of new entrants/payments systems, including the mentioned M-Pesa, PayPal, Apple Pay, Samsung Pay, and Alipay developed by the Chinese retailer Alibaba.

Telephone (minitel) banking: A major benefit of telephone (minitel) banking was that access to bank information (such as to the account balance) and transactions could be initiated from any location outside the bank's branch and processed automatically with electronic data processing.

Internet: Compared to telephone banking, the internet allowed millions of users to access data more easily from distant locations and facilitated the entry of transactions. Coupled with the development of mathematical algorithms, it allowed the clearing and settlement of securities trade at low cost. This facilitated the entry of online brokerage and asset management firms such as Boursorama and Cortal in France, Banco BIC in Portugal or Binckbank in the Netherlands, Belgium and France. More recently, the internet and mathematical

algorithms combination has allowed the matching of investors and borrowers. The case of peer-to-peer lending (P2P) is discussed in the next section.

Smart-phone with censors: Smart-phones that combine computer power and internet access allow banking at any time, any place. In addition, censors collect data on customer habits which allows big data analytics.

Blockchain decentralized ledger technology: Until recently, trust in the economy with records of cash account balances or real estate property was based on centralized bank or public ledgers. This helps to facilitate payment and real estate transactions. The application of cryptography and internet networks permits the development of a decentralized ledger technology. It was first applied to the cryptocurrency bitcoin.

Cloud computing: Progress in storage and transmission of data allows the aggregation of data and softwares in specialized places on the 'cloud'. This has an important impact on the bank value chain. Data and softwares no longer need to be stored in-house but can be stored with a third party. Smaller firms can benefit from lower cost generated by economies of scale of the cloud company specialists.

Artificial Intelligence and Robo-Advisors: It has long been expected that increased computing power and artificial intelligence would contribute to automatize effectively repetitive tasks performed by humans. Competition between robots and humans arose first in popular games. In 1997, *Deep Blue* of IBM defeated the chess world champion Kaskapov. More recently in 2016 *AlphaGo* of Google defeated Lee Sedol a Korean grand master in the sophisticated- game of Go. IBM has invested significantly in artificial intelligence with the project *Watson*. It could have application in the field of medicine, law and finance. In the field of asset management, two of the highest performing hedge funds, Two Sigma, are managed by algorithms. In private banking, start-up firms such as *Betterment* in USA offers fully automated private banking and asset allocation services.

Section 3. Banking Services and Disruptive Digital Technology

To understand the impact of digital technology on banking markets, it is useful to group some of the banking services discussed in Section 1 into three categories: those related to data processing, to data analysis, and to the bank's unique balance sheet structure, as in Table 1.

Table 1: Banking Services

Data Processing	Data Analysis	Bank's Balance Sheet
Payment	Lending to SMEs (with evaluation of risk, collateral, monitoring of risk, restructuring, recovery)	Non-maturing deposits: safe (as backed by a diversified loan portfolio, banks's equity and deposit insurance) and liquid (withdrawable on demand)
Brokerage of securities (shares and bonds), passively managed investment funds	Advisory (corporate finance and risk management)	Credit lines (borrowers can access liquidity on demand)
Consumer Loans (credit risk is quantifiable, commoditized)	Asset Management and private banking (advisory on estate planning, actively managed funds, structured products)	

The first column lists banking services that involve mostly electronic data processing. They include payment with debit and credit of accounts, brokerage of securities including trading with algorithms, and the distribution of passively managed funds. It includes consumer loans for which credit risk can be quantified with external discriminatory factors. Easy access to external data and statistical packages to evaluate credit risk implies that the risk is commoditized. As this first set of services requires expertise in data processing and not in banking, they are attractive to new competitors. Entrants into the payment business by PayPal or ApplePay and in international money transfers (TansferWise) illustrate the significance of the threat.

In many cases, banks have been able to respond. In France, they joined forces to introduce Paylib for online payment. In the online securities brokerage industry, Boursorama and Cortal have fought off competition, but have seen a significant reduction of the fee per transaction. Other industry

responses have been cooperation with telephone companies (such as Apple), but again with a reduction of bank revenue due to sharing. Finally, when credit risk is quantifiable with external data and commoditized, it becomes a data processing game. This explains the success of Lending Club in penetrating the US unsecured consumer loan market. this is discussed in Section 4.

The second column includes services that require data analysis and specific banking expertise. Lending involves not only a supply of funds, but also the control of risk via assessment of collateral and, when the economy dives, loan restructuring and recovery. This requires specific banking expertise that cannot be easily copied by data processing specialists. Artificial intelligence promises significant efficiency gains which could be provided by incumbent banks or by new players.

The third column includes banking services that rely on the unique balance sheet of banks and their ability to mismatch maturities. As stated above, banks provide liquidity insurance services in both deposit and credit markets by relying on large pool of depositors and borrowers. This service cannot be easily imitated by pure data processors and brokerage platforms. Lending Club, it will be observed, does not engage in maturity mismatch but offers matched-maturity medium-term investment.

From this we can conclude that data-processing activities are under threat from specialist companies such as telephone or internet companies. India, for example, has recently granted banking licenses to telephone operators to steer competition. On 6 January 2016, the French telephone operator Orange announced the purchase of the insurer Groupama's bank to launch a mobile bank. After several delays, the launch is taking place on 2 November 2017, an event that will be closely monitored. Banking services that are quantifiable with external data and commoditized are also subject to competition, such as Lending Club in the consumer credit market. A fundamental question arises as to whether banks will be affected by the loss of payment business and exclusive client relationships. Agile banks can adjust by offering alone or in partnership the omni-channel distribution to meet the needs of the clients, but often with a reduction of bank revenue, which in turn implies pressures to reduce operating costs.

Section 4. Peer-to- Peer Lending, the Case of Lending Club

As bank lending is fundamental for the economy, a specific analysis of digital disruption in the lending market follows. This is best illustrated by America's Lending Club, which has attracted a significant attention due in part to a successful IPO in December 2014 and the presence of well-known individuals on its board, such as Larry Summers, former US Treasury Secretary, and John Mack, former president of Morgan Stanley. Founded in 2006 in San Francisco by the French entrepreneur Renaud Laplanche, it is essentially a brokerage platform matching investors to individual borrowers. On the first day of trading (12 December 2014) the price of its shares issued at $15 jumped to $24.75, a 65 per cent gain. It implied a price-to-book of 7, comparable to that of Facebook.

Initially dubbed 'peer-to-peer (P2P) lending' with individuals financing individuals, it has evolved into 'marketplace funding' with large institutional investors such as pensions funds, hedge funds or other banks making these loans. According to Credit Suisse analysts (CS, 2015), the $ 4 billion loan volume issued by Lending Club in 2014 could be compared to a total addressable market (TAM) of $ 873 billion of unsecured consumer loans, reaching $ 1,171 billion if one includes unsecured loans to small and medium size enterprises (SMEs). The claim of Lending Club is that, unencumbered by an expensive set of physical branches and outdated IT, it can operate with a much lower cost base, offering better returns to investors and cheaper loans to individuals. Available FICO credit scores on the credit worthiness of individuals in the US allows to classify credit risk and investors can diversify by investing pieces of $25 into several loans. Lending Club relies on digital technology to solve the asymmetric information and divisibility issues mentioned earlier. On 26 October 2017 it was trading with a price-to-book of 2.4 and a share price of $ 5.73, significantly below the December 2014 issue price of $15.

Figure 1: Lending Club share price since IPO in December 2014..
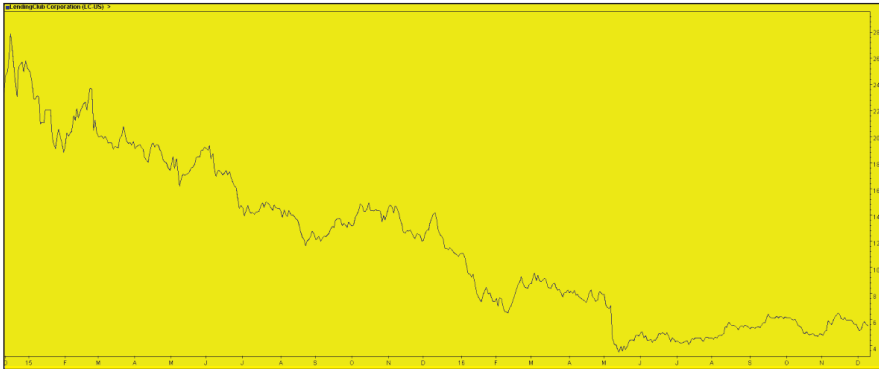
The severe drop in the share price of Lending Club is due to its inability to meet initial growth forecasts. If there was a demand for cheaper loans used to refinance previous expensive bank or credit card loans, the supply of funds from institutional investors proved to be volatile. On 9 May 2016, the CEO founder Renaud Laplanche a 'totemic' figure of the industry resigned due to mis-selling $22 million loans to Wall street investment bank Jefferies and a lack of full disclosure of a personal investment in a hedge fund in which LC was investing. On 23 May 2016, Shanda Payment Holdings Ltd, the Chinese investment group increased its stake in LC.

Jagtiani and Lemieux (2017) have analysed empirically the lending activity of LC. They find that Lending Club caters underserved areas (bank branches have been closed) or concentrated markets with lower spreads (for equivalent credit risk). They find that alternative information sources must be used as some borrowers with low FICO scores due to few or inaccurate credit reports have been able to access credit. They conclude that LC has enhanced financial inclusion.

One should take note of the very particular characteristic of the US banking market with a large reliance on credit scores developed by companies such as FICO, Experian or Equifax. In the United States, it is very difficult to obtain credit without a credit score and a long credit record history. In other countries, banks have applied statistical analysis with larger set of data to evaluate credit risk. The impact of P2P on financial inclusion in other countries remain to be analysed.

Section 5. Digital Disruption and Bank Lending: A Menu of Credit-Facilities

We have seen how P2P and marketplace funding could disrupt two banking services: the resolution of asymmetric information and the division of investment into small amounts to allow diversification. While it is too early to know whether the potential will become reality, two observations must be made about the benign economic circumstances which favor the growth of that industry: an ultra-low interest rate environment and an economic recovery in the US.

The ultra- low interest rate environment has created an appetite for riskier assets and credit risk spreads, with institutional investors searching for yield. Institutional money is known to be volatile and one can wonder whether the appetite of hedge funds for credit-related assets will be sustained in a rising interest rate environment. Besides ultra-low interest rate, a second factor has helped marketplace funding. The US economic recovery has shifted attention away from the downside risk of a recession and loan losses. It is obvious that lending is not just about matching investors and borrowers, it is also the business of controlling risk and managing non-performing assets From that perspective, a remote internet-based company from San Francisco will be at a competitive disadvantage vis-à-vis banks with branches that are closer to its non-performing clients. The case of marketplace funding suggests that we classify lending into different types of credit risk and funding vehicles, as in Table 2.

Table 2: Digital Disruption and Lending

Types of Loans	Bank Funding Vehicles
Types of Loans High risk ('information sensitive': collateral valuation, risk monitoring, restructuring, recovery) ↓ Low risk ('information insensitive', such as a mortgage with a low loan-to-value ratio)	**Bank Funding Vehicles** Insured deposits, unsecured deposits or bonds, subordinated debt and equity Banks keep 'skin in the game' ─────────── Securitized loans with several tranches – Shadow banking Under current international regulations, banks keep 'skin the game' ─────────── P2P, Marketplace funding Brokers do not keep skin in the game

Digital technology allows direct finance with the matching of borrowers and investors. It is a low cost competitor to the banking industry. However, as discussed above, lending is more than the matching of investors and borrowers. It involves the control of risk after lending has taken place, the trading of claims if investors need to access liquidity, and the management of non-performing assets. Given the complexity of these lending services, it is useful to rank assets according to the degree of credit riskiness (from high risk to very low risk) as shown in the first column of Table 2.

Higher credit risk implies a need for risk monitoring and a higher probability of having to deal with non-performing assets. Moreover, the presence of credit risk with asymmetric information between the holder of an asset and a potential buyer may lead to a market breakdown due to the classical fear of buying a 'lemon'. Such 'information sensitive' assets become illiquid in a recession, just when liquidity is most needed (Dang *et al.* 2013). For such assets, funding on the bank's balance sheet with a maturity mismatch allows the creation of liquidity and is something that cannot be replicated by a broker such as Lending Club that does not engage in maturity transformation.

At the other extreme are very safe assets, such as a mortgage with a very low loan-to-value ratio. These assets which are not affected by credit risk are

'information insensitive' and therefore liquid. A broker is well placed to offer financing vehicle at a low cost. Classifying loans from risky to very safe, one can argue that higher risk transactions will remain on the balance sheet of banks, that lower risk can be securitized and that very safe assets can be handled with marketplace funding. This does not necessarily imply market disruption as banks could replicate by offering similar products to investors.

Investors will face a menu of credit-related investment opportunities that will match their risk preference. Investors who have a strong aversion to risk - be it related to credit or liquidity - will prefer non-maturing bank deposits. With less risk aversion to credit and liquidity, they can invest in tranches offered by special purpose vehicles managing loan securitization. In these first two cases, the loan originating bank will keep skin in the game, reducing the agency problem with investors. The third set of credit-related investments offered by peer-to-peer lending will present the highest risk in terms of credit (no skin in the game for the brokerage platform) and liquidity risk.

A second empirical paper, Buchak *et al.* (2017), focuses on shadow banks in US residential market. Fintech represents a third of shadow banks. They observe that, besides the benefit of efficient digital technology, the growth in digital residential lending is related to two factors: regulatory arbitrage and access to government sponsored enterprises (GSE) with some form of government guarantee. Traditional banks retreat from market with high regulatory burden and this is filled by shadow banks. They observe a very large increase in the Federal Housing Administration (FHA) mortgage market which serves less credit worthy customers and is subject to highest regulatory or litigation costs. Moreover 80% of Fintech lending benefit from GSE and some form of government guarantee. One notices again in this second empirical paper very specific characteristics in the US residential loan market. They should be taken into account in assessing digital lending in other parts of the world.

Conclusion

With regards to the funding of loans, internet has facilitated P2P and marketplace funding. Furthermore, the environment for P2P has been extremely favorable, thanks to ultra-low interest rates and the expansion of

economic activity. Such a benign environment for marketplace funding may not last. Moreover, nothing stops a traditional bank from offering online a similar loan brokerage facility.

According to their risk aversion for credit or liquidity risks, investors will choose between safe non-maturing bank deposits, more risky tranches of securitized loan portfolios, or direct lending from digital platforms.

As was the case with securitization, public policy should ensure a minimum level of transparency for borrowers and investors. It must identify and control shadow banking with maturity mismatch, a major cause of a liquidity crisis. Banks have a unique role to play in providing liquidity and funding higher credit risk assets, which are often characterized by opacity and therefore illiquidity.

References

Buchak G., Matvos, G., Piskorsli, T., and Seru, A. (2017). Fintech, Regulatory Arbitrage, and the Risk of shadow Banks, mimeo, University of Chicago.

Credit Suisse (2015). Lending Club, Equity Research, 21 January, 1-22

Dang, T. V., Gorton, G., and Holmström, B. (2013). Ignorance, Debt and Financial Crises, mimeo, 1-34.

Dermine, J. (2015). Bank Valuation and Value-based Management, 2nd edition, McGrawHill, NY.

Dermine, J. (2016). Digital Banking and Market Disruption, A Sense of *déjà vu*? Financial Stability Review, Banque de France, N° 20, April.

Dermine, J. (2017). Single Resolution Mechanism in the European Union: Good Intentions and Unintended Evil, in Monetary Economic Issues Today, Festschrift in Honour of Ernst Baltensperger, editor Swiss National Bank, Orell Füssli Verlag, Zurich.

Diamond, D. W. (1984). Financial Intermediation and Delegated Monitoring. Review of Financial Studies, 51, 393-414.

Diamond, D. W., and Dybvig, P. (1983). Bank Runs, Deposit Insurance and Liquidity. Journal of Political Economy, 91, 401-419.

Fahri, E., and Tirole, J. (2017). Shadow Banking and the Four Traditional Pillars of Traditional Financial Intermediation. CEPR discussion paper 12373.

Jagtiani J., and Lemieux, C. (2017). Fintech Lending: Financial Inclusion, Risk Pricing, and Alternative Information. Working paper # 17-17, Federal Reserve Bank of Philadelphia

Stiglitz, J., and Weiss, A. (1981). Credit Rationing with Imperfect Information. American Economic Review, 71, 393-410.