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Open banking: Regulatory challenges for a new form of financial intermediation in a data-driven world

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**OPEN BANKING: REGULATORY CHALLENGES FOR A NEW FORM OF FINANCIAL
INTERMEDIATION IN A DATA-DRIVEN WORLD¹**

Nydia Remolina²

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Abstract

Data has taken immense importance in the last years. Consider the amount of data that is being collected worldwide every day, industries are reshaping their activities into a data driven business. The digital transformation of all industries, portent of the fourth industrial revolution, is creating a new kind of economy based on the *datafication* of almost any aspect of human social, political and economic activity as a result of the information generated by the numerous daily routines of digitally connected individuals and technology. The financial services industry is part of this trend. Embracing the digital revolution and creating the right foundations allow incumbent financial institutions to disrupt their own business model. Hence, financial institutions are creating new businesses within their existing structures that adapt and collaborate to meet the challenges of digital transformation and make better use, faster, of their enduring source of competitive advantage – their own customer insight. Open banking and banking as a service (BaaS) are emerging as new forms of intermediation in the financial system that portraits positive and negative externalities for the financial system. Both concepts – open banking and BaaS - refer to the use of open Application Programming Interfaces that enable third parties to build applications and services around a financial institution that exposes its data and/or its infrastructure. The use of these schemes represents a new form of intersection between data and finance, which is changing the way traditional products, services and customer experience traditionally work in the financial sector. This paper explains the open banking and BaaS foundations and what they exactly entail. It also explores the benefits and risks that this interaction between financial institutions and third parties portrait for the financial services industry and analyses from a comparative perspective the different approaches financial, data privacy and competition regulators have implemented to boost open banking phenom. This paper argues that the compulsory approach on open banking is not in all cases the best approach for capitalizing the benefits of open banking and managing its risks. Indeed, some regulators have proposed a compulsory approach to open banking regulations to increase competition in retail banking or in the payment systems. In opposition, this paper argues that open banking and BaaS model in the financial industry might lead to more concentration and this risks has been understate by financial regulators and competition authorities. Finally, we provide some policy recommendations regarding

open banking regulations, such as: the same regulatory approach should not apply to all jurisdictions, regulators should encourage reciprocity, especially when choosing the in compulsory approach, coordination among different regulatory authorities is needed on a national and international levels, risk based regulation is a correct type of approach, and monetization of data should not be prohibited for incumbents.

Key words: Open banking, Application Programming Interfaces, systemic risk, data protection, data privacy.

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1. Introduction

Data has taken immense importance in the last years. Consider the amount of data that is being collected worldwide every day³, industries are reshaping their activities into a data driven business. The digital transformation of all industries, portent of the fourth industrial revolution⁴, is creating a new kind of economy based on the *datafication* of almost any aspect of human social, political and economic activity as a result of the information generated by the numerous daily routines of digitally connected individuals and technology. In other words, the Fourth Industrial Revolution is a data-driven one⁵ and data has become a new factor of production, in the same way as hard assets and human capital. Some even argue that the world's most valuable resource is no longer oil, but data.⁶

³ By 2020, about 1.7 megabytes a second of new information will be created for every human being on the planet. Thus, Data is set to rise steeply to 44 zettabytes by 2020. To put that in perspective, if each Gigabyte in a Zettabyte were a brick, 258 Great Walls of China (made of 3,873,000,000 bricks) could be built. There are 931322574615.48 gigabytes in a zettabyte. See Amit Garg, Davide Grande, Gloria Macías-Lizaso Miranda, Christoph Sporleder, and Eckart Windhagen, *Analytics in Banking: Time to realize the value*, MCKINSEY & COMPANY FINANCIAL SERVICES REPORT 2017, available at: <https://www.mckinsey.com/industries/financial-services/our-insights/analytics-in-banking-time-to-realize-the-value>; Thomas Barnett, Jr., *The Zettabyte Era Officially Begins (How Much is That?)*, CISCO BLOGS 2016, available at: <https://blogs.cisco.com/sp/the-zettabyte-era-officially-begins-how-much-is-that>.

⁴ We are on the brink of the Fourth Industrial Revolution. And this one will be unlike any other in human history. Characterized by new technologies fusing the physical, digital and biological worlds, the Fourth Industrial Revolution will impact all disciplines, economies and industries - and it will do so at an unprecedented rate. World Economic Forum data predicts that by 2025 we will see: commercial use of nanomaterials 200 times stronger than steel and a million times thinner than human hair; the first transplant of a 3D-printed liver; 10% of all cars on US roads being driverless; and much more besides. See Klaus Schwab, *THE FOURTH INDUSTRIAL REVOLUTION* 32 (Penguin UK: London) 2017.

⁵ See Dan Ciurak, *The Economics of Data: Implications for the Data-Driven Economy*, CENTRE FOR INTERNATIONAL GOVERNANCE INNOVATION, 2018, available at: <https://www.cigionline.org/articles/economics-data-implications-data-driven-economy>

⁶ See The Economist, *The world's most valuable resource is no longer oil, but data*, 2017, available at: <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data> (last visited: July 12, 2019); Janos Barberis, *From FinTech to TechFin: Data Is the New Oil*,

The financial services industry is part of this trend. Even though, financial institutions have always leveraged their operations through technology,⁷ the phenomenon of digital transformation is changing the way technology impacts the financial industry. After the global financial crisis, banks in many regions are under enormous economic pressure.⁸ The post-crisis regulatory burden and other regulatory pressures such as financial consumer protection focus of some regulators, have increased the operational costs of the financial services industry.⁹ Hence, digital transformation and

ASIAN BANKER (2016), available at: <http://www.theasianbanker.com/updates-and-articles/from-fintech-to-techfin:-data-is-the-new-oil> (last visited: July 12, 2019)

⁷ Technology-driven banking and finance has existed even before the global financial crisis. Financial institutions have always focused their spending on technology to support their operations and innovate. In examining the timeline of fintech developments, the last 65 years paint a picture of continued innovation and evolution. For example, the ATM is considered one of the greatest results from the partnership between Banks and technology. In 1939, City Bank of New York launched the first ATM, which was removed after 6 months because of lack of acceptance from the public. Then, in 1967 Barclays launched an ATM located at the Enfield Town in North London. Years later ATMs became a mainstream item in retail banking. See Bernardo Batiz-Lazo y Robert J.K. Reid, *Evidence from the Patent Record on the Development of Cash Dispensing Technology*, MUNICH PERSONAL REPEC ARCHIVE PAPER NO. 9461 (2008); James Pethokoukis, *What the story of ATMs and bank tellers reveals about the 'rise of the robots' and Jobs*, AEI IDEAS (2016), available at: <http://www.aei.org/publication/what-atms-bank-tellers-rise-robots-and-jobs/> (last visited: Mayo de 2019); Paul Volcker, *The only thing useful banks have invented in 20 years in the ATM*, NEW YORK POST (2009), available at: <http://nypost.com/2009/12/13/the-only-thing-useful-banks-have-invented-in-20-years-is-the-atm/>

Other example of this common partnership between technology and finance is the development of electronic payments systems. The concept of using a card for purchases was described in 1887 by Edward Bellamy in his utopian novel Looking Backward. Bellamy used the term credit card eleven times in this novel, although this referred to a card for spending a citizen's dividend from the government, rather than borrowing, making it more similar to a Debit card. Before the computerization of credit card systems in America, using a credit card to pay at a merchant was significantly more complicated than it is today. Each time a consumer wanted to use a credit card, the merchant would have to call their bank, who in turn had to call the credit card company, which then had to have an employee manually look up the customer's name and credit balance. This system was computerized in 1973 under the leadership of Dee Hock, the first CEO of Visa, allowing transaction time to decrease substantially to less than one minute. In the 1970s, electronic stock trading began on exchange trading floors. The 1980s saw the rise of bank mainframe computers and more sophisticated data and record-keeping systems. In the 1990s, the Internet and e-commerce business models flourished. The result was the introduction of online stock brokerage websites aimed at retail investors, replacing the phone-driven retail stock brokering model. See Falguni Desai, *The evolution of Fintech*, FORBES (2015), available at: <https://www.forbes.com/sites/falgunidesai/2015/12/13/the-evolution-of-fintech/#267e26ba7175>; Donal O'mahony, Michael Peirce, and Hitesh Tewari, *ELECTRONIC PAYMENT SYSTEMS*. (Artech House, 1997); Richard Schmalensee, *Payment systems and interchange fees*, 50.2 THE JOURNAL OF INDUSTRIAL ECONOMICS 103-122. (2002)

⁸ See Amit Garg, Davide Grande, Gloria Macías-Lizaso Miranda, Christoph Sporleder, and Eckart Windhagen, *Analytics in banking: Time to realize the value*, MCKINSEY & COMPANY (2017), available at: <https://www.mckinsey.com/industries/financial-services/our-insights/analytics-in-banking-time-to-realize-the-value>

⁹ See Ingrid Goodspeed, *Cost of regulatory compliance in the aftermath of the global financial crisis*, SA FINANCIAL MARKETS JOURNAL (2015), available at: <https://financialmarketsjournal.co.za/cost-of-regulatory-compliance-in-the-aftermath-of-the-global-financial-crisis/>; Rebecca Linke, *How effective are post-financial crisis bank regulations?*, IDEAS MADE TO MATTER - PUBLIC POLICY MIT MANAGEMENT SLOAN SCHOOL (2018), available at: <https://mitsloan.mit.edu/ideas-made-to-matter/how-effective-are->

data-driven finance are also opportunities that financial institutions are trying to exploit for cutting costs.¹⁰ Embracing the digital revolution and creating the right foundations allow incumbent financial institutions to disrupt their own business model making the most out of the digital transformation. Financial institutions are creating new businesses within their existing structures that adapt and collaborate and make better use, faster, of their enduring source of competitive advantage – their own customer insight and their infrastructure.¹¹ Indeed, incumbents¹² held vast amounts of data inside their organisations and control vast amounts of not only typical financial information but also other types of data, such as clients’ identities, merchants’ performance, investors’ profiles, among others, that could help them reshape the financial business. Incumbents also have built the infrastructure for core banking operations. Hence, financial institutions ability to interpret and extract value from this data and its functionality/infrastructure is something the industry have started to explore. Financial institutions realized that they can utilise data effectively and transform themselves into data-driven organizations that will deliver knowledge

[post-financial-crisis-bank-regulations](#); Ahmed Al-Darwish, Michael Hafeman, Gregorio Impavido, Malcolm Kemp, and Padraic O’Malley, *Possible Unintended Consequences of Basel III and Solvency II*, IMF Working Paper Series 11/187 (2011); Viral V. Acharya, *The Dodd-Frank Act and Basel III: Intentions, Unintended Consequences, and Lessons for Emerging Markets*, Asian Development Bank Institute, ADBI Working Paper 392 (2012); Gregory Elliehausen, *The cost of bank regulation: a review of the evidence*, 84 Fed. Res. Bull. 252 (1998).

¹⁰ See Jacques Bughin and Nicolas Van Zeebroeck, *The best response to digital disruption*, 58.4 MIT SLOAN MANAGEMENT REVIEW 80-86 (2017).

¹¹ The digital disruption in financial services led to the use of the term “Fintech”, which refers to the use of technology to deliver financial solutions, either by incumbents or by startups, also known as fintech companies. According to some authors, Fintech has evolved over three distinct eras: first in the analogue context then with a process of digitalization of finance from the late twentieth century onwards. Since 2008, a new era of FinTech has emerged in both the developed and developing world. This era is defined not by the financial products or services delivered but by who delivers them and the application of rapidly developing technology at the retail and wholesale levels. This latest evolution of Fintech, led by start-ups, poses challenges for regulators and market participants alike, particularly in balancing the potential benefits of innovation with the possible risks of new approaches. See Douglas W. Arner, Janos Barberis, and Ross P. Buckley, *The evolution of Fintech: A new post-crisis paradigm*, 47 GEORGETOWN JOURNAL OF INTERNATIONAL LAW 1271 (2015).

¹² Traditional banks are often referred as incumbents when talking about Fintech. See Yinqiao Li, Renée Spigt, and Laurens Swinkels, *The impact of FinTech start-ups on incumbent retail banks’ share prices*, 3.1. FINANCIAL INNOVATION 26 (2017).

financing.¹³ Additionally, technology providers¹⁴ started to offer next-level financial services transforming customer experience using data or accessing banks functionality. The abovementioned factors represent a shift to the traditional model, but also, they are spurring significant new opportunities to pursue new revenue streams for banks and technology providers using the data and infrastructure that financial institutions control. Those opportunities are exploited through new banking paradigms that entail higher levels of openness towards third parties and a crescent number of modular services bundled together. As a result, online financial services are enabled through offering third-party providers access to customers' personal data and bank functionality. This way financial consumers no longer need to go to a bank to complete banking activities. It is entirely possible that the nature of a primary banking relationship changes as users do their banking with companies that are not banks at all. This is what we call *open banking*.¹⁵ Open banking is argued to lead to better

¹³ Financial Services companies understand the need for data-based insights to deliver superior customer experiences. Data driven finance refers to the use of data to make decisions in the context of the financial services industry, for example by using analytics. It also refers to a new business model in which institutions use data to provide better financial services, or even new services. See Guillaume Kendall, *On the Journey to Data-Driven Financial Services*, FORBES (2019). See also Douglas W. Arner, Ross P. Buckley, Rolf H. Weber and Dirk A. Zetzsche, *The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II*, EUROPEAN BANKING INSTITUTE WORKING PAPER SERIES 35 (2019).

¹⁴ These technology providers entering in the world of financial services are known by some authors as Techfins. However, there is no agreement on what exactly Techfin means. These companies typically start with their data and access to customers. They then move into the world of finance by leveraging their access to data and customers and seek to out-compete incumbent financial firms or FinTech startups. Thus, these technology providers begin with relationships with customers in a non-financial services setting, collects massive amounts of data from those relationships, and then seeks to make use of that data initially perhaps by selling the data to financial services providers or by leveraging its customer relationships by serving as a conduit through which its customers can access financial services provided by a separate institution, and later by providing financial services directly itself. See Dirk A. Zetzsche, Ross P. Buckley, Douglas W. Arner, Janos N. Barberis, *From FinTech to TechFin: The Regulatory Challenges of Data-Driven Finance*, EUROPEAN BANKING INSTITUTE WORKING PAPER SERIES 6 (2017).

This is the case of Ant Financial or Calibra. Ant Financial Services Group, formerly known as Alipay, is an affiliate company of the Chinese Alibaba Group. Ant Financial is the highest valued Techfin company in the world, and the world's most valuable unicorn, with a valuation of US\$150 billion. It is the world's number one mobile payment service organization and the second largest mobile payment service organization in the world. It was launched in 2003 but only after 2010 it was licenced by China's central bank. See Lerong Lu, *Decoding Alipay: mobile payments, a cashless society and regulatory challenges*, BUTTERWORTHS JOURNAL OF INTERNATIONAL BANKING AND FINANCIAL LAW 40-43 (2018).

Calibra is a newly formed Facebook subsidiary whose goal is to provide financial services that will let people access and participate in the Libra network. The first product Calibra will introduce is a digital wallet for Libra, a new so-called cryptocurrency. See Facebook Newsroom, *Coming in 2020: Calibra. A New Digital Wallet for a New Digital Currency* (2019), available at: <https://newsroom.fb.com/news/2019/06/coming-in-2020-calibra/>

¹⁵ Eventhough the term only mentions banking, this trend could be applicable to all types of financial services, not only to the retail banking sector. However, it is important to mention that discussion around open banking have been focused on the retail banking sector.

financial products and services for customers and investors that suit their needs and expectations.¹⁶

This trend woke up the interest of different regulators in many jurisdictions, who have proposed different regulatory models to incentivize an open data ecosystem in the financial services markets. Jurisdictions such as Europe, Australia, Mexico, Canada, United Kingdom, Singapore, United States, Hong Kong among others, have proposed different approaches to open banking. Not only financial regulators have addressed this situation, but also competition and data protection authorities. Some of them adopted the compulsory model, in which financial institutions are obliged to open the data they control to third party providers when financial consumers deliver an authorization, others opted for a market development approach, waiting for the ecosystem to deploy open banking business models, and others chose a sandbox approach in which regulators intervene to incentivize an open data environment and to connect technology developers with traditional financial institutions. Unfortunately, the proliferation and diversity of regulators for open banking initiatives around the world challenges traditional financial regulatory models in which the financial authority is the one in charge of setting the rules and supervising the risks associated with an activity. In the era of open banking coordination among regulators is pivotal to take advantage of the benefits of open banking and to mitigate the risks associated with it.

With the purpose to contribute with some policy recommendations to develop an open banking system mitigating the risks associated with it in this challenging regulatory environment, this paper explains the concept and foundations of open banking in order to understand how exactly data flows under this new way of interacting with financial consumers. This paper argues whether the opening of the banking core infrastructure and data, and the aggregation of those within a platform experience is a revolution or evolution of financial intermediation and the opportunities and risks associated with this so-called new business model. Then, the paper provides a functional and comparative approach of the different regulatory models for open banking and, finally,

¹⁶ See David A. Matsa, *Competition and product quality in the supermarket industry*, 126.3 THE QUARTERLY JOURNAL OF ECONOMICS 1539-1591 (2011); Jens Hagendorff, Barbara Casu, and Claudia Girardone, *Competition issues in European banking*, 17.2 JOURNAL OF FINANCIAL REGULATION AND COMPLIANCE 119-133 (2009).

it delivers some policy recommendations for regulators discussing how to create the proper regulatory environment to exploit the benefits of open banking while properly tackling its challenges.

2. Decodifying open banking

2.1. Foundations

Open banking is not a technology-based concept. Open banking is a term being used frequently at the moment in the financial services context,¹⁷ especially since the regulators, policymakers and the industry started to talk about fintech.¹⁸ Hence, there is no technical definition of what open banking means, but there is clearly a growing consensus among the industry and regulators – not only financial regulators – that the growing adoption of the open banking model present opportunities for financial institutions and Fintech players to gain insights from the shared data and potentially transform traditional banking.¹⁹ While jurisdictions vary as to how they are

¹⁷ According to Google Trends, the term “open banking” started to be searched much more commonly after October 2016. See Google Trends, *open banking*, available at: <https://trends.google.com/trends/explore?date=all&q=open%20banking>

¹⁸ The origins of the term Fintech can be traced to the early 1990s and referred to the “Financial Services Technology Consortium”, a project initiated by Citigroup to facilitate technological cooperation efforts.¹ However, it is only since 2014 that Fintech has attracted the attention of regulators, industry participants and consumers alike, according to Google trends analysis. See Douglas W. Arner, Janos Barberis, and Ross P. Buckley, *The evolution of Fintech: A new post-crisis paradigm*, 47 GEORGETOWN JOURNAL OF INTERNATIONAL LAW 1271 (2015); Marc Hochstein, *Fintech (the Word, That Is) Evolves*, AMERICAN BANKER (2015), available at: <http://www.americanbanker.com/bankthink/fintech-the-word-that-is-evolves-1077098-1.html>;

¹⁹ We will discuss in section three whether this transformation is evolutionary or revolutionary for the banking services industry and the benefits and perils this shift might portraint. This transformation is described by regulators, industry participants and policy makers in different ways. Some of them focus the transformation of the financial services industry through open banking in terms of allowing new competitors to enter in the financial markets by offering products using data controlled by banks, other focus the attention on the potential monetization of data that banks could start using open banking models, other see open banking as a way to integrate the traditional financial industry and technology developers in order to offer financial consumers innovative products or services. Indeed, depending on the focus of the regulators in a particular jurisdiction, the regulatory approach might change. Also, we will explain further all regulatory approaches and rational behind them in section 3. For more about the perceptions on open banking models. See Accenture, *The Brave New World of Open Banking* (2018), available at: <https://www.accenture.com/acnmedia/PDF-71/Accenture-Brave-New-World-Open-Banking.pdf#zoom=50>; Abhishek Sinha and Anthony Rjeily, *How new open banking opportunities can thrive in Canada*, ERNST & YOUNG (2019), available at: https://www.ey.com/en_gl/banking-capital-markets/how-new-open-banking-opportunities-can-thrive-in-canada; Paul Wiebusch, *Open banking - A seismic shift*, Deloitte (2018), available at: <https://www2.deloitte.com/au/en/pages/financial-services/articles/open-banking.html>; Isabelle Jenking and Jonathan Turner, *The future of banking is open. How to seize the Open Banking opportunity*, PriceWaterhouse Coopers UK (2018), available at: <https://www.pwc.co.uk/industries/financial-services/insights/seize-open-banking-opportunity.html>;

implementing this concept,²⁰ open banking involves opening up banking systems (functionality and customer data) to third parties to allow them to provide services directly to customers. In other words, open banking facilitates for customer data and functionality to be accessed by financial institutions and other third-party providers – transforming the relationship between traditional entities and customers. This access to data and functionality gives challenger banks, neo-banks,²¹ fintechs and bigtechs²² the opportunity to develop new innovative financial products and services and provides traditional banks an ideal opportunity to improve their customer experience through the vast amounts of data they hold and/or the infrastructure they already built.

In practice, how financial institutions open the data they control or grant access to their functionality? Event though, regulators not always mention the use of APIs in the regulatory frameworks for open banking, financial institutions use Application Programming Interfaces (APIs). The Payment Services Directive 2 (PSD2), issued by the European Union, mentions open standards of communication to be implemented

²⁰ For some jurisdictions, the term open banking only involves opening customers' data to third parties. This is the case of UK's open banking initiative, a regulation that came into force at the beginning of 2018. Its official website defines the open banking initiative as "the secure way to give providers access to your financial information." This definition of open banking centres around providing access to data, specifically, an individual consumer's existing data. This leaves out access to functionality, a key part of open banking as it is defined in other jurisdictions such as US and Singapore. See Open Banking, *What is Open Banking*, available at: <https://www.openbanking.org.uk/customers/what-is-open-banking/>

²¹ Challenger banks can be established firms – most likely midsize or specialist – that seek to compete with larger institutions. Neobanks tend to be newer, completely digital mobile outfits, but there's some overlap. These banks do not carry the weight of legacy technology, so they can, in theory, leapfrog over traditional infrastructure and disrupt the status quo. Although Neobanks and challenger banks are on the rise, they will not replace traditional financial institutions anytime soon. Right now, the established players enjoy the best of both worlds, having augmented their full-service models with digital banking. They've created innovation and fintech groups – consisting of young employees often located outside the orbit of their mainstream culture – whose ideas get embedded into the traditional business models. See Judd Kaplain, *The rise of challenger banks* (2018), available at: <https://home.kpmg/xx/en/home/insights/2018/02/rise-of-challenger-banks-fs.html>

²² Bigtechs are large technology firms. Technology firms such as Alibaba, Amazon, Facebook, Google and Tencent have grown rapidly over the last two decades. The business model of these bigtechs rests on enabling direct interactions among a large number of users. An essential by-product of their business is the large stock of user data which are utilized as input to offer a range of services that exploit natural network effects, generating further user activity. Increased user activity then completes the circle, as it generates yet more data. Building on the advantages of the reinforcing nature of the data-network activities loop, some big techs have ventured into financial services, including payments, money management, insurance and lending. As yet, financial services are only a small part of their business globally. But given their size and customer reach, big techs' entry into finance has the potential to spark rapid change in the industry. According to some policymakers, regulators need to ensure a level playing field between big techs and banks, taking into account bigtechs' wide customer base, access to information and broad-ranging business models. Actually, bigtechs' entry presents new and complex trade-offs between financial stability, competition and data protection. See Bank for International Settlements, *Big tech in finance: opportunities and risks* (2019), available at: <https://www.bis.org/publ/arpdf/ar2019e3.pdf>

by all account servicing payment service providers that allow for the provision of online payment services.²³ This means that those open standards should ensure the interoperability of different technological communication solutions. Those common and open standards should also ensure that the account servicing payment service provider is aware that he is being contacted by a payment initiation service provider or an account information service provider and not by the client itself. Other example is Australia, where the open banking discussions started with the development of a national Consumer Data Right (CDR)²⁴, which was announced by the Federal Government in November 2017 as a partial response to the Productivity Commission's Inquiry into Data Availability and Use. Banking will be the first sector to adopt the CDR, under the name "open banking."²⁵ Some other regulators do mention APIs as a central tool when developing an open banking model. For example, UK open banking remedy ordered by the Competition and Markets Authority (CMA) considers that timely development and implementation of an open API banking standard has the greatest potential to transform competition in retail banking markets.²⁶ In July 2018, the Hong Kong Monetary Authority (HKMA) published its Open API Framework, which sets out its regulatory model for open banking.²⁷ Along the same lines, the Monetary Authority of Singapore published a non-binding API Guidelines and an API register as part of their open banking regulatory strategy.²⁸ According to the Monetary Authority of Singapore, APIs are crucial enablers that facilitate financial institutions' push towards customer-focused initiatives by allowing applications to be developed quickly and responsively.²⁹

²³ See European Parliament, *Payment Services Directive 2*, paragraph 93, available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32015L2366&from=EN>

²⁴ See Australian Government, The Treasury, *Consumer Data Right complete documentation*, available at: <https://treasury.gov.au/consumer-data-right>

²⁵ See Australian Government, The Treasury, *Consumer Data Right complete documentation*, available at: <https://treasury.gov.au/consumer-data-right>.

²⁶ See Competition and Markets Authority, *Retail Banking market investigation Final Report* (2016), available at: <https://assets.publishing.service.gov.uk/media/57a8c0fb40f0b608a7000002/summary-of-final-report-retail-banking-investigation.pdf>

²⁷ See Hong Kong Monetary Authority, *Open API Framework for the Hong Kong Banking Sector* (2018), available at: <https://www.hkma.gov.hk/media/eng/doc/key-information/press-release/2018/20180718e5a2.pdf>

²⁸ See Monetary Authority of Singapore, *Application Programming Interfaces (APIs)*, available at: <https://www.mas.gov.sg/development/fintech/technologies---apis>

²⁹ Ibid.

Thus, APIs are fundamental for deploying open banking, so it is mandatory to talk about APIs and understand how they work in order to comprehend what open banking intends to achieve. In computer programming,³⁰ an API is defined as a set of subroutines, definitions, communication protocols, and tools for building software.³¹ In general terms, it is a set of clearly defined methods of communication among various components. And in much simpler words, API, is a way for two computer applications to talk to each other over a network using a common language that they both understand.³² An API facilitates the construction of a computer program by providing all the materials, which are put together by the programmer.

Programmers used to be the only people excited about APIs, but now a growing number of companies see them as a hot new product channel in the era of digital transformation of all industries. Currently, APIs are used in a variety of contexts, some examples include embedding content from one website into another, dynamically posting content from one application to display in another application or extracting data from a database in a more programmatic way than a regular user interface might allow.³³ In other words, APIs are what make it possible to move information between programs internally (within a company) or externally (between the company and third parties).³⁴ Accordingly, APIs work like a bridge of communication. For instance, every

³⁰ The term API seems to appear for the first time in the article of Ira W. Cotton, Data structures and techniques for remote computer graphics, published in 1968. See Ira W. Cotton and Frank S. Greatorex Jr., *Data structures and techniques for remote computer graphics*, AFIPS '68 (Fall, part I) Proceedings of the December 9-11, 1968, fall joint computer conference, part I. Pg. 533-544. Available at: <https://dl.acm.org/citation.cfm?id=1476661>

³¹ See Brian Proffitt, What APIs are and why they're important, REDWRITE (2013) (last visited: April 8, 2019). Available at: <https://readwrite.com/2013/09/19/api-defined/>. See MIT <https://libraries.mit.edu/scholarly/publishing/apis-for-scholarly-resources/>

³² See Daniel Jacobson, Greg Brail and Dan Woods, *APIs: A STRATEGY GUIDE: CREATING CHANNELS WITH APPLICATION PROGRAMMING INTERFACES* (O'Reilly Media, 2011); Phil Sturgeon and Laura Bohill, *BUILD APIS YOU WON'T HATE: EVERYONE AND THEIR DOG WANTS AN API, SO YOU SHOULD PROBABLY LEARN HOW TO BUILD THEM* (Philip J. Sturgeon, 2015).

³³ Jason Paul Michel, *WEB SERVICE APIS AND LIBRARIES* (American Library Association, 2013).

³⁴ For example, APIs can be used by firms internally, to integrate diverse systems and allow for the exchange of data across different departments by performing API calls or sending queries to an API server. This way of sharing data can make it easier for internal teams to collaborate and access information when and how they need it, thus helping to interconnect services and business processes across the organisation as well as improve employee productivity and even create better omni-channel experiences for customers. In a similar way, APIs can also be used to expose business assets such as information, a service, or a product to external audiences, hence, reaching beyond the boundaries of the firm. See Pinar Ozcan and Markos Zachariadis, *The API Economy And Digital Transformation in Financial Services: The case of open banking*, SWIFT INSTITUTE WORKING PAPER No. 2016-001 (2017).

page on the internet is stored somewhere on a remote server. A remote server³⁵ is just a part of a remotely located computer that is optimized to process requests. When you type www.facebook.com into your browser,³⁶ a request goes out to Facebook's remote server. Once your browser receives the response, it interprets the code and displays the page. To the browser, also known as the *client*,³⁷ Facebook's server is an API. This means that every time you visit a page on the Web, you interact with some remote server's API. Facebook also, provides APIs to developers, so they can have access and/or produce Facebook data.³⁸ We can find other examples of the use of APIs in our daily life. For illustration, think about the way Yelp³⁹ displays nearby restaurants on a Google Map in its app.⁴⁰ Actually, Yelp piggyback on Google Maps.

³⁵ A server is a type of computer or device on a network that manages network resources. Servers are often dedicated, meaning that they perform no other tasks besides their server tasks. On multiprocessing operating systems, however, a single computer can execute several programs at once. A server in this case could refer to the program that is managing resources rather than the entire computer. See Dennis Longley and Michael Shain, *DICTIONARY OF INFORMATION TECHNOLOGY* (Macmillan International Higher Education, 1988); Philip A. Laplante, *DICTIONARY OF COMPUTER SCIENCE, ENGINEERING AND TECHNOLOGY*, (CRC Press, 2017).

³⁶ a browser is a software application used to locate, retrieve and display content on the World Wide Web, including webpages, images, video and other files. As a client/server model, the browser is the client run on a computer or mobile device that contacts the Web server and requests information. The web server sends the information back to the browser which displays the results on the Internet-enabled device that supports a browser. See Mehdi Khosrow-Pour, *DICTIONARY OF INFORMATION SCIENCE AND TECHNOLOGY*. VOL. 1, (IGI Global, 2006).

³⁷ Typically, a client is an application that runs on a personal computer or workstation and relies on a server to perform some operations. See Dennis Longley and Michael Shain, *DICTIONARY OF INFORMATION TECHNOLOGY* (Macmillan International Higher Education, 1988); Philip A. Laplante, *DICTIONARY OF COMPUTER SCIENCE, ENGINEERING AND TECHNOLOGY*, (CRC Press, 2017).

³⁸ One example of an API offered by Facebook is the Groups API, which allows to read and create Facebook Group data on behalf of group members. By installing an app on a group, a group admin can grant this app access to group content, such as posts, photos, and videos, and allow the app to publish content to the group on behalf of the admin. Admins can also allow the app to access publicly available information about group members who have chosen to share their public information with apps installed on the group. See Facebook for Developers, Groups API, available at: <https://developers.facebook.com/docs/groups-api/> (last visited: July 24, 2019)

³⁹ Yelp is a business directory service and crowd-sourced review forum, and a public company of the same name that is headquartered in San Francisco, California. The company develops, hosts and markets the Yelp.com website and the Yelp mobile app, which publish crowd-sourced reviews about businesses. See Yelp, Investor relations, available at: <https://www.yelp-ir.com/overview/default.aspx> (last visited: July 24, 2019).

⁴⁰ A Harvard Business School study published in 2011 found that each "star" in a Yelp rating affected the business owner's sales by 5–9 percent. A 2012 study by two Berkeley economists found that an increase from 3.5 to 4 stars on Yelp resulted in a 19 percent increase in the chances of the restaurant being booked during peak hours. A 2014 survey of 300 small business owners done by Yodle found that 78 percent were concerned about negative reviews. Also, 43 percent of respondents said they felt online reviews were unfair, because there is no verification that the review is written by a legitimate customer. See Michael Luca, *Reviews, Reputation, and Revenue: The Case of Yelp.com*, HARVARD BUSINESS SCHOOL WORKING PAPER, NO. 12-016 (2016); Michael Anderson and Jeremy Magruder, *Learning from the Crowd: Regression Discontinuity Estimates of the Effects of an Online Review Database*, 122, 153 *THE ECONOMIC JOURNAL* 957-989 (2012), Tom Gara, *Fake Reviews Are Everywhere. How Can We Catch Them?*, *THE WALL STREET JOURNAL* (2013), available at: <https://blogs.wsj.com/corporate-intelligence/2013/09/24/fake-reviews-are-everywhere-how-can-we->

The same happens with some video games that let players chat, post high scores and invite friends to play via Facebook, right there in the middle of a game.⁴¹ Many scholarly publishers, databases, and products offer APIs to allow users - scholars and researchers - with programming skills to more powerfully extract data to serve a variety of research purposes. With an API, these users might create programmatic searches of a citation database, extract statistical data, or dynamically query and post blog content.⁴² In other words, APIs can “enable interfaces, services, and applications to connect seamlessly with one another, making digital content accessible” between a wide range of independent applications.⁴³ That reduces complexity and allows API-consuming systems to *plug-and-play* without the need to know the specifics of the API-provider’s systems. In return, APIs can be consumed like a service and can be agnostic to the consuming devices or applications that connect to it.⁴⁴ Such interoperability between modular systems can lower technology costs and accelerate innovation as the heterogeneous technology infrastructures can evolve independently and according to demand, strategy, available resources, and technological progress.⁴⁵

The following figure shows graphically how APIs work in a very simple way.

[catch-them/](#); Jamie Doward, *How online reviews are crucial to a restaurant's takings*, THE GUARDIAN (2013), available at: <https://www.theguardian.com/lifeandstyle/2012/sep/02/ratings-boost-restaurants>; Loten, Angus, *Yelp Regularly Gets Subpoenas About Users*, THE WALL STREET JOURNAL (2016), available at: <https://www.wsj.com/articles/yelp-regularly-receives-subpoenas-about-users-1396467536?tesla=y>

⁴¹ Commonly known games such as Angry Birds and Farm Ville let players do this thanks to APIs that communicate these games with Facebook. See

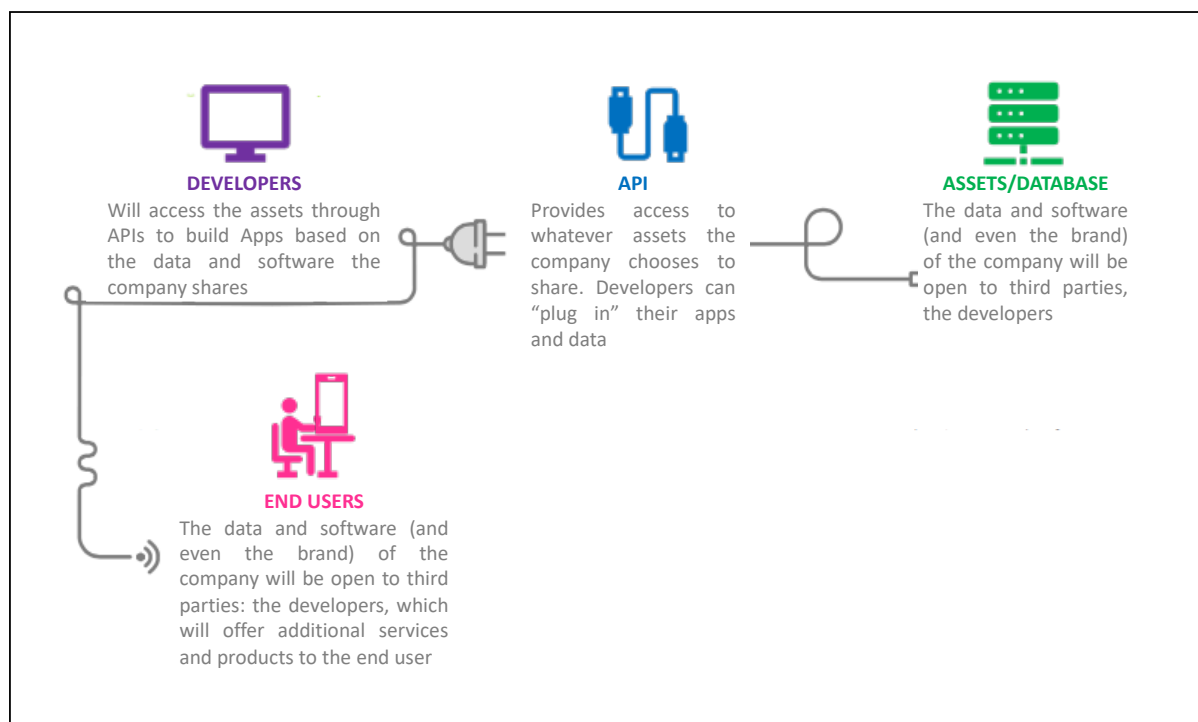
⁴² Scholars and researchers can use APIs for embedding content from one website into another, dynamically posting content from one application to display in another application, or extracting data from a database in a more programmatic way than a regular user interface might allow. For instance, the Massachusetts Institute of Technology provides a list of commonly used scholarly resources that make their APIs available for use. If someone has programming skills and would like to use APIs in her research, APIs are available for that purpose. See MIT libraries, *APIs for Scholarly Resources* (last visited: July 24, 2019), available at: <https://libraries.mit.edu/scholarly/publishing/apis-for-scholarly-resources/>

⁴³ See Robert Bodle, *Regimes of sharing: Open APIs, interoperability, and Facebook*, 14.3. INFORMATION, COMMUNICATION & SOCIETY 320-337 (2011)

⁴⁴ The word agnostic comes from the Greek *a-*, meaning without and *gnōsis*, meaning knowledge. In an information technology (IT) context, refers to something that is generalized so that it is interoperable among various systems. The term can refer not only to software and hardware, but also to business processes or practices. In IT, that translates to the ability of something to function without knowing the underlying details of a system that it is working within. As with interoperability, agnosticism is typically enabled by either compliance with widely-used standards or added elements (such as coding) that will enable one system to function in a variety of environments. See Dennis Longley, *DICTIONARY OF INFORMATION TECHNOLOGY* (Macmillan International Higher Education, 1988)

⁴⁵ Carliss Young Baldwin and Kim B. Clark, *DESIGN RULES: THE POWER OF MODULARITY* 45-36 (MIT press, Vol. 1, 2000).

Figure 1. API functionality



Source: author

While interoperability among heterogeneous technical systems using APIs can be beneficial,⁴⁶ there is still one question companies ask themselves: how open such systems should be? The data and software of the company can become more valuable by being leveraged by third parties, but this does not mean that all data and all functions/software/technology infrastructure of the company becomes exposed due to the use of APIs. There are different degrees of openness. Usually, when talking about open banking, for example, some assume that APIs are open and free.⁴⁷ However, APIs have different levels of openness and even working with open APIs does not mean that anyone can access the data you control or your technology infrastructure. Depending on their purpose, APIs can be used (i) internally, (ii) with partners or (iii) made available to the third parties that do not necessarily have a business relationship with the company.⁴⁸ A private API is for internal company use only. Internal APIs, also

⁴⁶ We will explain further the benefits of open banking – hence, the benefits of using APIs – in the section 2.3. of this paper.

⁴⁷ Not even regulations mandating banks to open the data they control through APIs, mean that data will be free for all. For example, under European Payment Services Directive 2 (PSD2), a payment provider cannot actually get all banking data from a person even with their consent. See Melv1n. Tech Product Managemtn, *PSD2: All you need to know about open banking data* (2018), available at: <https://melv1n.com/psd2-need-to-know-open-banking-data/>

⁴⁸ See Brajesh De, *API MANAGEMENT. AN ARCHIECT'S GUIDE TO DEVELOPING AND MANAGING APIS FOR YOUR ORGANIZATION* 16-20 (Apress, First Edition, 2017).

known as private APIs, are used to facilitate the integration of different applications and systems used by a company.⁴⁹ This rationalizes infrastructure, reduces costs, facilitates real-time businesses and, in general, improves internal operations. Certainly, some even claim internal APIs played a pivotal role in Amazon's transformation from a bookseller to a billion dollars, infrastructure as a service API, cloud computing business.⁵⁰ In the context of financial services, the creation of internal APIs can enhance processes, cost efficiencies and accelerate innovation too. Internal APIs are Web APIs used exclusively within the bank and its conglomerate. Internal APIs enable banks to increase business agility, reducing time-to-market by delivering new capabilities faster—such as reducing partner integration, onboarding complexity and KYC processes among different entities within the same financial group.⁵¹ Banks' traditional Information Technology (IT) approach⁵² to bringing new business ideas to market takes 18 to 24 months. APIs can reduce the capability

⁴⁹ Mark Boyd, *Private, Partner or Public: Which API Strategy Is Best For Business?*, PROGRAMMABLEWEB (2014), available at: <https://www.programmableweb.com/news/private-partner-or-public-which-api-strategy-best-business/2014/02/21>

⁵⁰ Sometime back around 2002, Jeff Bezos issued a mandate for all Amazon teams according to which:

- They must communicate with each other through these interfaces.
- There will be no other form of inter-process communication allowed: no direct linking, no direct reads of another team's data store, no shared-memory model, no back-doors whatsoever. The only communication allowed is via service interface calls over the network.
- It doesn't matter what technology they use.
- All service interfaces, without exception, must be designed from the ground up to be externalizable. That is to say, the team must plan and design to be able to expose the interface to developers in the outside world. No exceptions.

See API Evangelist, *The Secret to Amazon's Success--Internal APIs* (2012), available at: <http://apievangelist.com/2012/01/12/the-secret-to-amazons-success-internal-apis/>

⁵¹ See Jim Marous, *The Future of Banking Depends On Open Banking APIs*, THE FINANCIAL BRAND (2017), available at: <https://thefinancialbrand.com/65975/open-banking-api-fintech-partnerships/>

⁵² The traditional IT approach refers to developing a traditional IT infrastructure. Until recent past, Information Technology (IT) has been lurking in the background as support service for many organisations. Information Technology has helped all sized businesses to find their cadence in respective industry. Today businesses are able to obtain managed IT services equivalent to that of a large company without the burden on their payroll and establishment, and big platforms thanks to IT as a service. IT as a service (ITaaS) is an operational model where the information technology (IT) service provider delivers an information technology service to a business. See Saqib Hussnain, *Information Technology as a Service (ITaaS)* (2016), available at: <https://www.linkedin.com/pulse/information-technology-service-itaas-saqib-hussnain/>; Custom Solutions Group & EMC2, *IT as a service: A Work in Progress* (2017), available at: <https://www.emc.com/collateral/article/emc-cio-it-as-a-service-wp.pdf>; EMC2, *An IT as a service handbook: the key steps on the journey to ITaaS*, EMC2 WHITE PAPER (2012), available at: <https://www.emc.com/collateral/software/white-papers/h10801-stepstoitaas-wp.pdf>; Geng Lin, David Fu, Glenn Dasmalchi, Jizy Zhu, *Cloud computing: IT as a service*, 2 IT PROFESSIONAL 10-13 (2009), Vidyanand Choudhary, *Software as a service: Implications for investment in software development*, 40TH ANNUAL HAWAII INTERNATIONAL CONFERENCE ON SYSTEM SCIENCES (HICSS'07), INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEER (2007).

delivery cycle down to a few weeks, especially for new mobile apps or channel applications.⁵³ A vast majority of banks view private APIs as essential since 2015.⁵⁴

Another type of API connects only partners, which means that only specific business partners can use the API.⁵⁵ For example, transportation network companies such as Uber and Lyft admit approved third-party developers to directly order rides from within their apps. This allows the companies to exercise quality control by curating which apps have access to the API and provides them with an additional revenue stream.⁵⁶ In the financial sector, some players are leveraging open banking through partnerships between established and emerging players to offer different customer experiences and new products and services. For instance, digital-only Starling Bank enables its customers to make transfers from the UK across 35 currencies via app from London fintech startup TransferWise.⁵⁷

One last type of API is available for use by the public. These are known Open or Public APIs. Fundamentally, developers can use that API for software or app developing

⁵³ See Berend de Jong, Michael Little and Luca Gagliardi, *Open for Business*, ACCENTURE STRATEGY (2017), available at: https://www.accenture.com/_acnmedia/pdf-56/accenture-strategy-digital-open-banking-pov.pdf

⁵⁴ According to the World Retail Banking Report 2017, published by Capgemini in conjunction with Efma, See Efma & Capgemini, *World Retail Banking Report 2018* (2018), available at: https://worldretailbankingreport.com/wp-content/uploads/sites/3/2018/09/World_Retail_Banking_Report_2018.pdf

⁵⁵ See Brajesh De, API MANAGEMENT. AN ARCHIECT'S GUIDE TO DEVELOPING AND MANAGING APIS FOR YOUR ORGANIZATION 16-20 (Apress, First Edition, 2017).

⁵⁶ Uber launched its affiliate program for third-party developers in 2014 with 11 partners, including OpenTable, TripAdvisor and United Airlines. Lyft followed in its footsteps by integrating with Facebook Messenger, and has since struck deals with marketers including Starbucks and Southwest Airlines. Since then, both have opened their platforms to all developers, although neither company would comment on how many partners are currently hooked in. Lyft's APIs allow partners to display information like ride availability, cost, ETA (estimated time of arrival), animated maps and prime-time pricing in-app. Developers can sign up with no access fee and are paid for every customer they send to Lyft. However, Lyft and Uber are selective when it comes to choosing partners. For quality control purposes, for example, Lyft shares a set of brand guidelines with developers that offer recommendations on how to use the Lyft logo, as well as content and design. According to Lyft representatives, the goal for Lyft APIs is a little different than more advertising-focused APIs, it's more of a communication API than a data-sharing API. See Alison Weisbrott, *Car Service APIs Are Everywhere, But What's In It For Partner Apps?*, AD EXCHANGER (2016) (last visited: August 20, 2019), available at: <https://adexchanger.com/mobile/car-service-apis-everywhere-whats-partner-apps/>

⁵⁷ According to TransferWise and Starling Bank "the partnership is an attempt to revolutionise an outdated financial industry and provide a fair, transparent banking experience for consumers." Other API integrations (partner APIs) announced by TransferWise recently include Estonia's LHV Bank and N26. See Lee Bell, *TransferWise partners with digital-only Starling Bank*, WIRED (2017), available at: <https://www.wired.co.uk/article/transferwise>

purposes.⁵⁸ However, the API has to be used under specific usage rules, such as restrictions on endpoints,⁵⁹ number of calls,⁶⁰ throttling,⁶¹ pricing,⁶² among others.⁶³ Thus, an open API implies that some of the product data or features are exposed to the public, but there may be a layer of authentication. The bulk of the business value is still closed, or controlled, by the API owner.⁶⁴ An Open API may be free to use but the publisher may limit also how the API data can be used.⁶⁵ Therefore, the openness of an API derives from the fact that is openly shared and open to public use, but not necessarily for free. It should not be confused with other IT concepts such as open-

⁵⁸ See Cleidson R. B. de Souza, David Redmiles, Li-Te Cheng, David Millen, & John Patterson, *Sometimes you need to see through walls: a field study of application programming interfaces*. CSCW PROCEEDINGS OF THE 2004 ACM CONFERENCE ON COMPUTER SUPPORTED COOPERATIVE WORK 63-71 (2004)

⁵⁹ An endpoint is one end of a communication channel. When an API interacts with another system, the touchpoints of this communication are considered endpoints. For APIs, an endpoint can include a URL of a server or service. Each endpoint is the location from which APIs can access the resources they need to carry out their function. APIs work using 'requests' and 'responses.' When an API requests information from a web application or web server, it will receive a response. The place that APIs send requests and where the resource lives, is called an endpoint. If someone is concerned that unauthenticated users can access the endpoints, this access can be restricted; if someone is concerned that the endpoint might randomly be hit by the internet (from a random anonymous), then all access can be blocked with an API Key. Endpoints specify where resources can be accessed by APIs and play a key role in guaranteeing the correct functioning of the software that interacts with it. In short, API performance relies on its ability to communicate effectively with API Endpoints. These restrictions do not mean that the API becomes private or partner. See Alerts site, THE COMPLETE GUIDE TO API MONITORING (Alertsite, 2019)

⁶⁰ It is possible to limit the number of API requests made by each user. For example, in Dynamics 365 for Customer Engagement - a product line of enterprise resource planning (ERP) and customer relationship management (CRM) - Microsoft limits the number of API requests made by each user, per organization instance, within a five minute sliding window. Additionally, we limit the number of concurrent requests that may come in at one time. When one of these limits is exceeded, an exception will be thrown by the platform. The limit will help ensure that users running applications cannot interfere with each other based on resource constraints. See Microsoft, *API Limits* (2019), available at: <https://docs.microsoft.com/en-us/dynamics365/customer-engagement/developer/api-limits>

⁶¹ API throttling allows organizations to control the way an API is used. Throttling allows them to set permissions as to whether certain API calls are valid or not. Throttles indicate a temporary state and are used to control the data that third parties can access through an API. For example, throttling Limit Settings Are Applied in Amazon's API Gateway, specifically server-side throttling limit and per-client throttling limit. See Amazon Web Services, *Amazon API Gateway. Developer Guide* (2019) (last visited: August 22, 2019), available at: <https://docs.aws.amazon.com/apigateway/latest/developerguide/api-gateway-request-throttling.html#apigateway-how-throttling-limits-are-applied>

⁶² Organizations can charge developers directly for API calls and requests. See Lindsey Kischoff, *The Ultimate Guide to Pricing your API*, NORDIC APIS BLOG (2017), available at: <https://nordicapis.com/the-ultimate-guide-to-pricing-your-api/>

⁶³ For example, other restrictions might include the necessity to register with the service providing the API. See Cleidson R. B. de Souza, David Redmiles, Li-Te Cheng, David Millen, & John Patterson, *Sometimes you need to see through walls: a field study of application programming interfaces*. CSCW PROCEEDINGS OF THE 2004 ACM CONFERENCE ON COMPUTER SUPPORTED COOPERATIVE WORK 63-71 (2004)

⁶⁴ See Mulesoft, *The Value of APIs for Business* (last visited: August 22, 2019), available at: <https://www.mulesoft.com/resources/api/connected-business-strategy>

⁶⁵ See Sakari Paloviita, *Welcome to open culture of API Economy*, MEDIUM (2018), available at: <https://medium.com/apinf/welcome-to-open-culture-of-api-economy-89cfdac2cd38>

source software, for example, a type of computer software in which source code is released under a license in which the copyright holder grants users the rights to study, change, and distribute the software to anyone and for any purpose.⁶⁶ One example of open APIs are Facebook API offering. Facebook's APIs are freely shared in order to entice developers and other users to integrate social media functionality into their software products.⁶⁷

In the context of the financial sector, despite many definitions that different regulators and financial institutions take, Open Banking is a phenomenon expected to grow in momentum in the next few years⁶⁸ and it is essentially the disaggregation and re-aggregation of financial services so that these services can be consumed by, and at the same time offered with an additional value by third parties – partners, developers, fintechs, techfins, other banks, technology providers or whatever you want to call this trusted third parties – under certain operational standards. The means by which data and functionalities are extended out to those third parties is known as APIs, which by their very existence in the organization indicates the organization's willingness and capabilities to contribute, and take advantage of the opportunities, of this collaborative ecosystem.

2.2. The real transformational power of open banking

Some discussed whether the use of APIs to change the way the financial system interacts with fintech, tech providers, challengers, bigtechs, and customers, is evolutionary or revolutionary. This transformation is described by regulators, industry participants and policy makers in different ways. Part of the participants in this discussion feel represented by the famous quote by Bill Gates "people do not need

⁶⁶ See Andrew M. St. Laurent, UNDERSTANDING OPEN SOURCE & FREE SOFTWARE LICENSING (O'Reilly, 2004)

⁶⁷ See Technopedia, *Open API definition* (last visited: August 20, 2019), available at: <https://www.techopedia.com/definition/12020/open-application-program-interface-open-api>

⁶⁸ According to Pricewaterhouse Coopers and the Open Data In, Open Banking has the potential to create a revenue opportunity of at least \$8.8 billion by 2022 across retail and SME only in United Kingdom. See Open Data Institute & PWC, *The Future of Banking is Open. How to seize the Open Banking opportunity markets* (2018), available at: <https://www.pwc.co.uk/financial-services/assets/open-banking-report-web-interactive.pdf>

banks, they need banking.”⁶⁹ But others, think that open banking is just part of the evolution of the interaction between customers and financial institutions, but will not be as disruptive as the first group expect.⁷⁰ It is undeniable the digital transformation trend that is affecting all types on industries⁷¹ and it will re-shape the financial services too.⁷² Even though, the use of APIs is nothing new in the financial sector, now many banks have realized that digital is about services, not about digital features and data-driven finance⁷³ is a very important component in this shift on the views of what the

⁶⁹ See Rama Subramaniam Gandhi, *New paradigm in banking: banking is necessary, not banks - really?*, Speech by Mr R Gandhi, Deputy Governor of the Reserve Bank of India, at the FIBAC 2016 "New horizons in Indian banking", (2016), available at: <https://www.bis.org/review/r160822b.htm>

⁷⁰ See KPMG, *PSD2 and Open Banking. Revolution or Evolution?* (2019), available at: <https://assets.kpmg/content/dam/kpmg/pl/pdf/2019/04/pl-Raport-PSD2-i-Open-Banking-ENG.pdf>; Joe Rizzi, *Open Banking: and Evolution to Re-evolution*, A MEDIUM CORPORATION (2018), available at: <https://medium.com/@joe.rizzi/open-banking-an-evolution-to-re-evolution-1e2ba9c7885c>; The future of banking is open, Open Data Institute & PWC, *The Future of Banking is Open. How to seize the Open Banking opportunity markets* (2018), available at: <https://www.pwc.co.uk/financial-services/assets/open-banking-report-web-interactive.pdf>

⁷¹ According to the World Economic Forum, the Fourth Industrial Revolution represents a fundamental change in the way we live, work and relate to one another. It is a new chapter in human development, enabled by extraordinary technology advances commensurate with those of the first, second and third industrial revolutions. These advances are merging the physical, digital and biological worlds in ways that create both huge promise and potential peril. The speed, breadth and depth of this revolution is forcing us to rethink how countries develop, how organisations create value and even what it means to be human. The Fourth Industrial Revolution is about more than just technology-driven change; it is an opportunity to help everyone, including leaders, policymakers and people from all income groups and nations, to harness converging technologies in order to create an inclusive, human-centred future. The real opportunity is to look beyond technology and find ways to give the greatest number of people the ability to positively impact their families, organisations and communities. This so-called revolution is cross-sectoral, including of course the financial sector. See Klaus Schwab. *THE FOURTH INDUSTRIAL REVOLUTION* (World Economic Forum, 2016); Rabeh Morrar, Husam Arman, and Saeed Mousa, *The fourth industrial revolution (Industry 4.0): A social innovation perspective*, 7.11 TECHNOLOGY INNOVATION MANAGEMENT Review 12-20 (2017).

⁷² The digital revolution has transformed the world's financial systems. This is true not only for the customer experience (how hundreds of millions of people now manage their financial lives), but for the system at every level: how financial institutions manage their operations, how investors analyse risk and make decisions, how capital markets move, and how policymakers approach their work. No doubt digitalization has affected every area of life, not just financing. See Maria Ramos and Achim Steiner, *How the digital finance revolution can drive sustainable development*, WORLD ECONOMIC FORUM ANNUAL MEETING 2019 (2019), World Economic Forum, *Shaping the Future of Financial and Monetary Systems* (2018), available at: <https://www.weforum.org/system-initiatives/shaping-the-future-of-financial-and-monetary-systems>;

⁷³ Some industries compete over the data. The size of the pool data determines the competitive strength of a company. See Tim Wu, *THE MASTER SWITCH: THE RISE AND FALL OF INFORMATION EMPIRES* (Random House LCC US, 2015)

In the context of the financial services, data-driven finance refers to the paradigm shift in finance, in which we are entering a period in which the leaders in finance will have to focus intensely on data and its analysis. See Dirk A. Zetzsche, Douglas W. Arner, Ross P. Buckley and Rolf H. Weber, *The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II*, European Banking Institute Working Paper Series 2019/35; UNSW Law Research Paper No. 19-22; University of Luxembourg Law Working Paper No. 005-2019; University of Hong Kong Faculty of Law Research Paper No. 2019/004. (2019), available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3359399

financial sector is. Accordingly, banks will not disappear, but the way this industry conceives business will change thanks to open banking.

Open banking will start the era of banking-as-a-service,⁷⁴ which will derive in new form of financial intermediation and will enable data-driven finance at the core of banking operations. We will explain further what this transformation entails in this section.

2.2.1. Banking-as-a-service (BaaS): the future of the financial services industry

In order to understand why and how Open Banking will cause a new form of financial intermediation, we will present the concept of BaaS that underlines the implementation of an open banking system. BaaS is based on the concept of Anything-as-a-Service (XaaS), also known as Everything-as-a-service. XaaS is a term that describes a broad category of services related to cloud computing⁷⁵ and remote access.⁷⁶ With cloud computing technologies, vendors offer companies different kinds of services over the web or similar networks. This idea started with Software-as-a-Service (SaaS) with cloud providers offering individual software applications. However, this idea evolved to other terms like infrastructure as a service (IaaS)⁷⁷ and communications as a service (CaaS)⁷⁸ until talking about XaaS, in which businesses simply buy what they need, and pay for it as they need it – on demand. In other words, rather than buying a

⁷⁴ We will define the concept of Banking-as-a-service in section 2.2.1.

⁷⁵ Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. See Stephen Orban, Andy Jassy, Adrian Cockcroft and Mark Schwartz, *AHEAD IN THE CLOUD: BEST PRACTICES FOR NAVIGATING THE FUTURE OF ENTERPRISE IT* (Amazon Digital Services LLC, 2018); Thomas Erl, Ricardo Puttini, Zaigham Mahmood, *CLOUD COMPUTING: CONCEPTS, TECHNOLOGY & ARCHITECTURE* (Prentice Hall, 1 edition, 2015); Andy Kirk, *DATA VISUALISATION: A HANDBOOK FOR DATA DRIVEN DESIGN* (SAGE Publications Ltd; 1 edition, 2016)

⁷⁶ See Yucong Duan, Guohua Fu, Nianjun Zhou, Xiaobing Sun, Nanjangud C. Narendra, Bo Hu, *Everything as a service (XaaS) on the cloud: origins, current and future trends*, IEEE 8TH INTERNATIONAL CONFERENCE ON CLOUD COMPUTING 621-628 (2015).

⁷⁷ Infrastructure as a service (IaaS) is a form of cloud computing that provides virtualized computing resources over the internet. See Sushil Bhardwaj, Leena Jain, and Sandeep Jain, *Cloud computing: A study of infrastructure as a service (IaaS)*, 2.1. INTERNATIONAL JOURNAL OF ENGINEERING AND INFORMATION TECHNOLOGY 60-63 (2010)

⁷⁸ Communications as a Service (CaaS) is an outsourced enterprise communications solution that can be leased from a single vendor. Such communications can include voice over IP (VoIP or Internet telephony), instant messaging (IM), collaboration and videoconference applications using fixed and mobile devices. Joseph Hoftstader, *Technical fundamentals of CaaS*, MICROSOFT DEVELOPER NETWORK (2008), available at: <https://msdn.microsoft.com/en-us/library/bb896003.aspx>

software license for an application and installing this software on individual machines, a business signs up to use the application hosted by the company that develops and sell the software, giving the buyer more flexibility to switch vendors and making less complicated to maintain such software.⁷⁹

How is this related to APIs in general? APIs are the keys that allow different applications or software to talk to each other. Compounded with the rise in XaaS, there is a growing market for developers who can create third-party applications that integrate with existing platforms. For example, the rise of SaaS has led to entire companies emerging that depend on developers using their SaaS.⁸⁰ However, APIs and SaaS are not synonyms. Basically, an API does not need SaaS, and APIs have been around a lot longer than the Internet itself and can be used offline.⁸¹ In order to clarify, LinkedIn has a SaaS model because they charge for subscriptions to a software product. On the contrary, Facebook does not have a SaaS model, but they do use APIs to expose data. They derive their revenue from advertising, much as Google does. They do not charge a recurring revenue fee for a software product.

The things that banks are currently able to develop with APIs resemble to another concept that integrates the family of XaaS. That is what we call BaaS, which enables the digital delivery of banking services via APIs. In other words, it extends banking services outside of traditional brick-and-mortar branches; offering an invitation to do business through the mobile and web experiences. With BaaS banks expose through

⁷⁹ See Abhijit Dubey and Dilip Wagle, *Delivering software as a service*, THE MCKINSEY QUARTERLY 6 (2007), available at: http://www.pocsolutions.net/Delivering_software_as_a_service.pdf

⁸⁰ Some examples of SaaS are:

- Salesforce: Salesforce is a customer relations management solution that enables businesses to collect all information on customers, prospects and leads within a single online platform, enabling authorized employees to access critical data on any connected device at any time. Salesforce credits its tools for boosting customer sales an average of 37 percent as well as driving increased client loyalty and satisfaction.
- Microsoft Office 365: Users now may create, edit and share content from any PC, Mac, iOS, Android or Windows device in real-time, connect with colleagues and customers across a range of tools from email to video conferencing and leverage a range of collaborative technologies supporting secure interactions both inside and outside of the organization.

For more examples see Vadim Vladimirov, *10 Popular Software as a Service (SaaS) Examples*, NERDIO (2018), available at: <https://getnerdio.com/academy/10-popular-software-service-examples/>

⁸¹ See Peter Mell, and Tim Grance, Effectively and securely using the cloud computing paradigm, 2.8. NIST, INFORMATION TECHNOLOGY LABORATORY 304-311 (2009); Neal Leavitt, *Is cloud computing really ready for prime time?*, 1 COMPUTER 15-20 (2009); Eric Knorr and Galen Gruman, *What Cloud Computing Really Means*, 7 INFOWORLD (2008), available at: <https://www.infoworld.com/article/2683784/what-is-cloud-computing.html>

APIs their data and their functionality/infrastructure. Thus, the solution provides bank-like services outside of a bank-owned channel. The third party not only relies on access to bank data, creating new and valuable ways for consumers to visualize and understand that information, but also, relies on access to bank services and the ability to leverage a bank's infrastructure to provide a service that the bank does not offer to consumers outside of the bank's existing footprint. Giving third parties access to existing customers' bank data is important to offer beautiful customer experiences, but providing third parties access to banking functionality through BaaS will create revolutionary customer experiences across industry verticals.

A personal finance manager may decide that it makes sense for it to store and move money on behalf of its users. Short of becoming a full-fledged bank, the personal finance manager can use BaaS technology from companies to power a current account and debit card. Some people in the industry call this functionality accounts as a service. Also, digital core banking providers can often supply some or much of the technology stack for new challenger banks. Before open banking, those third parties would need an e-money license, a bank board, lots of capital, among other regulatory requirements. With open banking, a company can code against bank's APIs and get a customer-centric product out into the market really quickly. Traditional banks have gotten into the BaaS trend. Big banks such as BBVA, JPMorgan, DBS, Citi, among other, have opened up of banking tech infrastructure in an attempt to ramp adoption of a BaaS platform.⁸²

While promising, open banking is only 1%⁸³ complete and BaaS is the catalyst to increase that percentage and create more truly seamless and integrated customer experiences for the platform economy. This strategy allows banks to move towards a customer-centric platform-based model and incumbents will have to restructure.⁸⁴ In other words, the future of financial institutions might look like what Microsoft Office 365 does, but with financial services. This requires a connected and collaborative

⁸² We will provide further detail of these examples in section 3.2. of this paper.

⁸³ See Adam Davis, *The World Turns to Open Banking*, 11:FS (2018), available at: <https://11fs.com/blog/world-open-banking>

⁸⁴ See Organization for Economic Co-operation and Development, *Digital Disruption in financial markets – Note by Professor Xavier Vives* (2019), OECD DIRECTORATE FOR FINANCIAL AND ENTERPRISE AFFAIRS COMPETITION COMMITTEE, available at: [https://one.oecd.org/document/DAF/COMP\(2019\)1/en/pdf](https://one.oecd.org/document/DAF/COMP(2019)1/en/pdf)

ecosystem in which integration is the core component and where APIs are the key tactical consideration.⁸⁵

Such an environment will probably originate a strategic need in the financial industry and financial institutions will probably embrace more mainstream a service-oriented-architecture (SOA), which is a style of system design where services are provided to the other components by application components, through a communication protocol over a network.⁸⁶ A service is a discrete unit of functionality that can be accessed remotely and acted upon and updated independently. Hence, SOA is an architectural approach in which integration becomes forethought rather than afterthought.⁸⁷ This technical definition sounds complicated, but it means that the end solution is likely to be composed of services developed in different programming languages, hosted on disparate platforms with a variety of security models and business processes. Using this approach, enterprises can assemble and reassemble these open, standards-based services to extend and improve integration among existing applications, support collaboration, build new capabilities, and drive innovation at every point in the value chain.⁸⁸ The independent services can communicate by an API, hence an API is a

⁸⁵ See Shashi Rana, Angus Duncan, Richard Peers, Aman Kohli, Dave Phelps, *PSD2 and Open Banking. Using regulation to kick-start the transformation of banking*, ACCENTURE, AVANADE AND MICROSOFT REPORT (2018), available at: https://www.avanade.com/~/_media/asset/white-paper/microsoft-psd2-open-banking.pdf?la=zh-sg&hash=ADF24799D9C4C76C828C53FC0F946DB2; Eric Marts, *APIs are not enough – Open Banking is all about building an ecosystem*, RED HAT BLOG (2018), available at: <https://www.redhat.com/en/blog/apis-are-not-enough-%E2%80%93-open-banking-all-about-building-ecosystem>

⁸⁶ Service orientation is viewed as a means to better align business and IT objectives and to better support the levels of flexibility and change required by the business. Existing business processes are decomposed into discrete units of business function termed services. These services are then recombined into business processes in a more flexible manner. Such decomposition has led to the emergence of collaborative ecosystems, where the reconstructed processes often integrate services from partners, outsourced providers, and even customers. See Axel Buecker, Paul Ashley, Martin Borrett, Ming Lu, Sridhar Muppidi and Neil Readshaw, *UNDERSTANDING SOA SECURITY DESIGN AND IMPLEMENTATION* (IBM Redbooks, 2007); Microsoft, *Enabling “Real World” SOA through the Microsoft Platform*, MICROSOFT WHITE PAPER (2006), available at <http://www.microsoft.com/biztalk/solutions/soa/whitepaper.msp>; Dirk Krafzig, Karl Banke, and Dirk Slama, *ENTERPRISE SOA: SERVICE-ORIENTED ARCHITECTURE BEST PRACTICES* (Prentice Hall Professional, 2005); Marc-Thomas Schmidt, Beth Hutchison, Peter Lambros, Rob Phippen, *The enterprise service bus: making service-oriented architecture real*, 44.4 IBM SYSTEMS JOURNAL 781-797 (2005)

⁸⁷ In the context of IT, this means that SOA is not a technology. It is a design philosophy independent of any vendor, product, technology or industry trend. SOA is an architectural philosophy and is not necessarily an implementable concept. See Peter Herzum and Oliver Sims, *BUSINESS COMPONENT FACTORY* (Wiley, 1999)

⁸⁸ See Jay DiMare and Richard S. Ma, *Service oriented architecture. Revolutionizing today's banking systems*, IBM INSTITUTE FOR BUSINESS VALUE (2009); Hedley, Kimberly, John White, Cormac Petit dit de la Roche and Sunny Banerjee, *The paradox of Banking 2015: Achieving more by doing less*, IBM INSTITUTE FOR BUSINESS VALUE (2005).

part of a SOA.⁸⁹ Whilst nothing new, this concept will probably be more relevant in a BaaS-like financial system.⁹⁰

In sum, BaaS functions as a digital and distributed model of financial services that pushes out these services to apps and other pieces of software. The underlying infrastructure is given by a traditional licensed and regulated bank. On top of such a regulated bank, it's a centralized BaaS. Plugged onto this BaaS are decomposed banking services, an ecosystem of Fintechs and third parties.⁹¹ As a consequence, the front-end to the customer could be accomplished in various ways. First, the bank can still appear directly as a bank to its customers, or the bank operates as white label bank.⁹² Either way, consumers no longer need to go to a bank, for instance, to complete banking activities. With the use of APIs, it is possible that the nature of a primary financial relationship changes as consumers interact with companies that could not be even banks but are connected to them through APIs.

2.2.2. Open Banking will change the structure of financial intermediation

This paper argues that open banking will pave the way to change in the structure of financial intermediation derived from the entrance of third parties as financial services providers and banks willingness to provide BaaS. First, these third parties are allowed to initiate and make online payments, drawing directly from a client's account, which will lead to transform financial intermediation. Second, open banking facilitates the

⁸⁹ As an example, you could have one service responsible for capturing customer orders and a separate service responsible for tracking when the customer is billed and how much is owed, which responds to the OrderCaptured event. The first service might not need to know anything about billing due to the separation of responsibility. And the two services do not need to know about each other either, only about the events going on around them. Also, both services communicate through APIs. In SOA, services can connect to create applications, where customers have a service experience delivered by several divisions within a business or by several different businesses at the same time, when externally published APIs are used.

⁹⁰ The literature of SOA has been around for more than 20 years. Some argue that SOA evolved out of the experiences associated with designing and developing distributed systems based on previously available technologies. See John Evdemon, More Thoughts on SOA and the SO Design Tenets, Microsoft Developer Blog (2005), available at: <https://blogs.msdn.microsoft.com/jevdemon/2005/03/02/more-thoughts-on-soa-and-the-so-design-tenets/>

⁹¹ This is what Chris Skinner calls a "digital bank". See Chris Skinner, DIGITAL BANK: STRATEGIES TO LAUNCH OR BECOME A DIGITAL BANK (Marshall Cavendish International, 2014).

⁹² This opens a plethora of possibilities for other companies (e.g., grocery stores) including banking services into their portfolio.

entrance of technology companies with established presence in the market for digital services, Bigtechs, into the world of financial services.⁹³ Third, banks will become the platform or in other word, become the orchestrators.

Firstly, the changes we foresee to the financial intermediation system do not assume that banks will become irrelevant, in any of the new layers of the value chain of financial services. There will always be demand for risk intermediation—for institutions to take on the risk while intermediating (e.g., deposit to loans)—an activity that requires a regulated balance.⁹⁴ The question is not then whether traditional banking activity will continue to exist; it is whether (i) banks will be disintermediated from their customers, disaggregated, commoditized, and made invisible; (ii) or banks will maintain or even expand their role in intermediation, owning customer relationships and creating value on a sustainable basis. We argue that in an open banking mainstream implementation we will see both scenarios. On the one hand, BaaS implies that banks' services can be offered by third parties or the part who serves as the platform. This means that banks could even become invisible for the end client. On the other hand, open banking represents an opportunity for banks to exploit their advantage in owning the customer relationship. Either way, disaggregation and decentralisation are new challenges originate from open banking.⁹⁵

Secondly, open Banking can become a Trojan Horse for BigTech dominance of financial services. Online giant Amazon was reported to have held talks with investment bank JPMorgan Chase to develop a personal account product, last March. This would not be the firm's first foray into the financial services sector. It has become a major player in online lending to small businesses, announcing in summer 2016 that it had originated \$3bn in loans since launching the service in 2011.

⁹³ The Financial Stability Board already stated to be concerned that Open Banking might be used by BigTech to dominated parts of the industry and threaten financial stability. We will discuss further the financial stability and systemic risk associated with open banking in section 2.4.1. of this paper. See Financial Stability Board,

⁹⁴ Miklos Dietz, Paul Jenkins, Rushabh Kapashi, Matthieu Lemerle, Asheet Mehta and Luisa Quetti, *New rules for an old game: Banks in the changing world of financial intermediation*, MCKINSEY GLOBAL BANKING ANNUAL REVIEW (2018), available at: <https://media.rbcdn.ru/media/reports/Banks-in-the-changing-world-of-financial-intermediation-GBAR.pdf>

⁹⁵ Open banking is not the only fintech-related phenomena that abrogated to disintermediate the banking sector. Blockchain started as an alternative for the traditional form of intermediation for payment transactions. See Satoshi Nakamoto, *Bitcoin: A Peer to Peer Electronic Cash System*, BITCOIN ORG (2008), available at: <https://bitcoin.org/bitcoin.pdf>

Out of the scope of open banking, BigTech companies are becoming active in financial services in other regions, for instance in East Africa, Egypt, and India, through the entry into payment and banking-related services of Vodafone M-Pesa; in Latin America, with the growing financial activities of e-commerce platform Mercado Libre; in Asia with the activities of Kakao Bank, KBank and Samsung Pay in Korea, Line and NTT Docomo in Japan and the payments and credit services of ride-hailing apps Go-Jek and Grab, operating in Indonesia, Malaysia, Singapore and elsewhere in Southeast Asia; in France, with the banking services offered by Orange; and in the United States, with the budding payment services offerings of Amazon, Apple, Facebook and Google.⁹⁶

They often start with payments, in many cases overlaying such services on top of existing payments infrastructures. Increasingly, thereafter, they have expanded beyond payments into the provision of credit, insurance, and savings and investment products, either directly or in cooperation with financial institution partners. In China, both Ant Financial and Tencent's (part) subsidiary WeBank provide lending to millions of small and medium firms. To be sure, their activity is small in terms of total lending (less than 1% of total credit). There are also important differences in the strategy of BigTech firms. However, their growing footprint in areas that were previously unserved by the conventional banking sector suggests that there are important economic effects that deserve attention, including their role in financial inclusion.⁹⁷ This may also apply for the provision of savings products. Yu'eobao, a money market fund investment product of Ant Financial, became the largest money market fund in the world in 2017 in terms of total assets, but 99% of its users are retail customers, often with small investments. Meanwhile, Tencent recently gained a license to operate mutual funds.

Some banks will begin with ambitious option of becoming an end-to-end ecosystem orchestrator. Naturally, few if any banks will be able to compete with the likes of Tencent and Amazon to become full owners of multitrillion-dollar mega-ecosystems. But some banks could build ecosystems on a more realistic scale, placing themselves

⁹⁶ See <https://www.bis.org/publ/work779.pdf> and Zetzsche et al., 2017

⁹⁷ Luohan Academy Report, 2019

at the centre of their customers' journeys in an effort to own the relationships—and the associated data. Such banks would expand their scope to become one-stop shops for all banking-related products and services, focusing primarily on “distribution” and in some cases also “manufacturing” activities. They would deliberately move beyond the traditional banking value proposition and address broader parts of the customer journey, such as housing and home financing. Their open platforms would allow third parties to plug in through APIs and provide additional value-added services for customers. A bank might choose to orchestrate one of several different kinds of ecosystem—from a large-scale national ecosystem to a local one. Likewise, a bank might choose to aggregate a wide variety of services and providers in its ecosystem or could focus on a niche segment ecosystem. Let's consider how a bank might become a successful ecosystem orchestrator in each of the three “layers” of the future financial intermediation system. Success in this strategy will depend highly on partnership-building capabilities, a strong customer focus, and a culture and value proposition that is highly attractive for digital and analytics talent.⁹⁸

2.2.3. Data-driven finance: open APIs, big data and artificial intelligence

Open APIs, in particular, will enable banking organizations to gather actionable data from various internal and external sources, including buying habits, financial goals, risk tolerance and even social interactions. Insight derived from this data will enable more proactive (and accurate) multi-channel marketing, moving from reactive sales pitches to proactive solutions and advisory services. In other words, the difference between ‘rear-view mirror’ notifications and ‘financial GPS’ recommendations.

The ability to apply machine learning and artificial intelligence will respond to the customer desires of “Know me”, “Look out for me” and “Reward me.” This is expected to greatly improve the customer experience which currently lacks personalization and real-time engagement.⁹⁹

⁹⁸ Miklos Dietz, Paul Jenkins, Rushabh Kapashi, Matthieu Lemerle, Asheet Mehta and Luisa Quetti, *New rules for an old game: Banks in the changing world of financial intermediation*, MCKINSEY GLOBAL BANKING ANNUAL REVIEW (2018), available at: <https://media.rbcdn.ru/media/reports/Banks-in-the-changing-world-of-financial-intermediation-GBAR.pdf>

⁹⁹ <https://thefinancialbrand.com/65975/open-banking-api-fintech-partnerships/>

Certainly, of the two, banking as a platform has the potential to offer the end consumer the broadest set of capabilities, but does come with some lack of centralised control of quality.¹⁰⁰ The answer, at least in the short term, is likely to be not one or the other, but a combination. Banks will choose to strengthen products in which they excel today and consider offering these services to others to white label and consume and gain value through scale. In parallel, banks or fintechs may choose to curate best-of-breed products from their own offerings and those of third parties – providing combinations that are compelling and unique. In either scenario, the bank that is most flexible to consume or offer products or services through APIs has the advantage.¹⁰¹

Access to customer data drives higher level analytic and predictive services that create a competitive edge of intelligent customer insight and robo-advisory services.¹⁰² One example of the intersection between data and finance is the new European Union Payment Services Directive, which entered into force this year and introduced “open banking”. This means that bank account holders can ask their banks to transmit their financial data to third parties. They can also authorise third-party providers to initiate payments from their bank account. Similar initiatives have been taken by the Hong Kong Monetary Authority and the Monetary Authority of Singapore. Australia is also set to adopt open banking. Others may follow suit.

2.3. Open banking positive and negative externalities

2.3.1. Is Open Banking increasing competition or increasing concentration?

Policymakers, regulators and part of the literature have argued that open banking initiatives can increase competition in the financial services industry, particularly in for

¹⁰⁰ Artificial intelligence and data driven businesses such as Amazon.

¹⁰¹ See concept of intelligent bank, available at: <https://www.avanade.com/~media/asset/white-paper/microsoft-psd2-open-banking.pdf?la=zh-sg&hash=ADF24799D9C4C76C828C53FC0F946DB2>

¹⁰² See available at: <https://www.avanade.com/~media/asset/white-paper/microsoft-psd2-open-banking.pdf?la=zh-sg&hash=ADF24799D9C4C76C828C53FC0F946DB2>

retail banking. Accordingly, some open banking regulations,¹⁰³ state the open banking is the way to increase competition in certain areas that have worried antitrust regulators before, such as the payment systems.¹⁰⁴ However, we argue that open banking initiatives can be the door that bigtech can take to enter into the financial services world. Additionally, the compulsory regulatory approaches for open banking do not necessarily increase competition in the financial services industry, or at least, there is no empirical evidence that shows that. On the contrary, open banking may lead to restrict competition even more if we expect a future where customers interact with platforms in order to acquire financial services, instead of interacting with financial institutions.

Indeed, competitive impact of BigTech may be greater than that of fintech firms.¹⁰⁵ This is because giants such as Amazon have customer bases counted in the tens of millions, strong brand recognition, deep pockets and access to low cost capital from investors. Firms that accessed credit expanded their product offerings more than those that did not. It is too early to judge the extent of BigTech's eventual advance into the provision of financial services.¹⁰⁶ Additionally, BigTech firms typically have large, established customer networks and enjoy name recognition and trust.

A compulsory open banking regulatory approach might serve as the entrance for Bigtechs in the financial services, specially in those jurisdictions where bank license is if they become the orchestrator or platform for the clients.¹⁰⁷ In analyzing the advantages and threats posed by rising technological innovation in the financial sector, a cadre of researchers from all over the world found that a more efficient and resilient financial system could develop due to BigTech and Fintech causing more competition and diversity in lending, payments, insurance, trading, and other areas of

¹⁰³ For example PSD2 and Open Banking regulation in UK state that one of the motivations behind this approach is to improve competition in the payment systems for retail customers. See Open Banking (2016).

¹⁰⁴ Antitrust and competition authorities have intervened in the payment system before. For example in 2013 Visa, and American Express, along with some Banks were sanctioned by different competition authorities because of pricing agreements. See European competition authority, FCA, Brasil, Colombia.

¹⁰⁵ Bank of International Settlements, annual report, bigtech (2017).

¹⁰⁶ Id.

¹⁰⁷ See concept of orchestrator under open banking schemes above.

financial services.¹⁰⁸ More attention is needed from regulators and analysts precisely because BigTech and FinTech might affect financial stability by changing the market structure in financial services. As used in the FSB's report, "market structure refers to the interrelation of companies in a market that impacts their behavior and their ability to make profits."

2.3.2. Facilitating financial institutions to embrace digital transformation

Open banking is by definition a collaborative model. In that regard, open banking can be part of the innovation and digital transformation of incumbents by facilitating collaboration with Fintech firms.¹⁰⁹ The heterogeneity of legacy banking systems is also coupled with the fact that replacement and integration of these systems is a difficult undertaking.¹¹⁰ Older architectures complicate integration of enterprise applications because the underlying elements have created 'closed' architectures. Closed architectures restrict access to vital software and hardware configurations and force organizations to rely on single-vendor solutions for parts of their information computer technology. Thus, closed architectures hinder a bank's ability to innovate and roll out new integrated financial products.¹¹¹

However, it is important to notice that competition authorities have not analysed if this type of collaborative approach should be supervised as an integration. In theory, it seems to be a vertical integration, but truth is that no competition authorities evaluates ex ante the impact of opening financial services and products other than suggesting that this approach increases competition by lowering entering barriers in some markets such as the payment systems.

2.3.3. Enhancing client experience

¹⁰⁸ Financial Stability Board, available at: <https://www.fsb.org/2019/02/fintech-and-market-structure-in-financial-services-market-developments-and-potential-financial-stability-implications/>

¹⁰⁹ <https://www.mckinsey.com/industries/financial-services/our-insights/data-sharing-and-open-banking>

¹¹⁰ See Mazursky (as cited in Baskerville, Cavallari, Hjort-Madsen, Pries-Heje, Sorrentino & Virili, 2010)

¹¹¹ <https://anthonymoak.com/2016/01/16/the-benefits-of-service-oriented-architecture-for-financial-services-organizations/> z

Banks can however go one step further by extrapolating valuable data from their large established customer bases and segments – something challengers do not have. This data can be monetised by allowing third parties to access segmentation information about their own customer base, detailing consumer behaviour. This permissive data which customers have agreed to share is an important development. This opportunity to sell insights based on segmentation knowledge offers the possibility of a profitable new revenue stream for banks.¹¹²

How to create value for customers through data becomes an important factor in the digital economy. It means establishing a more accurate understanding of customers and the context in which they consume services. Communicating with customers about products and services in an appropriate and timely manner and ultimately creating a more enhanced customer experience through the value of data.¹¹³

2.3.4. Rising financial inclusion

Financial inclusion is the situation in which all working age adults have effective access to financial products such as payments, savings, credit and insurance from formal service providers. Effective access involves convenient and responsible service delivery, at a cost affordable to the customer and sustainable for the provider, with the result that financially excluded customers use formal financial services rather than existing informal options, which is usually quite expensive. Financial inclusion improves social well-being and alleviates poverty. The usage of formal financial services buffers individuals against liquidity shocks, allows for saving with safe financial tools, obviates the unnecessary liquidation of illiquid investments, and channels savings from unproductive liquid assets toward investments in productive capital. When defining financial inclusion, access is the most important dimension and represents a necessary but insufficient condition for using formal financial services. Therefore, extending access to the formal financial system is essential to foster

¹¹² Christian Ball, *Why Data Has Become Banks most important Commodity*, GLOBAL & BANKING FINANCE REVIEW, 2017, available at: <https://www.globalbankingandfinance.com/why-data-has-become-banks-most-important-commodity/>

¹¹³ Christian Ball, *Why Data Has Become Banks most important Commodity*, GLOBAL & BANKING FINANCE REVIEW, 2017, available at: <https://www.globalbankingandfinance.com/why-data-has-become-banks-most-important-commodity/>

financial inclusion. Yet traditional access channels seem to be limited in guaranteeing universal financial access. From the supply side, bank branches and ATMs are not cost efficient for financial institutions to serve certain segments of the markets. Moreover, from the demand side, there are physical, cultural and social barriers that make access difficult through traditional channels. Given these limitations, technology and regulation have facilitated the emergence of a new branchless channel, i.e. non-bank correspondents, with the potential to reach millions of unbanked individuals more rapidly.

This approach consistent of allowing third parties to provide financial services to consumers is nothing new in the financial inclusion driven policies. The non-bank correspondent business model is an example of this. Non-bank correspondents are non-financial commercial establishments that offer basic financial services under the name of a bank, becoming access points to the formal financial system. Those establishments can belong to a broad range of sectors (grocery, gas stations, postal services, pharmacies, etc.), as long as they are bricks-and-mortar stores whose core business involves managing cash. In its most basic version, nonbank correspondents carry out only transactional operations (cash in, cash out and bill payments) but in many cases they have evolved to serve as a distribution channel for the banks' credit, saving and insurance products. This business model makes it sustainable for banks to focus on low-income clients with cost efficient access channels. In areas where bank branches are a long way away from households, non-bank correspondents pool the cash requirements of all customers and reduce the number of costly (and sometimes risky) trips to the bank. Moreover, since deposits and withdrawals are offset at the agent's till, the total amount of cash that needs to be transported to the bank branch is also reduced. Thus, the non-bank correspondent business model leads to economic efficiencies. Outsourcing agreements allow banks to turn fixed costs into variable costs, lowering and making more flexible their cost structure. In particular, banks have two main incentives for outsourcing their most basic customer contact activities to retail agents. First, correspondents allow banks to reach new customer segments (low-income, rural, etc.) that are too costly to serve with bank branches, due to the fixed costs involved. Second, in the case of areas already covered by bank branches, transferring some activities to correspondents (i.e. channel substitution) allows banks to cut costs and concentrate their employees' efforts in more value-

added activities while also decongesting bank branches and increasing convenience for customers.¹¹⁴

The difference in the case of open banking is that banks can open its APIs and do not need to have any partnership with the third party. On the contrary, is the third party who will decide which API wants to use.¹¹⁵

2.3.5. Financial stability and systemic risk

Not enough attention is being paid to the potential security risks that may arise as a broader set of entities start to gain access to customer data. Open banking goes beyond payment services, but regulators mistakenly have focused the discussions around open banking only in the payment services market or retail banking.

First, the FSB warns that cross-subsidisation may allow Big Tech firms to gain market share rapidly and knock out existing providers. As a result, “their participation may not result in a more competitive market over the longer term.”¹¹⁶ That is a warning policymakers should heed. Second, the ability of new entrants to undercut banks significantly could make the latter potentially more vulnerable to losses. The accompanying reduction in retained earnings as a source of internal capital, the report argues, could have an impact on financial sector resilience and risk-taking.¹¹⁷

This type of interaction with third parties can also increase cybersecurity issues that might lead to financial stability problems in the future. Also, the increased

¹¹⁴ Non-bank correspondents have significantly contributed to extend access to the formal financial system in many developing countries, particularly in Latin America and the Caribbean, which is the world region with the greater number of non-bank correspondents (136 outlets per 100,000 adults). Latin America is followed at a considerable distance by South Asia (83 agents per 100,000 adults) and Middle East and North Africa (72). The prevalence of the non-bank correspondent business model in Latin America is consistent with the emergence of this business model in Brazil in the year 2000, and with the pioneering specific regulation introduced by many countries in the region. This may be in part promoted by the long-standing banking tradition in this region relative to other emerging markets. See Noelia Cámara, David Tuesta y Pablo Urbiola, Extending access to the formal financial system: the banking correspondent business model, BBVA Research Working Paper, No. 15/10 (2015)

¹¹⁵ https://www.bbva.com/wp-content/uploads/2015/12/Banking-Outlook_Dec15_Cap5.pdf

¹¹⁶ Financial Stability Board (2019)

¹¹⁷ Id.

concentration of financial markets because of the orchestrators or platforms should be also evaluated by financial regulatory authorities.

2.3.6. Cybersecurity

Sharing data with third parties naturally increases cybersecurity risks. Regulators should guarantee that this type of strategy for unbundling banking services does not pose greater risks for privacy. This is certainly challenging because, in one hand, financial regulators are in charge of dictating the regulations for cybersecurity in the financial system but many of some parties in the open banking world can be non-financial institutions. Even the platform orchestrating all services might be a non-financial institution. This is exactly what Libra initiative seem to propose. The platform would be Facebook, but the financial services and product will be provided by the licensed institution Calibra.¹¹⁸

Note: Can MAS clarify what type of controls would be considered acceptable in such instances? Will a risk assessment of the vulnerability by the FI suffice? Paragraph 9(b) requires a relevant entity to implement multifactor authentication (“MFA”) for all accounts on any system used by the relevant entity to access confidential information through the internet. We note that the MAS TRM Guidelines recommends FIs to implement two-factor authentication for their online financial systems, and there is no similar guidance in the MAS Outsourcing Guidelines. Can MAS clarify if the MFA requirement would apply to information systems hosted by third-party service providers and which contain confidential information? If it does apply, it may not be possible for FIs to impose the MFA requirement on systems hosted by their existing third-party service providers which do not have such MFA capability. Appreciate if MAS could reconsider this requirement for third party-providers or provide alternative options in relation to this.¹¹⁹

2.3.7. Data protection and data governance

¹¹⁸ See Libra White Paper (2019)

¹¹⁹ Monetary Authority of Singapore, available at: <https://www.mas.gov.sg/-/media/MAS/Notices/PDF/Responses-to-Feedback-Received-to-Draft-Notice-on-Cyber-Hygiene---6-August.pdf?la=en&hash=30855EC539C0764709810E10F2F1260E9D96EBCB>

Open Banking in EU and UK may have started, principally, as way to promote competition in the payments and banking industry. But it is clear now that its impact is much broader. Open Banking promises to create a new data sharing infrastructure, which will form the basis of a much richer range of services and products across the whole of financial services, and critically, in other industries as well. For some, Data portability might decrease interest in innovations.¹²⁰

Against this we argue that data regulation will have a transformative impact on the shape and structure of financial services, particularly in the context of data sharing and portability. If it is clear that Open Banking and data sharing are blurring the lines between financial services and other industries, what is less clear is whether collaboration between financial services regulators and DPAs[14] is sufficient to respond to these challenges.

Across the world, the EU GDPR has been seen to set a new gold standard for data protection. But although GDPR and PSD2 both went live in 2018, in hindsight it is clear that while the two policies share similar objectives in terms of data security and portability, the details were developed in silos and are difficult to reconcile in practice.

Australia on the other hand is again leading the way, as the DPA has been fully involved in the development of the CDR from the outset and are currently overseeing the development of API-based open communication standards to be adopted by firms in scope of the CDR.

However other jurisdictions, including the US, have been largely silent on whether they are planning to review their data protection regimes in light of the expected increase in data sharing due to Open Banking. The US silence is particularly worrying as the use of screen scraping, which as we mentioned remains wide spread, does not give customers any real control over which data they are sharing, nor does it establish a clear liability framework in case of data breaches or fraud. In the EU for example, while

¹²⁰ Available at: <https://ec.europa.eu/digital-single-market/en/news/communication-building-european-data-economy>

PSD2 technically does allow screen scraping¹²¹ the conflict with GDPR requirements is clearly steering banks towards the development of APIs communication solutions.¹²²

The aggregation of data complexity. There are no standards fully deployed in the markets. The digital transformation of banks was a very democratic process (for the banks that proceed in adopting it) and no norms, rules or standard imposed by anybody.

Even in the new PSD2 regulation, in EU region, there is no clear rule on how a bank should expose their data. Only that it is mandatory and they need to invest money to obey the law. If you look at CEE markets, for example, there are almost 350 relevant banks. This year, in order to be compliant, every bank will choose to adopt one of the types of APIs from a big list of “standards” (Open Banking API, Berlin Group, Polish API, Slovak API, STET, etc.). Or they will create a mix of them with a couple of flavours.

On top of the lack of common standard, it comes the multiplicity in itself. If you want to build a wallet to cover the region and you want to add on services from local banks, aggregation on hundred of endpoints becomes a huge effort. It is a bigger task than creating the UX of the frontend and getting traction to users. And it simply doesn't make sense to make it for a single app.¹²³

3. Is regulation an enabler for open banking?

3.1. Regulatory Approaches to open banking

Some Regulation is one of the catalysts to encourage the open banking revolution in the financial services industry. However, is not the only one. Customer expectations,

¹²¹ https://blogs.deloitte.co.uk/financialservices/2018/11/open-banking-around-the-world-towards-a-cross-industry-data-sharing-ecosystem.html#_ftn7

¹²² https://blogs.deloitte.co.uk/financialservices/2018/11/open-banking-around-the-world-towards-a-cross-industry-data-sharing-ecosystem.html#_ftn7

¹²³ <https://www.fingware.com/blog/2019-04-22-the-2-technological-complexities-that-slow-open-banking/>

Competition and technology are also driving the interest of the financial services industry in entering into the open API economy.

First, Customer expectations change rapidly and will continue to do so. Millennials and early adopters across generations are at the forefront here, expecting full service digital banking, being far from loyal to high street banking brands – and trusting tech brands to provide better service. More than ever a customer's choice of bank is influenced by ease of digital access and ease of integration with higher level services, as much as it is with rates or premium account features or branch locations. Banking is fast becoming just one step in the way of getting the 'stuff' you need. Banks need to adapt and adjust to this new attitude to maintain market share.¹²⁴

Second, Today's high street banks have evolved numerous layers of organisation, process and technology designed to maintain stability and minimise risk. When all around you behave similarly, this status quo is maintained. However, these rules will not be followed by new banking entrants without the legacy, fintechs that specialise or don't fall under the same regulatory scrutiny, and disruptive entrants from other markets. As most of this new competition will struggle to compete directly on price, agility and customer focus are the two factors most likely to disrupt – and this may well be attractive enough to make significant shifts in market share.

Third, the checklist of potentially game-changing technologies continues to grow and drive customer expectations – AI, bots, bitcoin/blockchain, biometrics, big data, predictive analytics and Internet of things (IoT) are just some of the technologies promising to change the art of the possible. Regardless of the technology, easing customer journeys, automating the tedious, providing just-in-time and access-anywhere information and services are the promise of the new normal today. Before long, even this list will become commonplace or obsolete and replaced by new innovation capturing the attention of fintechs and consumers alike. Ultimately, it is the flexibility to rapidly experiment with, adapt to and adopt emerging technologies that will allow for continued relevance in the marketplace. Uber is a case in point, bringing

¹²⁴ www.millennialdisruptionindex.com

established technologies together to connect buyers and sellers via a marketplace which focuses on a great mobile experience, where payment is an integral but largely invisible by-product.

Jurisdictions have taken different approaches to open banking, as follows.

3.1.1. Market development approach

There are no compulsory open banking requirements in Singapore, but the government supports a number of voluntary initiatives towards an open data framework, for example Finance-as-a-Service or the API Playbook. This was published by Monetary Authority of Singapore (MAS) and the Association of Banks in Singapore, the non-binding API Guidelines provide guidance to financial institutions, FinTechs and other entities in developing and adopting API-based system architecture. Second, Financial Industry API Register: A list of open APIs available in the Singapore financial industry. Different types of APIs are registered, eg Transactional APIs which allow transactional services for payments, funds transfer, settlements etc and less sensitive APIs such as Product APIs, which provide information on financial product details, rates and branch/ATM locations.

Private open data initiatives by financial institutions in Singapore include the world's largest banking API developer platform by DBS, with 155 APIs at launch in November 2017 across more than 20 categories including funds transfers, rewards and real-time payments. It seeks to enable third-party developers to access APIs to integrate functionality into their own services.

Also, Japan follow this regulatory model. There are no compulsory open banking requirements in Japan, but the government has committed to supporting FinTech innovations and to promote the adoption of open APIs by banks and credit card companies (eg via policy measures and technical standards, and a regulatory sandbox). For example, Japanese Prime Minister, Shinzo Abe, has set a target of 80 banks to have open APIs by 2020. In June 2018, amendments to the Banking Act came into effect to facilitate open API architecture between financial institutions and FinTech firms.

In India, there is no formal open banking regime in India, but the government is supporting a range of measures to promote competition in the banking sector. For example, The Reserve Bank of India authorised the National Payments Corporation to develop an instant real-time payment system (the Unified Payment Interface API) to facilitate inter-bank transactions. Regulated by the Reserve Bank of India, it is processing an average of 877 million transactions a month. All bank account holders in India can send and receive money instantly from their smartphones without needing to enter bank account information. The Government has also implemented a set of APIs through IndiaStack that allow governments, businesses and developers to access a technology platform via the Aadhaar national identity number system (for example, when a third party service provider needs to verify the identity of their customer, they can send the customer's Aadhaar number and biometric information to the centralised database for verification).

3.1.2. Compulsory approach

This approach fails because of the lack of reciprocity and because open banking should not be limited to the payment systems. This approach was firstly implemented by UK and the European Union.¹²⁵ The EU regulates the sharing of consumers' banking account data with third party payment service providers (PISPs and AISPs) through the revised Payment Services Directive (PSD2). PSD2 builds on the first Payment Systems Directive (PSD1) which was adopted in 2007 and provided the legal foundation for an EU single market for payments. PSD2 aims, for example, to improve the playing field for payment service providers (including new players), make payments safer and more secure, and protect consumers.

Under PSD2, upon request from customers, banks and other account-holding payment service providers must grant registered/authorised PISPs and AISPs secure read and write access (including payment initiation) to the customer's account data through open APIs. PSD2 came into force on 12 January 2018 (EU members had to adopt into their national laws by 13 January 2018).

¹²⁵ In the European Union is a Directive, not Regulations.

The European Banking Authority is responsible for issuing guidelines and recommendations to authorities and financial institutions on PSD2. It is currently drafting regulatory technical standards (RTS) for PSD2 which will take effect in mid-2019. In June 2018 it published an Opinion and a Consultation Paper on draft Guidelines in relation to the RTS on strong customer authentication and common and secure communication under PSD2 which will apply from 14 September 2019.

United Kingdom

The UK's Open Banking regime is a response to a 2016 report by The Competition and Markets Authority (CMA) which found that there was a lack of competition among established, larger banks for customers' business, in this environment and smaller and newer banks found it difficult to compete. The UK's implementation of open banking builds on its PSD2 obligations by requiring that banks provide data to third parties in a standard API format. The UK's Open Banking regime is implemented through the CMA's Retail Banking Market Investigation Order 2017, which requires the UK's nine largest banks to, upon request from customers, provide regulated providers access to customer's banking data via a secure and standardised form. Third parties (AISPs or PISPs) that use published APIs to access customer data are authorised and regulated by the Financial Conduct Authority (FCA) and enrolled on the Open Banking Directory. As of 3 September 2018, there are 40 providers enrolled in Open Banking.

The Open Banking Implementation Entity (OBIE) (set up by the CMA to deliver Open Banking), determines the specifications for the APIs that are being used to deliver Open Banking, creates security and messaging standards, manages the Open Banking Directory (which allows participants to enrol in Open Banking), produces guidelines, and manage disputes and complaints. OBIE is governed by the CMA and funded by the UK's nine largest banks and building societies (Allied Irish Bank, Bank of Ireland, Barclays, Danske, HSBC, Lloyds Banking Group, Nationwide, RBS Group and Santander). Managed roll out of the Open Banking Directive began on 13 January 2018, when start-ups could apply to FCA to be authorised third parties to access APIs. The regulated providers have been able to offer open banking services to customers since 18 April 2018.

An open banking regime is being introduced in Australia, with a phased implementation from July 2019. The open banking regime is part of the development of a national Consumer Data Right (CDR), which was announced by the Federal Government in November 2017 as a partial response to the Productivity Commission's Inquiry into Data Availability and Use.

The CDR will provide individuals and businesses with a right to access specified data held by them by businesses, and to authorise secure access to this data by accredited data recipients (eg, other banks, telecommunications providers, energy companies, or companies providing comparison services). A key feature of the right is that access must be provided in a timely manner and in a useful digital format which complies with the applicable standards. The Government plans to implement the CDR in designated sectors within the economy on a sector-by-sector basis, beginning with banking, energy and telecommunications. Banking will be the first sector to adopt the CDR, under the nomenclature, "Open Banking".

In August 2018, the Government released exposure draft legislation (Treasury Laws Amendment (Consumer Data Right) Bill 2018) to introduce the CDR. Scope of Open Banking Upon request from a customer, banks (being all authorised deposit-taking institutions, other than foreign bank branches) will be required to share with the customer or an accredited data recipient information that has been provided to them by the customer if it is in a digital form, and does not relate to identity verification assessment. Banks must also share all transaction data from specified banking products via a dedicated API but will also be automatically accredited to receive data under Open Banking.

Only accredited data recipients may receive Open Banking data, with the Australian Competition and Consumer Commission (ACCC) determining the criteria for, and method of, accreditation. Standards will specify the way in which data is transferred, how it is described and recorded, and to protect the security of the data. The starting point for the standards for the data transfer mechanism will be the UK's Open Banking technical specifications.

3.1.3. Sandbox approach

In some jurisdictions, open banking has been part of the functions of the regulatory sandbox. For example, in Singapore, the sandbox allows financial institutions and FinTech players to experiment with innovative financial products or services. MAS may provide regulatory support by relaxing its specific legal and regulatory requirements. SGD 27 million grant to promote artificial intelligence and data analytics in financial sector: A grant by the MAS to promote adoption and integration of artificial intelligence and data analytics in financial institutions.

Additionally, the Monetary Authority of Singapore launched in November 2018 an initiative call APIX, which is a cross border sandbox and marketplace that helps fintechs and banks to connect with each other through APIs.¹²⁶

3.2. Which model is the best? Some empirical evidence

Almost two years later, has Open Banking changed anything?

To the average British person, the advent of Open Banking would mean very little. In fact, three in four are said to not even know what it is, even though it is almost two years old. However, more avid followers may be asking themselves what has been achieved since it came onto the scene. The initial statistics do not paint a great picture.

Of the 442 banks that had to implement facilities for third parties to test their functionality in a sandbox by 14 March 2019, only 59% have complied. As the next deadline of 14 September looms, when banks will need to have fully compliant dedicated application programming interfaces (APIs) for third-party providers (TPPs) in place, there is a growing concern about the number that will apply for exemptions and therefore delay the implementation of Open Banking.

However, at this stage, such statistics are not necessarily the best metric for measuring success. Indeed, Open Banking is a process and, right now, we are in the implementation stage, and the deadlines put in place are ambitious, but the most important aspect currently is how we are layering up.

¹²⁶ See <https://www.mas.gov.sg/development/fintech/api-exchange>

The questions that should be asked are: is there consumer appetite; are banks ready for Open Banking; and are TPPs registering? From the consumer perspective, whether they know what Open Banking is or how it works is almost irrelevant: they need to be interested in the products that Open Banking can offer and, since there were over two million users of account aggregators before Open Banking, it can safely be assumed that there will be a demand.

When it comes to banks, according to the Open Banking Implementation Entity (OBIE), which was created in 2016, in addition to the nine mandated banks (the CMA9) 40 further banks are using the Open Banking standards.

As for TPPs, according to the Financial Conduct Authority, more than 100 have registered so far. All of this takes time and happens behind the scenes – it takes time for banks to be able to build trusted and reliable APIs, and it takes time for TPPs to build products and get authorised.

The big bang of implementation that many thought would have occurred by now is instead a steady incline, and this is important. Serious questions need to be bottomed out, such as what is a payment account, what is in scope, when can a bank restrict access. Setting the rules to the game before opening up the data is also imperative. The biggest threat to Open Banking at present is a lack of trust and this is something that is earned slowly.

Before consumers will feel comfortable with TPPs being able to handle their data, they need to be assured that the necessary protections are in place and be made aware of the benefits of this. If the cost of slower implementation is negative articles and questions being raised about whether the project is a failure, the OBIE can be satisfied with the approach taken.¹²⁷

4. Policy recommendations to enhance open banking regulation

¹²⁷ See Hogan Lovells, available at: <https://www.hlogage.com/almost-two-years-later-has-open-banking-changed-anything?did=130&uid=4880&uemail=nremolin%40bancolombia.com.co&aid=3811>

As we mentioned, many regulators are starting to think how to regulate open banking. Based on the preliminary findings of what the world knows so far as open banking, we provide here some policy recommendations directed to produce better regulatory frameworks for this matter.

4.1. One size does not fit all

If the fintech market is not well developed, a compulsory approach should not be encouraged. The regulatory framework is not enough to develop an API ecosystem in the financial services industry. The case of Mexican fintech law proves this. Part of this regulatory framework includes a chapter on open banking, however, here are no major open banking developments in this jurisdiction. Mexican regulators diverged from the scope of the original UK standard, requiring that the Mexican one apply to all products and services, open, transactional, and also aggregated data, and be adopted by all financial service providers, not only banks. These institutions will be able to charge for sharing their data, but this should not represent a barrier to entry for new players.

The publication of a report earlier this year commissioned by the British Embassy on the potential for Open Banking in Mexico – co-authored by C Minds and the Open Data Institute with the support of the National Banking and Values Commission (CNBV) and the FinTech Hub – offered recommendations on the path towards a successful Open Banking initiative, highlighting the importance of an inclusive effort, of reaching out to consumers, promoting innovation exercises and encouraging the development of new solutions for financial inclusion.¹²⁸

Following the recommendations, the CNBV and C Minds accompanied the National Digital Strategy Coordination in the implementation of a first pilot, exploring the usability of the UK standard for Mexican banks. The pilot resulted in the opening of 12 APIs, eight ATM and branch endpoints and four product endpoints. It ended with a hackathon to test the potential of said APIs to create new exciting solutions for

¹²⁸ Report on www.cminds.com

consumers. The results of both exercises contributed insights for the development of the Mexican Open Banking Standard.¹²⁹ Does the lack of open APIs in compulsory regimes suggest that the best approach is the market development? Not necessarily. It will depend on the particularities of each jurisdiction.

4.2. Reciprocity is pivotal for an open banking revolution

The central role data plays in the digital economy has driven regulatory and policy interventions around the world regarding the access to and the use of customer data. In this regard, a number of jurisdictions are introducing mandatory data sharing frameworks that allow customers to transfer their data from one firm to another, with the aim of promoting greater competition, facilitating innovation in data-based solutions and empowering customers with more control over their data.¹³⁰

Reciprocal data sharing frameworks that follow these principles will ensure fair and dynamic competitive landscapes, and in the end, they will benefit the customer through better, more personalized and price efficient proposals from a broader range of providers. This is key for developing and unleashing the full potential of the digital economy.

4.3. Coordination among regulators

There are important new and unfamiliar challenges that extend beyond the realm of financial regulation as traditionally conceived. Big techs have the potential to become dominant through the advantages afforded by the data-network-activities loop, raising competition and data privacy issues. Public policy needs to build on a more comprehensive approach that draws on financial regulation, competition policy and data privacy regulation. The aim should be to respond to big techs' entry into financial services so as to benefit from the gains while limiting the risks. As the operations of big techs straddle regulatory perimeters and geographical borders, coordination

¹²⁹ See <https://www.openbankingexpo.com/insights/the-global-revolution-of-open-banking-a-look-at-mexico/>

¹³⁰ See Institute of International Finance. https://www.iif.com/portals/0/Files/private/32370132_reciprocity_in_customer_data_sharing_frameworks_20170730.pdf

among authorities - national and international - is crucial at both the national and the international level. First, there is a need for coordination of national public policies. The mandates and practices of the three different national authorities - competition authorities, financial regulators and data protection supervisors - may not always be compatible. Financial regulators focus on the specifics of the financial sector, whereas competition and data privacy laws often impose general standards that apply to a wide range of businesses. Second, as the digital economy expands across borders, there is a need for international coordination of rules and standards (eg for data exchange). To prevent those differences from leading to conflicting actions, policymakers not only need a new compass but also need to find the right balance of public policy tools.¹³¹

4.4. Is risk-based supervision enough to contain the risks?

In addition to providing APIs that meet and ideally exceed usability, access, and quality standards, banks can strengthen their relationship with developers and partners. They can establish API innovation hubs, host development hackathons, boot camps, and coordinate regular meetups, for instance. Relationships with the community must be actively solicited and backed up with real use cases and value models for these potential partners, too.

That said, there may be a bit of tension of expanding into an indirect model of delivering services to customers. Historically these institutions have controlled the path to customers through a direct distribution model. So, bank executives may need to overcome internal roadblocks around the idea of delivering data and value through APIs and third parties.

Finally, no bank should go into any of this without a good understanding of the importance of the technology that underpins the participation in Open Banking. Containers, distributed connectivity, and Open APIs based on a micro services architecture create the conditions for software delivery agility. Choosing the right [solution](#) will be critical to supporting the delivery of cloud-native applications that

¹³¹ Bank of International Settlements. <https://www.bis.org/publ/arpdf/ar2019e3.htm>

can be easily connected together and run across multi-cloud infrastructures in an automated fashion.

It's a new era in financial services, and there's no time left for banks to contemplate a move towards Open Banking. Now, it's a matter of how well they will equip themselves to start down that road, and how fast they get going with crafting digital ecosystems.¹³²

4.5. Monetization of Data essential in a data-driven economy

Monetization is one of the key elements that the sustainability of a business must consider for the entire product or service guaranteed. Monetizing means converting an asset into money. In this case, the asset after the conversion of the different API Families is the information that will be exchanged. Monetizing is synonymous with generating a return on an asset that we own or that we have created over time. The API monetization strategy varies according to the company's business model.¹³³

The monetization strategy of API varies depending on the business model of the company. The following table sets forth all possibilities in API monetization: (insert table)

5. Conclusion

Data has taken immense importance in the last years. Consider the amount of data that is being collected worldwide every day, industries are reshaping their activities into a data driven business. The digital transformation of all industries, portent of the fourth industrial revolution, is creating a new kind of economy based on the *datafication* of almost any aspect of human social, political and economic activity as a result of the information generated by the numerous daily routines of digitally connected individuals and technology. The financial services industry is part of this

¹³² Eric Marts, *APIs are not enough – Open Banking is all about building an ecosystem*, RED HAT BLOG (2018), available at: <https://www.redhat.com/en/blog/apis-are-not-enough-%E2%80%93-open-banking-all-about-building-ecosystem>

¹³³ <https://www.mckinsey.com/industries/financial-services/our-insights/monetizing-data-a-new-source-of-value-in-payments>

trend. Embracing the digital revolution and creating the right foundations allow incumbent financial institutions to disrupt their own business model. Hence, financial institutions are creating new businesses within their existing structures that adapt and collaborate to meet the challenges of digital transformation and make better use, faster, of their enduring source of competitive advantage – their own customer insight. Open banking and banking as a service are emerging as new forms of intermediation in the financial system. They refer to the use of open Application Programming Interfaces that enable third parties to build applications and services around a financial institution. The use of open banking schemes represents a new form of intersection between data and finance, which is changing the way traditional products, services and customer experience traditionally work in the financial sector. This new structure for financial intermediation has positive and negative externalities that regulators should take into account when promoting or regulating open banking. This paper explains what open banking foundations and what it exactly entails. It also explores the benefits and risks that open banking portraits for the financial services industry and analyses from a comparative perspective the different approaches financial, data privacy and competition regulators have implemented to boost open banking phenom in the financial services industry. Finally, we provide some policy recommendations regarding open banking regulation since the same regulatory frame should not apply to all jurisdictions. A one size fits all approach could be detrimental for the development of innovation in this industry.

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