MASTER OF PUBLIC POLICY
CAPSTONE PROJECT

Adopting Open Banking in Canada: An Analysis of Current Global Frameworks

Submitted by:

Andrew Taylor-Kerr

Approved by Supervisor:

Dr. Eugene Beaulieu
September 14, 2020

Submitted in fulfillment of the requirements of PPOL 623 and completion of the requirements for the Master of Public Policy degree

THE SCHOOL OF PUBLIC POLICY

Acknowledgements

I would like to thank Dr. Eugene Beaulieu for his support and mentorship throughout the completion of this capstone. I would also like to thank ATB Brightside for giving me the opportunity to work with them on this project and all the support that they gave throughout the project.

Table of Contents

Glossary of Terms and Acronyms:

ACOB	Advisory Committee on Open Banking
API	Application Program Interfaces
BIS	Bank for International Settlements
BOC	Bank of Canada
BOE	Bank of England
BOI	Bank of Israel
CBC	Competition Bureau Canada
CDR	Consumer Data Right
CMA	Competition and Market Authority
CSA	Canadian Securities Administration
CSBS	Conference of State Bank Supervisors
DLT	Distributed ledger technology
EC	European Commission
ECB	European Central Bank
EP	European Parliament
EU	European Union
FCA	Financial Conduct Authority
FDX	Financial Data Exchange
FRBSF	Federal Reserve Bank of San Francisco
FSA	Financial Service Authority
FSB	Financial Stability Board
FSI	Financial Stability Institute
FSOC	Financial Stability Oversight Council
GAO	U.S. Government Accountability Office
GDPR	General Data Protection Regulation
GFR	Great Financial Recession
HKMA	Hong Kong Market Authority
IMF	International Monetary Fund
MSA	Monetary Authority of Singapore
OBIE	Open Banking Implementation Authority
OCC	Offices of the Comptroller of the Currency
OECD	Organization for Economic Cooperation and Development
OSC	Ontario Securities Commission
PSD2	Payment and Services Directive II
SME	Small and Medium Enterprises
TPP	Third Party Providers
U.K.	United Kingdom
U.S.	United States
USDT	United States Department of the Treasury
WBG	World Bank Group
WEF	World Economic Forum

Executive Summary

Financial technology or fintech is a rapidly evolving and disruptive development within the financial sector. New technologies arising from fintech innovations are changing how consumers access and utilize financial services while also allowing new fintech firms to compete within the financial sector. As fintech innovations proliferate throughout the financial sector benefits are being seen globally from growing financial inclusion, increased access to capital for small and medium enterprises and improved operational efficiencies for financial firms.

Developments from fintech innovations do come with potential drawbacks that regulators are working to address. Fintech has the potential to adversely affect banking sector stability and presents increased cyber-attack risks that adversely affect firms and consumers, requiring regulators to adapt in response to these issues. One regulatory response that has gained traction globally for its ability to harness fintech competition and innovation while maintaining a more secure and stable financial system is that of open banking. Open banking is a regulatory approach that allows consumers to opt in and opt out of sharing their personal financial data with financial firms. Open banking also creates opportunities for more secure transfers of personal financial data by discouraging a data collection practice known as 'screen-scrapping', currently utilized by fintech firms, by allowing them to collect personal financial data through more secure application programming interfaces (API). With the permission of the consumer open banking frameworks usually obligate firms to transfer personal financial data via API to another firm who then utilize that data to develop consumer-centric products for customers.

Canada, praised globally for the security and stability of its financial system, has been slow in developing an open banking framework and is now at risk of being left behind jurisdictions that have chosen to harness the competition, cyber-security and innovation advantages open banking can bring. To aid Canada in developing an effective open banking framework this capstone examines the regulatory approaches to open banking that have been developed in several jurisdictions including the U.S. and EU. A comparative analysis is conducted to identify what aspects of current regulatory approaches to open banking Canada can utilize in developing its own successful open banking framework. It is concluded that Canada should build on the strengths of its secure and stable financial system to become a 'fast follower' in developing an open banking framework that will enable it to attract further fintech investment and transform itself into a global leader in fintech innovation. Based on the comparative analysis of open banking frameworks several jurisdictions have developed the following recommendations are made to ensure Canada's prospective open banking framework will enable it to become a global fintech leader:

1. Create an open banking lead to oversee and coordinate the creation and implementation of Canada's open banking framework.
2. Incorporate competition in Canada's financial regulators mandates
3. Harmonize regulatory efforts to avoid regulatory fragmentation
4. Take international and market development into consideration when developing API standards
5. Include data reciprocity in Canada's open banking framework
6. Take sectoral interoperability into consideration when developing an open banking framework

Introduction

The digital revolution has disrupted many traditional industries and the financial sector is no exception. Financial technology or fintech is changing the playing field in the financial industry by increasing competition, making banking more efficient and providing greater access to financial services for individuals and firms (WEF 2017). Fintech is also raising new concerns about the possible negative effects it may have on the overall stability and security of the financial sector (WEF 2017). In response regulators and policymakers are adapting their regulatory frameworks to enhance the potential benefits and mitigate potential consequences fintech innovations pose (Clements 2019a; FSB 2017). This regulatory response is essential as fintech continues to reshape the financial sector across the globe by changing the way financial services are accessed and utilized by firms and individuals (OECD 2020).

Fintech is loosely defined by the OECD (2020) as the use of innovative and automation technology to provide financial services. With that broad definition in place it becomes apparent fintech has the potential to affect every aspect of the financial sector through the creation of new financial platforms, digital payment methods, cryptocurrencies, digital ledger technology, artificial intelligence and other current and future digital technologies (Clements 2019a). Fintech is not a new phenomenon, as previous technological advances like credit cards and online banking are earlier iterations of fintech that have immensely impacted how people utilized financial services in the past (Desai 2015). What is different now is the immense variety and sheer number of technologies that are being introduced in the financial sector at a much higher rate then in the past (OECD 2020; Muhleisen 2018; Desai 2015). Fintech's growing ability to impact change has increased largely because increased smartphone use, and internet access globally have provided the opportunity for individuals and firms to access financial services anywhere and anytime (OECD 2020).

Fintech provides opportunities for increased competition and efficiency within the financial sector and because of this it is attracting large amounts of investment globally. In 2019 worldwide investment in fintech reached $135.7 billion USD over 2,693 deals (KPMG 2020). The easier access to financial services fintech provides is also showing potential social benefits with millions of previously unbanked and underbanked citizens and firms globally now able to better access the financial services sector (OECD 2020). In Canada there is initial evidence that fintech is providing small and medium enterprises (SME) access to capital that they were previously struggled to obtain from incumbent institutions (BOC 2019). Further, fintech is enhancing customer choice by lowering switching costs and increasing financial product choice (Clements 2019a).

Global regulators, think tanks, and central banks have all highlighted potential increased interconnectivity, money laundering and cybersecurity risks fintech could pose for the global financial system (FSB 2017). These risks become heightened by the fact that fintech activities don't necessarily fit well within current regulatory frameworks, posing challenges over who and how their activities should be regulated (Clements 2019a; FSB 2017). Big tech companies like Apple, Amazon, Alibaba, Tencent and Google are also entering the financial market with fintech products that compete directly with incumbent financial institutions in their most profitable lines of business (FSB 2017; McKinsey 2019; OECD 2020). Lastly, how customers personal data is accessed, stored and used by financial firms is increasingly becoming an important question for policymakers and financial institutions to address (Canada 2019; USDT 2018; Australia 2017; FSB 2017).

Balancing the needs between the opportunities and challenges of fintech is essential for Canada's financial sector to remain successful and secure. The challenge lies in finding regulatory approaches that maintain a stable secure financial sector with regulations that do not stifle the economic potential of fintech (OECD 2020, Pierce 2018, Chiu 2016). A regulatory approach that is attracting global attention for its abilities to unlock innovation while increasing security and consumer benefits is that of open banking (Canada 2020a). Open banking, as defined by Department of Finance Canada (Canada 2019), is a regulatory framework that allows businesses and individuals to authorize third party financial service providers to access their financial data through secure channels. By allowing consumers to control the sharing and use of their banking data, open banking frameworks look to increase competition and innovation by giving more financial industry players access to consumer data while protecting consumer data security (Canada 2019).

Canada has begun a second round of consultations as to what a possible open banking framework may look like and is looking to learn from open banking policies developed by other jurisdictions. This capstone looks to examine fintech's potential impacts within the financial system and examine how Canada can best develop an open banking framework that will help it to become a global fintech leader. The next section provides a background on fintech, its adoption levels globally, impacts on financial sector competition and implications for financial sector stability and security. The section following that examines what open banking is and why it is being utilized by regulators as a tool to foster innovation and improve financial sector security and stability. Open banking developments in the European Union (EU) and the United States (U.S.) along with relevant open banking developments from other jurisdictions are then examined along with Canada's current fintech regulatory ecosystem and current progress on open banking.

A comparative analysis is then conducted on the open banking policies undertaken in all jurisdictions evaluating them on their ability to promote innovation while maintaining a secure and stable banking sector. The analysis finds that in order to maintain its lauded status as a secure and stable financial system Canada needs to adopt an open banking framework that will enable it to become a global fintech innovation leader and not fall behind competitively other jurisdictions. Based on the analysis conducted recommendations are given to create an open banking framework implementation entity, incorporate competition in financial regulator mandates, increasing regulatory harmonization, taking international consideration into account when developing API standards, including data reciprocity in regulatory development, and design a framework with future sectoral interoperability in mind during framework development. Lastly, it is concluded that if these recommendations are incorporated Canada can continue to maintain its globally lauded stable and secure financial system status while also becoming a global fintech innovation leader.

Background

Fintech, despite current media attention and excitement around its revolutionary nature, is not a new phenomenon. The OECD (2020) definition of fintech being the use of innovative and automation technologies in the financial sector broadly covers products we currently use daily. Products developed in the previous century like credit cards (1950s), automated teller machines (1960s), electronic stock trading (1970s) and e-commerce platforms (1990s) are all evolutions of fintech (Desai 2015). What is different presently is the rate and pace of potential change is accelerating in the digital revolution we are currently experiencing. Factors including the proliferation of the internet, mobile phones and computers globally supported by the development of big data and artificial intelligence technologies are all contributing immensely to the increasing speed and proliferation of fintech innovations globally (Muhleisen 2018).

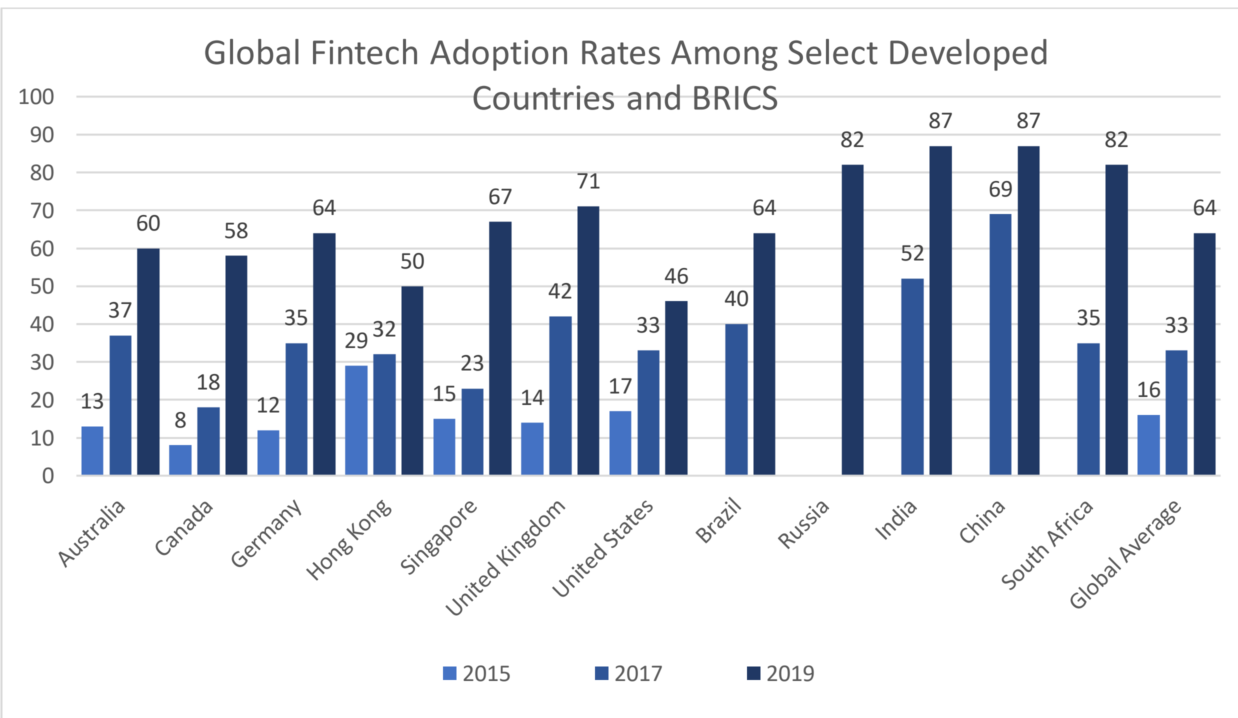
These developments are leading to large and growing investments globally in fintech. The United States and Europe in 2019 attracted the majority share of global fintech investment according to KPMG's (2020) pulse of fintech report with firms in each region attracting $59.8 and $58.1 billion USD in fintech investment respectively. Europe and the U.S. combined accounted for approximately 87% of total global fintech investment in 2019 (KPMG 2020). Investment is also growing in other regions as well with smaller but significant investments seen in Asia, Africa and Latin America (KPMG 2020).

Developing region fintech investments are smaller in size than those seen in Europe and the U.S.. The value of investment however, may not be the determining factor of fintech's economic importance in each region, as although developed countries are attracting overall higher gross amounts of fintech investment, fintech firms and innovation in developing countries are proving to be of a higher relative economic importance (Frost 2020; KPMG 2020). Fintech in

Asia and Africa's developing regions has become a facilitator for positive change by providing financial services to previously unbanked populations. Between 2014 and 2017 mobile phone proliferation combined with mobile fintech innovations saw the global banked population rise by 515 million adults (WBG 2017, 2). As a result, 69% of the global adult population is now 'banked' and the World Bank Group believes by the end of 2020 it is an achievable goal to bring financial inclusion to the remaining 1.7 billion adults globally (WBG 2017, 2,5). Fintech is enabling the addition of these populations to the global financial system which will have a net positive impact locally and globally as higher financial inclusion is linked to economic growth and prosperity (Sahay et al. 2015).

Fintech Adoption

Figure 1: Compares Ernst and Young (EY) global fintech adoption rate survey results among developed countries and developing BRICS with global fintech adoption averages.



(Source: EY 2016, EY 2017, EY 2019)

The adoption of fintech globally has not been universal. As seen in Figure 1, adoption rates in developed and the developing countries vary with higher adoption rates present in developing countries (EY 2019). The lower fintech adoption rates among developed countries may be due to developed countries having established strong financial institutions with high switching costs (OECD 2020). Whereas developing nations are seeing individuals previously unable to access traditional banking systems come into the financial system for the first-time thanks largely to the easier and cheaper accessibility of financial services being created by fintech innovations (OECD 2020). Developing countries, who typically did not have accessible financial institutions prior to the arrival of recent fintech innovations, are able to leapfrog into the financial digital age faster then developed countries who had already established accessible financial institutions (OECD 2020; EY 2019). Partially explaining the higher fintech adoption rates found among developing BRICS countries in Figure 1.

Fintech adoption is driven in part by the growth of fintech in areas where the financial sector is not meeting demand (Frost 2020). Innovations that can meet customer demand by being practical to use, voluntary to subscribe to and provide increased customer experience are more likely to be adopted by consumers (Moufakkir and Qmichchou 2020). For example, in developing regions like Africa, Asia, and Latin America fintech firms are meeting unmet financial sector demand by providing basic banking, remittances, means of payment, and money transfer services to more people at lower costs then traditional banks (Frost 2020). In developed countries some examples of fintech adoption can be found in firms providing better access to services and capital for small and medium enterprises (SMEs) and cheaper investment products for consumers (OECD 2020; Canada 2017). A key trend seen in Figure 1 is that rates of adoption have steadily increased globally in both developed and developing countries in the past 5 years and this trend is expected to continue (EY 2019). In general, fintech has been most successful in finding adopters where banking sectors are relatively uncompetitive with high profit margins allowing fintech entrants to competitively enter the market by building products that increase efficiency and lower the overall cost of accessing financial services for consumers (Frost 2020

Whether fintech is adopted by users or not is also affected by their trust in the firms providing the services. EY's (2019) adoption index found that non-adopters second most common reason for not adopting fintech was having higher levels of trust in incumbents. Incumbents have a distinct advantage in trust development in that they have already established historical customer relationships and trust from consumers (Canada 2017; OECD 2020). However, the advantage of historical customer relations is not paramount as consumer and incumbents who chose not to adapt and incorporate new fintech innovations may find a declining customer base as a result (FSB 2017). A warning of the potential weakness of the consumer-bank relationship was highlighted in a 2013 Viacom survey that found 71% of millennials would rather go to the dentist then listen to what their bank was saying and 73% would be more interested in financial offerings from big tech and fintech firms than those from traditional banks (Viacom 2013).

Fintech's growing adoption is being aided by an increase in the population generally of comfort with managing all aspects of their life digitally (Moufakkir and Qmichchou 2020; EY 2019; EY 2017). Consumers have become more accustomed to customer centred products on digital platforms in other industries and now demand similar ease of use characteristics be included in their interaction with financial products (WEF 2017). In response to these expectations incumbents have begun offering their own fintech services which are believed to be behind the large increase between EY's 2017 and 2019 adoption survey results (EY 2019).

Younger individuals have generally been assumed to be more likely to adopt fintech products (Frost 2020; EY 2016). This may not be inherently true however as there is evidence that older cohorts may be attracted to different types of fintech products and it is the kinds of products available that affect fintech adoption rates more then age (Frost 2020; EY 2016). As more fintech products targeting older consumers are developed in areas like estate planning and personal financial management, adoption rates among older cohorts are expected to increase over time (Frost 2020).

Fintech adoption is changing the way SME's do business and fintech adoption rates among SME's are seeing similar trends to those of individuals. As with consumer fintech adoption, emerging markets have the advantage when it comes to services offered by fintech providers as their less sophisticated financial structures allow them to build services from the ground up rather then mainly providing alternative products to incumbents (EY 2019). EYs (2019, 5) SME fintech adoption survey which assessed SME adoption of banking and payments, financial management, financing and insurance, found that globally 25% of SME's had used fintech services in the previous six months to conduct business in all four financial service categories. Full adoption of fintech by SMEs is expected to experience a significant increase in the near future with 22% of those classified as non-adopters by the EY survey already using fintech products in 3 of the 4 financial service categories assessed (EY 2019, 5).

Fintech firms are increasingly etching out a market for themselves in SME financial services which has been underserved by traditional institutions (EY 2019). EY's 2019 global adoption index found among its survey respondents that SME's are accessing fintech services at increasing rates as they are attracted to technology solutions that increase their efficiency and provide lower costs (EY 2019). The Competition Bureau Canada (CBC) (2017) identified fintech as a key source of funding for SMEs, filling the gap left following the tightening of credit markets post 2008 great financial recession (GFR) largely due to increased risk aversion by traditional financial institutions.

Sources such as crowd funding and peer to peer (P2P) loan platforms are decreasing the cost of borrowing for SMEs by giving them access to capital and reducing their need to rely on sources like personal financing, personal savings, loans from family/friends and credit cards (Canada 2017; BOC 2019). Although fintech credit still represents a small portion of total global credit even in countries with high adoption rates the amount lent is growing (OECD 2020). In the U.S. and United Kingdom (U.K.) fintech lending platforms now account for 15.1% and 6.3% respectively of total SME lending in those jurisdictions (Frost 2020, 2). Sensing opportunity, big tech players like Amazon and Shopify have also begun moving into the traditional territory of banks and are now offering capital lending and other financial services to SMEs (OECD 2020, O'Kane 2020).

The growing importance of fintech to SME's business models is being recognized by regulators globally. Israel, when developing its national digital program, identified fintech service access and adoption by SMEs as an opportunity with the potential to increase SME productivity by as much as 9% nationally (Israel 2017, 51). Adoption rates among SME's and individuals are both expected to continue to grow and are likely to grow faster then predicted thanks to the Covid-19 pandemic increasing the use of digital products. For example, Canada's Shopify, an e-commerce company specializing in digital retail platforms, saw a 97% increase in second quarter revenue year over year as retailers rushed to access digital markets during the ongoing global pandemic (O'Kane 2020). Fintech robo-advisor/investment platforms like

Wealthsimple, and Wealthbar have also seen their number of clients grow significantly during the pandemic (Alini 2020).

Fintech and Financial Sector Competition:

Fintech adoption has been fostered by the addition of new competitors and innovative technologies within the financial sector (OECD 2020; EY 2019). The implications increased financial sector competition will have on incumbents and overall financial sector stability from fintech entrants are an ongoing development with the full implications not fully realized yet (OECD 2020; FSB 2017; WEF 2017). Much of fintechs success depends on how regulators choose to set regulatory guardrails to enable innovation through competition while maintaining sector stability (Canada 2017). Enabling competition can be good for both consumers and businesses throughout the economy as it forces firms to keep prices low, search for efficiencies and continuously innovate to be successful (Canada 2017). Fintech firms do not exclusively own innovation within the financial sector and must also themselves compete with incumbents and big tech entrants within the financial sector.

Fintech firms compete head on with incumbents with the sizeable advantage of having lower administrative costs due to not having physical infrastructure or legacy systems to support and maintain (OECD 2020). Although initial investment in fintech innovations may require a higher initial investment they are able to significantly reduce their costs per new customer to provide cheaper services (Philippon 2016). Lower costs per new customer allow fintech firms to reduce the cost of the financial service's they provide below that of incumbents (Frost 2020; Philippon 2016). This is particularly true in regions where financial services and products costs remain relatively high (Frost 2020; Philippon 2016). The low cost per new customer advantage fintech firms have is particularly pronounced in developing economies and is partly why fintech adoption has happened relatively quickly there in comparison to developed countries (Frost 2020).

Despite their efficiency advantages, the ability of fintech start ups to take incumbents head on may have been overestimated in the near term. Although fintech firms have been able to attract investment and drive innovation they have yet to capture a large market in developed countries raising doubts on their ability to directly take on incumbents in those jurisdictions (FSB 2020; WEF 2017). This may partly be attributed to high switching costs for customers as well as a rapid response from incumbents who have moved quickly to acquire or develop innovative technologies themselves (WEF 2017; Clements 2019a; OECD 2020).

Incumbents, rather then develop technology in house, often look to partner or buy fintech start-ups to obtain access to their technology and integrate the services they've developed into their own platforms (OECD 2020; KPMG 2020; Watson and Laplante 2017). Incumbent institutions also have a historical customer trust and a customer financial data advantage over fintech firms they can leverage to retain customers (OECD 2020) The customer trust factor incumbents have may erode over time however, as fintech firms become better established and typically focus on customer satisfaction activities to obtain new customers and build trust (OECD 2020; Canada 2017). Fintech firms are also managing to overcome some of their customer financial data disadvantage by utilizing the controversial practice of screen-scrapping to obtain data from incumbents and develop customer centric products (Canada 2019).

The problem for fintech firms competing on their own may be that entrance costs into the financial sector are too high (Canada 2017). Start-ups face regulatory hurdles in the sense that regulations have often been designed for large incumbents and regulatory compliance burdens do not necessarily reflect the actual level of financial system risk fintech start-ups pose in comparison to large incumbent financial firms (Gill 2019; Canada 2017). Fintech start ups also face barriers in that there is a lack of regulatory clarity for the activities they undertake, and jurisdictional regulatory nuances make it difficult for new entrants with limited resources to manage the compliance burdens they face (Canada 2017; USDT 2018). To get around these issues fintech firms often enter into partnerships with incumbent banks to gain access to the incumbent's expertise in navigating regulatory structures (Clements 2019a). Many fintech firms do still manage to enter the market without incumbent partnerships in place especially when they are supported by regulatory frameworks that aid their entrance into the market (OECD 2020; Clements 2019a; Canada 2017).

Policymakers have responded to the barriers faced by implementing policies initiatives such as regulatory sandboxes, innovation hubs, and regulation harmonization (Clements 2019a; USDT 2018; Canada 2017). Regulatory sandboxes aim to reduce regulatory burden by basing their compliance obligations on the risks posed by a firm's activities (Clements 2019a). Regulatory sandboxes allow firms to compete on a different level than incumbents and reduce their initial administrative costs by allowing them to comply with fewer regulatory compliance measures then what is required of a full bank (Clements 2019a). As a firm increases in size and importance typically the level of regulatory burden within the sandbox also increases (Clements 2019a). Innovation hubs reduce administrative and search costs by connecting firms to regulators and other industry players (Canada 2017). They help fintech's to build partnerships and navigate regulatory hurdles to enable them to bring their products to market (Canada 2017). Lastly, interjurisdictional regulators at both national and subnational levels have created agreements to ensure entrance and administrative costs are lowered by harmonizing regulations between them for firms to operate within (USDT 2018; CSA 2020; Canada 2017).

Policymakers, by introducing regulatory interventions that help to level the playing field between incumbents and fintech entrants are fostering more competitive financial sectors globally. Increased financial sector competition is expected to have many positive effects with competition's potential to increase financial inclusion in underbanked market segments, increased financial sector efficiency, increased product choice and decreased consumer costs (Clements 2019a). Jurisdictions and firms that do not embrace the fintech revolution are expected to see their productivity and competitiveness decline compared to those who embrace it over the medium to long term (Shield 2018; Canada 2017). The entrance of fintech firms and products into the financial sector does bring potential risks to the overall stability and security of the financial sector and these concerns must be mitigated while allowing for competition induced innovation to thrive (FSI 2020; FSB 2017).

Financial Sector Stability and Security

Since the 2008 GFR financial regulators have been especially focused on maintaining overall financial sector stability to prevent another financial recession (USDT 2018; Canada 2017). Fintech while bringing immense positive potential also brings potential systemic risks to the stability and security of the financial sector globally (FSB 2017). Many well known potential market failures including adverse selection in lending, deposit liquidity mismatches, moral hazard of large or too big to fail firms, interconnectedness of financial institutions and information asymmetry are present in fintech activities just as they are in other areas of the financial sector (Frost 2020). Digitization of financial services also raises the risk of potential cyberattacks and consumer risks from the use of their personal data (Clements 2019a; GAO 2018; FSB 2017). These risks create a need among policymakers to ensure protections are in place to maintain confidence in a safe and secure financial system.

Fintech and big tech's entrance into the financial industry has largely occurred in areas with high profitability for banks such as the payments, deposits, lending and investments (OECD 2020). For example, big tech firms have entered the financial space mostly in the payments and lending areas of finance eating at potential profits for banks in those areas (OECD 2020). The risk is that reduced profitability as a result of competition with more efficient fintech platforms has the potential to lead incumbents to partake in riskier behaviours to recover profits (FSB 2017). Another risk is found in non-incumbent financial service providers choosing not to provide some financial services such as deposits to avoid the costs of regulatory burdens faced by incumbent banks (OECD 2020; FSB 2017). This leads to higher levels of financial activities taking place in the shadow banking sector outside of regulators current sectoral oversight mandates leading to higher potential systemic stability risks (FSB 2017; Sahay et al. 2015).

Regulators focus on stability post the GFR are partially responsible for creating the conditions that allowed for fintech loan providers to thrive (Canada 2017). Since the GFR SME's have found it harder to obtain capital from incumbent banks creating the market for fintech loan providers (FSB 2017; Canada 2017). Fintech firms have been key in the growth of P2P loans globally particularly for SME's and micro SME loans, sometimes to individuals/firms with no credit history, in the shadow banking sector (FSB 2017).

Non-bank loans saw their value increase compared to bank loans between 2012 and 2017 (FSB 2017). This is of concern as shadow banking sector activities played an important part as one of the causes of the GFR (Bordo, Redish and Rockoff 2015). Despite increased activity and the potential risk from fintech lending platforms has remained small. In 2017 total fintech lending assets accounted for 545 billion USD which although not an insignificant amount works out to be only 0.14% of global financial system assets (Frost 2020, 4). This doesn't mean policymakers can dismiss or be complacent as the number of loans provided by fintech providers is expected to continue to grow and pose risks via potential contagion effects that may occur when fintech firms fail (FSB 2017).

New cooperation between financial regulators and firms conducting financial activities has been identified as an essential for regulators as fintech is expected to increase the interconnectedness of the global financial system (Frost 2020; OECD 2020; FSB 2017). Cooperation will be essential as financial risks associated with fintech have not yet been fully assessed as many fintech technologies and activities have not yet been tested over a full business cycle (Frost 2017; FSB 2017). The establishment of big tech and fintech players also pose risks in that as they grow, they may potentially become systemically important institutions within the global financial sector increasing the potential of moral hazard occurring (FSB 2017) This could lead to increased risk taking by these firms if they become too big to fail (FSB 2017).

Data collection and monitoring by regulators will need to be expanded to include potential risks posed by big tech and fintech activities (IMF 2019; FSB 2017). This will be essential for providing regulators the ability to detect potential risks early and apply interventions if needed (IMF 2019; FSB 2017). Part of the issue is that not all activities fintech firms are apart of are currently observable by regulators current data collection initiatives (FSB 2017). Potential data collection points do exist however, and policy tools like sandboxes, and innovation hubs designed to stimulate fintech growth, can serve important dual purposes as points of contact for regulators to obtain information about fintech firm activities (FSB 2017).

Interactions with third party providers (TPP) providing services to banks and fintech's also come with their own benefits and risks. An example of TPP operational risk can be found in developments surrounding the European fintech firm Wirecard. Wirecard was a payment process provider utilized by multiple fintech firms to provide payment services to their customers (Finextra 2020). When Wirecard became insolvent in June 2020 the U.K. Financial Conduct Authority (FCA) froze their operations (Finextra 2020). As a result customers utilizing financial services reliant on Wirecard's products lost their ability to access the funds in their accounts and their ability to make payments (Finextra 2020). Firms who had outsourced operational functions to Wirecard were left scrambling to find alternative providers and restore their customers access to their platforms (Finextra 2020). The impact of Wirecard's insolvency on other financial firms demonstrates how reliance on TPP services for platform operations poses potential operational risks for firms and their customers.

Besides insolvency cyber attacks on TPP pose risks to financial firms connected to one another (FSB 2017). A successful cyber attack on one firm may grant the attackers access to the systems of other firms they do business with, amplifying the spread of the attack from one firm to many (McKenna 2018). Further, activities undertaken by TPP may be outside the purview of regulators and the TPP may not understand the potential effects their business decisions have on broader financial stability and consumer protection (McKenna 2018). Meaning that events occurring outside of the financial sector, like a TPP cloud server going down for unexpected maintenance, could have the potential to have far reaching implications within the financial sector (FSB 2017). Fintech products themselves are also becoming increasingly important as core functions of the financial system. In a recent development the Bank of Canada's (BOC) added Interac's e-transfer payment system to its list of 'prominent payment systems' and now considers it critical to maintaining financial system function and stability (Zochodne 2020a).

As financial firms rely more heavily on TPP to provide data and cloud computing services the risks from cyber attacks will grow (OECD 2020; FSB 2017). Regulators will have an increasing challenge to manage these concerns as they evolve. Cyber risk has broadened the complexity of what safeguards are required within the financial sector. For example, even with capital requirements in place to address certain operational risks, capital safeguards alone are not enough to restore operations if a financial institution suffers a cyber attack incident (FSB 2017, 29). Work is currently underway in most jurisdictions to enhance cybersecurity by both firms and policymakers. The specifics of these efforts are not necessarily shared publicly for obvious security reasons (FSB 2017).

Fintech firm activities also create several risks for consumers. If consumers choose to utilize fintech providers whose services are outside of regulatory safety nets like deposit insurance, there is potential that if those fintech firms become insolvent they could lose their money or at a minimum temporarily lose access to their money. Using the previous Wirecard example consumers lost access temporarily to their funds when the U.K.s FCA froze customer accounts when the firm went into insolvency (Finextra 2020). In another example a lack of oversight and controls at e-wallet provider Quadriga CX allowed for customers to be defrauded of $169 million CAD (Van Horne 2020). Though insolvencies and fraud are not unique to fintech, these examples portray the potential negative risks fintech firms can pose for consumers.

Consumer data protection also becomes a concern with the adoption of fintech. As banks adopt fintech as part of their internal processes customer data vulnerability increases with the risk of cyber attack (Clements 2019a). A data collection practice known as screen scrapping has been identified as a major creator of cyber security risks and potential fraud within the financial sector (Canada 2019; BIS 2019; USDT 2018). Screen-scraping creates risk from TPP getting consumers to provide their account log in credentials to access fintech services (USDT 2018). Consumers may be unaware that they are not directly logging into their financial institution and are providing their credentials to a TPP (USDT 2018). This practice lacks informed consent on the part of the consumer and the financial institution involved in the data accessing process on behalf of the consumer by a TPP and exposes all parties involved in the process to higher levels of cyber risk (USDT 2018). TPP use the data collected from screen-scraping to build consumer financial products, but the level of risk associated with the practice is widely recognized by regulators, banks and TPP as a sectoral problem (BIS 2019). The issue for fintech's is that despite wide understanding of the issue incumbents have remained reluctant to share customer data leaving fintech firms largely dependant on screen scrapping for product development (USDT 2018).

Fintech: A Solution for Some Financial Sector Problems:

Fintech, with its rapid growth and wide array of product potential, has proven that it's not just an incidental development but a permanent reality of the financial sector requiring policymakers to address the challenges it brings (Deloitte 2017). Fintech innovations can be apart of the solution to some of the problems they create. A potential positive impact of fintech on financial sector stability can be seen in the deposits added to the financial system as result of higher financial inclusion in jurisdictions that have had significant decreases in their previously large unbanked populations (Sahay et al. 2015). The positive impact will vary though, with states with stronger regulatory institutions benefiting the most from higher financial inclusion (Sahay et al. 2015).

Firms themselves will also see stability benefits from incorporating fintech into their systems. An IMF (2020) study found that firms who more heavily adopted technology prior to the 2008 GFR faired better during the crisis then those who had not. Loans sold by high technology adopter firms were of higher quality then their peers even during the crisis (IMF

2020). Firms that chose not to adopt technology experienced a heavy disadvantage in maintaining their stability during the GFR (IMF 2020). This phenomenon appears to be correlated with technology investments providing adopter firms with the ability to better assess data related to lending risk (IMF 2020).

As banks digitize there will be opportunities for fintech firms to provide solutions for incumbents to manage, use and secure the data within their systems (WEF 2017). Distributed ledger technology (DLT), the programming backbone of digital currency bitcoin, has shown potential to increase overall transparency and security of transactions within the financial system (Clements 2019a). Fintech innovators are also finding opportunities in developing financial regulatory technology or "regtech" that enhance regulator oversight capabilities and reduce overall costs for both regulators and firms (FSB 2017).

Increased efficiencies from fintech will allow incumbent banks to experience increased profitability in many existing segments of their banking operations and a general reduction in administrative costs (OECD 2020). These lower costs and the potential for having a more diverse product range mean fintech innovations will likely enhance the revenue making opportunities for banks (OECD 2020; BOE 2020). The addition of new fintech entrants into the market will also have positive implications for financial sector stability. During the GFR many banks had become too big to fail and taken on riskier activities assuming they will be bailed out by government (BOE 2020). With new fintech entrants entering the financial system, competition for customers will increase between firms and it becomes less likely that any one institution becomes to big (BOE 2020). In turn banks take fewer risks as their smaller size means there is a lower chance of them being bailed out if they fail largely because their risk to the market if they fail will have smaller implications on overall financial sector stability (BOE 2020).

Like firms, jurisdictions that do not incorporate fintech and the competition it brings as part of their systems risk falling behind globally which in and of itself could adversely affect financial sector stability over the long term (FSB 2017). The development of data monetization is expected to be increasingly important for company product differentiation and it has become an essential question for regulators to answer how data is accessed, used and stored by firms (WEF 2017). There is also a pressing need to address cyber security and consumer data protection concerns arising from fintech. To meet these needs the regulatory approach that is globally showing promise to address both cyber security and consumer data concerns while increasing financial sector innovation and competition is that of open banking (Canada 2019).

Open Banking

Open banking is a regulatory approach wherein the individual and business consumers authorize financial services providers to access their financial transactions data using secure online channels (Canada 2019). At the core of an open banking frameworks is consumer consent for the sharing of personal financial data with firms they trust (Canada 2019). The right of consumers to share their financial data typically coincides with the right to opt out of sharing their data at anytime if they no longer want it to be shared (Canada 2019). The data sharing takes place between firms via secure Application Programming Interfaces (API) whose specifications are either developed by industry or mandated by regulators (BIS 2019; Canada 2019). The firms granted data access by consumers can then utilize the customer data they've obtained to build products and services that provide more efficient payment methods, greater financial transparency options, new and improved account services and market tailored products to consumers (BIS 2019; Canada 2019).

Open banking increases competition in data driven banking services by providing a mechanism to unlock personal financial data access for banks and other financial service providers. The intention being that the financial data obtained through open banking regulations will make it easier and safer to develop consumer-oriented products that compete directly in the financial market for customers (OECD 2020; McKinsey 2019). Fintech and big tech firms benefit immensely from open banking regulations as they provide increased secure access to data they previously accessed through the unsecure practice of screen-scrapping (OECD 2020). Incumbent banks aren't left behind by open banking as they can also benefit depending on the investments, they make in monetizing personal financial data (OECD 2020). Incumbents have an advantage in that they are already in possession of large financial datasets that they can leverage to develop personalized and innovative products to help them keep their current customers and potentially attract new customers (Deloitte 2017a). Meanwhile business and individual consumers benefit from increased product choice and financial mobility (McKinsey 2019).

At the centre of open banking frameworks is consumer trust and protection of their personal financial data (Canada 2019; Australia 2017). With consumers becoming more accustomed to living their life digitally evidence shows that consumers are mostly comfortable with the secure sharing of their data to obtain better offers from their financial service providers (EY 2019). When asked to what extent they would be comfortable having their main bank securely share their company's financial data with other organizations if it meant they would receive better offers, 89% of adopters (individuals who utilize two or more types of fintech services) and 50% of non-adopters said they would be willing to share their data with fintech challenger firms (EY 2019, 29). To ensure this trust remains strong and develops further, jurisdictions with open banking frameworks often outline what data can be collected, how data can be used and how it must be securely stored by firms (BIS 2019). Open banking frameworks also often include licensing schemes for TPP and banks to help regulators to monitor and ensure the institutions have proper safeguards in place for consumers (Deloitte 2020; BIS 2019).

Open banking attempts to decrease potential cyber risks associated with fintech activities by moving the fintech sector away from the use of screen-scraping (BIS 2019; Canada 2019; USDT 2018; FSB 2017). Although it may seem that simply eliminating screen-scraping as a practice is a potential solution to this problem. Doing so would stifle development of data driven financial products, which there is clearly a market for, and so alternative solutions are needed to ensure that safer collection and transmission of consumer financial data occurs (Canada 2019). Open banking frameworks accomplish this by either encouraging or forcing data transfers to take place via API (Canada 2019; USDT 2018). API are sets of programming code that query data, parses responses and sends instructions between one software platform and another (Investopedia 2019). Essentially, API provide secure pipelines between and within firms for the movement of data between applications (Canada 2020a).

API's are not infallible though and are susceptible to potential cyber security issues like any other digital technology (BIS 2019). To address this risk measures are put in place to ensure API's are as secure as possible. API's used in the financial industry typically include designated access and transmission architecture to help ensure data security (BIS 2019). Mechanisms and technology such as "stricter access privileges, authorised end-to-end encryption, authentication mechanisms, vulnerability testing, establishing an audit trail, setting expiration times for tokens, IP whitelisting, firewalls and monitoring cyber incidents related to APIs as part of the overall cyber incident monitoring program" all are used to reduce cybersecurity risks (BIS 2019, 18). Cybersecurity risk from API are more manageable then those from screen-scraping and with the right safeguards in place API are considered the industry standard for securely transferring consumer data within the financial industry (Canada 2020a; BIS 2019; USDT 2018; Australia 2017).

Although regulators and incumbents would like to see a movement away from screen-scraping to more secure API's, fintech firms have reported resistance on the part of banks in obtaining this information (USDT 2018). As a result, fintech firms in these jurisdictions remain dependant on screen scrapping activities (Canada 2019; USDT 2018). This has led policymakers in several jurisdictions to conclude that in order to reduce the use of screen scrapping further intervention are required (BIS 2019; Canada 2019) Regulatory interventions like data transmission standards are utilized within open banking frameworks to mitigate screen-scrapping and enable a transition to using API (BIS 2019; Canada 2019; USDT 2018).

Data sharing regulations in open banking frameworks usually include informed consumer consent requirements (BIS 2019). This is done to ensure the consumer is fully informed as to what their data will be used for and typically these regulations include plain language requirements to help ensure consumers understand how their data will be used (Canada 2020a; BIS 2019; Australia 2017). Frameworks also generally include liability provisions for customer data breaches that are created specifically for open banking or tie into existing rules customer rights laws around personal data (Canada 2020a; BIS 2019). To further protect consumers, clear dispute resolution mechanisms are typically included in open banking frameworks in the form of newly created regulations or existing regulations are adapted to include open banking within their mandates (BIS 2019). Together these components work to protect consumers and engender consumer trust that their data is secure and protected.

Open banking frameworks combine consumer data protections and consent with increased competition open banking to complement the common goal of consumer welfare contained within both policy of these spheres (OECD 2020; Australia 2017). The higher consumer choice and trust that open banking frameworks create have positive effects on fintech adoption in developed countries. EYs 2019 fintech adoption index noted faster then anticipated increases in fintech adoption occured following the implementation of open banking frameworks in several developed countries (EY 2019). The report noted that it is expected that this trend will continue as more and better consumer-oriented products become available as more jurisdictions adopt open banking policies and those that already have them see their financial sectors mature around those policies (EY 2019).

Overall, the increased innovation and competition driven by open banking is expected to expand consumer access to financial products tailored to their needs (Canada 2020a). The potential of open banking is being realized by regulators and there are currently 35 jurisdictions globally who have either developed or are in the process of developing and adopting open banking frameworks (McKinsey 2019, 12). The specifics as to how each jurisdiction chooses to develop and implement open banking frameworks varies between them (Deloitte 2020; BIS 2019). They are tailored to specific jurisdictional considerations such as the specific financial regulatory oversight structure a country has and other financial sector factors distinct to that country (BIS 2019). This gives Canada, who is currently developing its open banking framework, the opportunity to observe how open banking frameworks are being developed and implemented by other jurisdictions and adapt lessons learned from those jurisdictions into the Canadian context.

The European Union and Open Banking

The EU has been the global leader in developing and implementing an open banking framework. Two main factors are behind their move to develop open banking, a lack of competition within its banking sector and growing personal data privacy concerns (OECD 2020; EU 2012). As a result, two separate pieces of legislation, the Payment Services Directive II (PSD2), and General Data Protection Regulation (GDPR), addressing these measures have been developed and implemented within the EU trading block as of 2018 (OECD 2020; Deloitte 2017c). These two pieces of legislation are recognized as foundational to the proliferation of open banking frameworks globally and have largely been recognized as successful in accomplishing their intended goals of increasing financial sector competition and providing personal data protections (OECD 2020).

The EU takes the protection of personal data very seriously so much so that personal data protection rights have been enshrined within its charter of rights. The Charter of Fundamental Rights of the European Union Article 8 gives everyone “the right to the protection of data concerning him or her” (EU 2012). The charter also stipulates that in the hands of governments or corporations “data must be processed fairly for specified purpose” with the consent of the individual (EU 2012). Complementary to that right individuals also have the right to access data that has been collected concerning them as well as the right to rectify that data if they wish (EU 2012). The charter goes so far as to mandate that compliance with “rules shall be subject to control by an independent authority” (EU 2012).

GDPR is the transnational legislation that was created to enforce the personal data rights set out in the EU charter for EU member states (EC 2020). GDPR came into force in 2016 and gave member states a two-year period to codify the act into their own laws before it came into force in 2018 (EC 2020). GDPR harmonized data privacy laws across member states, eliminating the regulatory fragmentation that existed previously with each member state having their own data privacy laws (EC 2020a). The personal data protections afforded to citizens within GDPR are broad in nature, covering all public and private sectors of the EU (EP 2016). It provides specifications for how personal data can be utilized, how consent to collect data must be obtained, enforces mechanisms for consent to be withdrawn and outlines how personal data must be stored (EP 2016). GDPR enables national data protection authorities in the enforcement of data protection measures and allows them to apply corrective measures for violations (EC 2020b; EP 2016).

The other half of the EUs open banking framework, PSD2, was developed with the encouragement of competition within the financial sector in mind (OECD 2020). European banks had been struggling to generate revenue in the low interest rate and higher regulatory compliance environment that has been present since the GFR (Deloitte 2017a). On aggregate European banks had been unable to generate returns above the cost of equity since the GFR and on average where seeing half the returns on tangible equity of their North American counterparts (McKinsey 2019; Deloitte 2017a). A McKinsey (2019) report goes so far as to describe a majority of European banks as ‘wealth destroyers’ within the global financial system. European banks were being pulled down by their sluggish home markets and in need of regulatory intervention (McKinsey 2019; Deloitte 2017a). In response the EU revised its original 2007 Payment Service Directive in 2015 to be more supportive of innovation, encourage competition and prevent the monopolistic behaviours being exhibited by incumbent banks (OECD 2020; ECB 2018).

PSD2 was designed with four goals in mind. The directive looks to create an integrated pan EU payments market, level the playing field for payment service providers, increase the safety and security of payments, and enhance consumer and business protections transnationally within the EU (ECB 2018). PSD2 accomplished these goals by setting out strict customer authentication requirements, eliminating surcharges on consumers for specified payment methods, and providing rules on TPP access to data (ECB 2018). To engender trust in the payments system PSD2 clarified liability rules between banks and TPP and provided consumer protection through enforceable measures in instances of theft or fraud (ECB 2018). PSD2 created regulations that allows TPP to become authorized TPP and forces banks to share consumer-permissioned financial data with these authorised TPP (OECD 2020). PSD2 also sets regulatory technical standards for API's to ensure data transfers are secure between banks and TPP (ECB 2018). PSD2 does not however, establish a common standard API, instead opting to allow for the eventual creation of a market consensus based on one or a few API standards in the future (ECB 2018).

The EU's open banking framework, in its short lifetime since implementation in 2018, has been lauded for being successful in supporting increased competition and protecting consumer data rights (Deloitte 2020; OECD 2020). In 2019 Europe was second globally to only to the U.S. in total fintech investment capital received (KPMG 2020). Europe now sees a fifth of venture capital investment entering the region go to fintech, making the fintech sector the largest receiver of foreign investment capital within the region (Finch Capital and Dealroom.com 2019, 6). Success can also be seen in high fintech adoption rates among some member states. The Netherlands, U.K. and Ireland lead in fintech adoption among developed countries, reflecting in part the rapid development of open banking in Europe (EY 2019). Further success can be found in the U.K. where the total number of financial sector start-ups within the financial sector grew by 65% in 2019 alone (McKinsey 2019, 11).

U.K.: A leader in open banking adoption

The U.K. does not leave the EU common market until Dec 31st, 2020 and as such is still beholden to EU regulations and laws at time of writing (Edgington 2020). The U.K. is one of the few EU member states that has rapidly and fully rolled out its open banking framework and has seen a significant number of new entrants in its financial market as a result (McKinsey 2019). In 2015 the U.K.'s Competition and Market Authority (CMA) released a report on the financial sector that found an overall lack of competition within the U.K. financial sector and made the recommendation that the U.K. pursue competition policies that would make the banks work harder for their customers in order improve overall consumer welfare (OECD 2020; Open Banking 2020a). As part of the measures recommended by the CMA the U.K. made competition enforcement apart of the mandate of their Financial Conduct Authority and created a policy lead for open banking implementation in the form of the aptly named Open Banking Implementation Authority (OBIE) (OECD 2020; Open Banking 2020a).

The OBIE is governed by the CMA and is funded by a collaboration of banks and building societies (Open Banking 2020a). OBIE works to develop common API standards, supports TPP in using open banking standards, create open banking security and messaging standards, manages open banking enrolment by participating firms, and produces guidelines for open banking participants (Open Banking 2020a). The CMA in its 2015 report recommended and has since enforced the participation of its largest banks in the U.K.'s Open Banking Standard and required these banks to make open data available for TPP through open API's by March 2017 (Deloitte 2017a). The CMA chose to differ from the PSD2 in that it mandated the creation of a common standard API by incumbent banks in collaboration with TPP and consumer welfare groups to be used within the U.K. Open Banking system (Deloitte 2017a). Whereas as noted before the EU as chosen to let market consensus eventually form around 1 or several API standards (ECB 2018).

The U.K.'s open banking framework provides an important conduit between financial regulators and market participants in the U.K. working to grow consumer welfare through increased innovation and competition (Open Banking 2020a). Since its inception the participation in the U.K.'s Open Banking Standard has grown immensely. From the initial six banks membership swollen to now include 59 banks and account providing institutions and 181 registered TPP participants (Open Banking 2020b). The U.K. has benefited as a first mover in adopting an open banking framework and has seen an increase in fintech adoption with it now having the second highest fintech adoption rate of developed countries (EY 2019).

Criticisms of PSD2 and GDPR

A criticism of the EUs open banking framework is the lack of data reciprocity between TPP and incumbent banks (Deloitte 2020). While PSD2 mandates that banks provide customer data to authorized TPP free of charge on request, there is no mechanism for banks to request the same of TPP (OECD 2020). GDPR only requires TPP facilitate data transfers to incumbents where it is technically feasible and does not make it a regulatory obligation (OECD 2020). There is also a lack of a timeline within the legislation that determines how quickly TPP are required to respond to these requests (Deloitte 2020a). This leaves incumbent banks at a major disadvantage to TPP, including big tech firms, who gain advantages from nonreciprocal access to valuable data (OECD 2020). The banking sector has been vocal about the unfair disadvantage they face in the current regulatory system, however, when engaged by policymakers incumbent banks have been unable to clearly identify the value they would obtain from such information (Deloitte 2020a). It is clear though that big tech firms are the big winners from the lack of reciprocity in the EU framework as they have the most to gain from accessing consumer data and are well positioned to leverage the data they obtain through utilizing their economies of scale advantages and large existing databases (OECD 2020).

PSD2 legislation has also been criticized for covering too narrow a scope of types of data transmitted through API's. PSD2 encourages API use by authorized TPP and blocks unauthorized TPP from accessing payment accounts data (BIS 2019). PSD2 does not however cover other data types within the banking sector leaving that data open to the practice of screen scrapping by TPP (BIS 2019). The EU does recognize the limitations of PSD2 and does not block jurisdictions from adopting their own frameworks that cover a broader scopes of personal financial data types (BIS 2019; Deloitte 2017c). GDPR for its part pushes TPP towards the use of API rather then screen-scraping but it is unclear if it fully bans its use (Deloitte 2020).

PSD2 requires banks to provide data to authorized TPP so long as it does not contain 'sensitive payment data' (Deloitte 2017d). PSD2 does not provide any definition as to what 'sensitive payment data' is but GDPR allows member states to define special personal data types such as 'sensitive data' individually (Deloitte 2017d). The problem arises in that GDPR has stronger enforcement mechanisms than PSD2 with potential fines for firms of up to 4% of their annual global turnover for violations (Deloitte 2017d). In response firms largely choose to err on the side of caution and follow the most restrictive definition of 'sensitive data' possible to avoid non-compliance and TPP access to data may be more restricted then hoped under the EUs open banking framework (Deloitte 2017d). Further, by leaving the defining of 'sensitive data' up to member states regulatory fragmentation potential increases within the EU.

The discrepancies between GDPR and PSD2 on issues like reciprocity, screen-scrapping and a ‘sensitive payment data’ definition highlight an overarching criticism that PSD2 and GDPR were developed in separate policymaker siloes (Deloitte 2020; OECD 2020). As a result of their siloed nature further clarification from regulators and amendments will be needed to rectify these issues in the future. In the meantime, the framework does not function as smoothly as it possibly could if GDPR and PSD2 had been developed in conjunction with one another instead of separately.

Open Banking in the United States

The United States has a complex and innovative fintech sector that attracts more investment than any other jurisdiction in the world (KPMG 2020). Fintech developments in the U.S. have been so successful that there is potential that some fintech firms may manage to supplant incumbent financial institutions within the U.S. market (Clements 2019a). Following the GFR, a general distrust of financial institutions, heightened regulatory scrutiny, higher capital requirements for banks and mobile phone proliferation created an atmosphere conducive for a thriving fintech sector to develop (Clements 2019a). Efforts by U.S. regulators to enhance financial sector stability since the GFR have largely paid off and the regulatory reforms enacted have strengthened the U.S. financial systems ability to weather economic shocks (FSOC 2019). Strict regulations like enhanced capital requirements for banks have however raised the costs of doing business for incumbents and has moved more financial activity into the U.S. shadow banking sector (OECD 2020). This has largely benefited fintech firms who have moved in to tap unmet market demand for financial products resulting from these policies (Clements 2019a; GAO 2018).

Financial Sector regulatory responsibilities in the U.S. are divided between federal regulators and their corresponding state regulators with financial companies regulated at the state and/or federal level. Most regulators have a consumer welfare mandate, and some have competition mandates but there is a lack on any type of unified competition authority within the regulatory system (Clements 2019a). At the federal level there are 17 separate regulators who oversee financial sector activities and at the state level there are 57 individual state and U.S. overseas territory regulators (OSC 2020). A complete list of U.S. federal and state financial regulators is outlined in Appendix A. The list in Appendix A does not fully encompass all regulators involved in the U.S. financial system as states have individual consumer protection and privacy laws/regulatory bodies which are not included (GOA 2018).

Having so many regulators in the U.S. with often overlapping regulatory mandates means the U.S. has a very complex and fragmented financial regulatory system that can be hard for financial firms to navigate (Clements 2019a). Fintech firms, when developing products, can find it hard to identify not only the applicable laws governing their products/activities but also how their products/activities will be regulated and by whom (GAO 2018). Regulations are typically prescriptive in nature which can lead to issues for digital firms who must comply with regulations that have not necessarily progressed with technological developments (Clements 2019). For example, there are still regulatory rules in place that imply the need for physical bank branches for banking firms which nullifies the advantages of digital banks (OECD 2020). There is a movement away from prescriptive regulations and technology specific regulations towards principle-based regulations and technology agnostic regulatory rules (Clements 2019a; USDT 2018). However, the fragmented nature of the financial system means progress has been slow and inconsistent at both the federal and state levels in addressing these issues (Deloitte 2020; Clements 2019a; USDT 2018; GAO 2018).

U.S. regulatory fragmentation creates prohibitive licensing and compliance barriers for new firms entering the market. There is an overall lack of harmonization at both federal and state levels making complying with regulatory requirements costly and time consuming for firms (Clements 2019a; USDT 2018; GAO 2018). State licensing and compliance requirements for fintech activities are done on a state by state basis with firms often having to fill out similar documents in each state (GAO 2018). A U.S. Government Accountability Office (GAO) (2018) report found. that fintech firms often faced regulatory examinations 2-3 times per year by up to 30 different regulators, immensely raising administrative costs for these firms which has pushed some fintech firms to look internationally for product markets to avoid these burdens. GAO found that some fintech start-ups were spending as much as 50% of their venture capital funding just to meet state licensing and compliance requirements (GAO 2018, 45). Regulators, however, are responding to issues resulting from the fragmented nature of the regulatory system and have begun to undertake efforts to harmonize interjurisdictional regulatory requirements and reduce administrative burdens faced by fintech firms (USDT 2018). Two of these efforts are discussed in a later section.

Although there have been calls for open banking regulatory approaches to be developed within the U.S., policymakers have chosen not to pursue an overarching regulatory driven open banking framework (USDT 2018). A United States Department of the Treasury (USDT) (2018) report on fintech found that the U.S. banking systems highly fragmented regulatory structure is not conducive to the development of an open banking framework and indicated such a policy would not be pursued as a government priority. The preferred mechanism to enable open banking like policies would be to look at what regulations can be improved upon to allow for market driven solutions in support of consumer financial data sharing (USDT 2018). The USDT identified the importance of enabling data aggregation, the need to reducing screen-scrapping as a data collection practice, and the need to enhance consumer data protections within the U.S. financial sector as important government priority areas to improve upon (USDT 2018).

Both GAO and USDT acknowledged a need for higher levels of regulatory cooperation within the financial sector between regulators to support innovation and reduce regulatory fragmentation (GAO 2018; USDT 2018). The USDT recognises that supportive regulatory measures that enhance the sharing of data between financial institutions with consumer consent should be fostered (USDT 2018). The USDT asked that regulators look for areas within current laws and adjust their regulations accordingly to allow for data transactions between firms to occur, allow consumers to opt-in and opt-out of data sharing, and remove barriers to the use of API for data transactions, (USDT 2018). The USDT also encouraged regulations that are developed in support of data sharing avoid being prescriptive and instead be principle based and technology agnostic wherever possible (USDT 2018). Where regulators are unable to change regulations due to current laws the USDT recommended moving issues through congress, however, it indicated this is not the ideal course of action unless absolutely necessary to do so (USDT 2018).

Since the USDT came out little action has been taken on the part of policymakers to enact any sort of industry wide strategy to implement the data protection and transfer measures outlined by the USDT (Deloitte 2020). As a result, screen-scrapping remains prevalent within the U.S. financial sector keeping risks to consumers and banks unnecessarily elevated (Deloitte 2020). Some TPP have entered into the types of data sharing contracts with incumbent banks that was encouraged by the USDT report and are using these partnerships to offer API based products to consumers (Deloitte 2020). Another market driven open banking initiative is that U.S. financial firm groups have joined with the non-profit Financial Data Exchange (FDX) to build a unifying API technical standard for consumer permissioned data sharing in the financial industry (Bradshaw 2020; FDX 2020a). FDX has 85 U.S. members including financial institutions, fintech firms, consumer groups, financial industry groups and utilities that are working to develop a common API technical standard (FDX 2020a; FDX 2020b). If FDX API technical standard comes to fruition and gains wide acceptance there is potential that the U.S. could develop a fully functioning market driven open banking standard even without policymaker regulatory interventions occurring.

Other Notable U.S. Fintech Developments

The U.S. has identified areas where it can cut regulatory red tape and is at various stages of doing so. Two notable regulatory developments that could reduce the competitive disadvantages currently faced by the U.S. fintech industry are the creation of a Special Purpose Banking Charter by the Office of the Comptroller of the Currency (OCC) and state regulatory harmonization efforts. If fully realized both initiatives would reduce regulatory fragmentation and regulatory compliance costs and increase fintech ability to compete within the U.S. market.

OCC Special Purpose Banking Charter

In 2016 the OCC released a report looking at the potential of creating a special purpose banking charter for fintech firms (OCC 2016). The report felt that establishing a special purpose banking charter for fintech's could be done in a similar fashion to how the OCC had previously built special purpose banking charters for trusts and credit card banks (OCC 2016). The benefit of establishing a special purpose fintech charter is that it would exempt fintech firms who obtained the charter from some state regulations and state licensing requirements, reducing their overall administrative costs (OCC 2016). The OCC would provide special purpose charters on a case by case basis, with regulatory burden based on the activities the fintech firm undertook (OCC 2016).

The Trump administration expressed support for the creation of special purpose charters and sees it as a way to reduce regulatory fragmentation and regulatory red tape by promoting regulatory and legal consistency within the U.S. financial sector (USDT 2018; OCC 2916). The special purpose banking charter is not guaranteed to become a reality however as it has faced legal challenges from states who feel these charters impinge on their regulatory rights (Mengyu 2020). In 2019, a Southern District of New York Judge deemed the creation of the special purpose banking charters for fintech companies to be outside the mandate of the OCC, halting their creation (Mengyu 2020). The OCC is appealing the verdict, but it remains to be seen if a federal special purpose banking charter for fintech companies will ever become a reality in the U.S. (Mengyu 2020).

State Regulatory Harmonization

State legislators, with support from the federal government, have also begun to harmonize supervisory and licensing functions across states to reduce administrative costs for financial firms (CSBS 2019a; GAO 2018). Undertaking these initiatives to reduce entry and administrative barriers are seen as important for reducing fragmentation and fostering competition in the U.S. financial market (USDT 2018). As discussed earlier the licensing and supervisory requirements in the U.S. can be very burdensome and force firms to expend a significant portion of their often-limited resources on administrative costs (USDT 2018).

The Conference of State Bank Supervisors (CSBS) is undertaking several initiatives to reduce the regulatory burdens fintech firms face. CSBS has developed or is currently developing a centralized database of state licensing requirements, nationwide multistate licensing system, a nationwide state examination system, a nationwide money service business law with standardized regulatory definitions and requirements, and developing other standardized regulatory requirements for financial firms to reduce their overall administrative burdens at the state level (CSBS 2020; CBSA 2019a). These initiatives have seen good initial uptake although adoption by state regulators has not been entirely universal (CSBS 2019a). Nonetheless the harmonization initiatives are promising developments in reducing entry and compliance costs face by fintech firms and may allow them to invest more capital in other priorities that will further increase the competition and innovation potential within the U.S. market and reduce fragmentation.

World Open Banking Highlights

Australia – Competition, Interoperability and Reciprocity

Australia has taken the concept of consumer data rights found in open banking and has included interoperability between sectors as a consideration in developing its open banking framework (Australia 2017). This is unique in that Australia's framework is not simply a financial sector data sharing framework but a broader data policy initiative that rolled out into the financial services sector first before being implemented in other sectors (Deloitte 2020; Australia 2017). Australia has chosen to have its open banking framework Consumer Data Right (CDR) to be implemented by its competition authority putting both competition and consumer data protection at the heart of its framework (BIS 2019). In its initial review into open banking

Australia also identified the concept of reciprocity being important for the creation a competitive financial sector (Australia 2017).

Reciprocity within Australia's open banking system would require both accredited banks and accredited TPP provide equivalent data to one another in an equivalent format with the consumers permission (Deloitte 2020; Australia 2017). Issues over defining what equivalent data means for different sectors saw reciprocity left out of the initial phase of Australia's open banking framework implementation (Deloitte 2020). Reciprocity has since been included into CDR and participating members are now required to give share equivalent 'designated' data with customer permission (Australia 2019).'Designated' data is defined within the CDR and a mechanism has been included to allow for incorporating data types not yet designated into the act upon review (Australia 2019). Further, firms from sectors outside of the financial currently have 'read-only' rights for financial information meaning that they can transfer consumer data but not funds from accounts helping to prevent financial sector activities from spreading into sectors outside of financial regulators current purview (BIS 2019).

Hong Kong

The Hong Kong Monetary Authority (HKMA) released its framework for the implementation of open API in 2018 (HKMA 2018). The framework only covers retail banking data in its initial implementation but strongly encourages banks to use open API in other areas of their business (HKMA 2018). The HKMA is focusing on the most customer facing aspect of the banking industry, retail banking, to increase consumer benefits through achieving their goals of increasing innovation, inducing competition, and increasing personal data security (HKMA 2018). The HKMA is working collaboratively with industry to develop a common standard API repository that can be updated as technology evolves (HKMA 2018). Hong Kong regulators are currently in phase 2 of their open API framework rollout and are now undergoing a further review to look at how it can encourage banks to open their data more to TPP before rolling out further phases (Eroglu 2019).

Japan

Japan is unique among the jurisdictions examined here in that consumption within the country is mostly cash based with no universally accepted dominant electronic payment network present in the country (FRBSF 2019). Japanese citizens and SME's are generally happy with their banks and have not faced the same credit issues experienced elsewhere in the world since the GFR (FRBSF 2019). Partially because of this Japan's fintech sector is mostly defined by fintech partnerships with incumbent institutions with few stand alone fintech firms operating within their financial sector (FRBSF 2019). Japan has taken a market driven approach to open banking developments within its financial sector (Deloitte 2020). In 2018 it amended its Banking Act to promote open API use within the financial sector, required TPP to register with regulators and introduced an obligation for banks to publish their open API policies (Deloitte 2020; FRBSF 2019; FSB 2017). The Banking Act changes were mostly voluntary but the Financial Services Agency of Japan strongly encouraged banks to enter contracts with at least one TPP by 2020 (Deloitte 2020). Uptake has been well received with a majority of incumbent banks entering into contracts with TPP and multiple market driven API's being developed within the Japanese market (Deloitte 2020; FRBSF 2019).

Singapore

Singapore has a vibrant fintech sector and this small city state has taken a wholly market driven approach to open banking. The Market Authority of Singapore developed an API playbook to encourage banks to open up data exchanges between banks and fintech's (Deloitte 2020). It gave guidance on the development of open APIs, but no regulations were imposed (Deloitte 2020; Ergolu 2019). This has led to a flurry of API's development by banks (Ergolu 2019). Utilization of the API developed remains low however, with industry indicating a lack of API standardization, no common infrastructure, or common processes as reasons for low API usage within the sector (Ergolu 2019).

Canada's FinTech Ecosystem

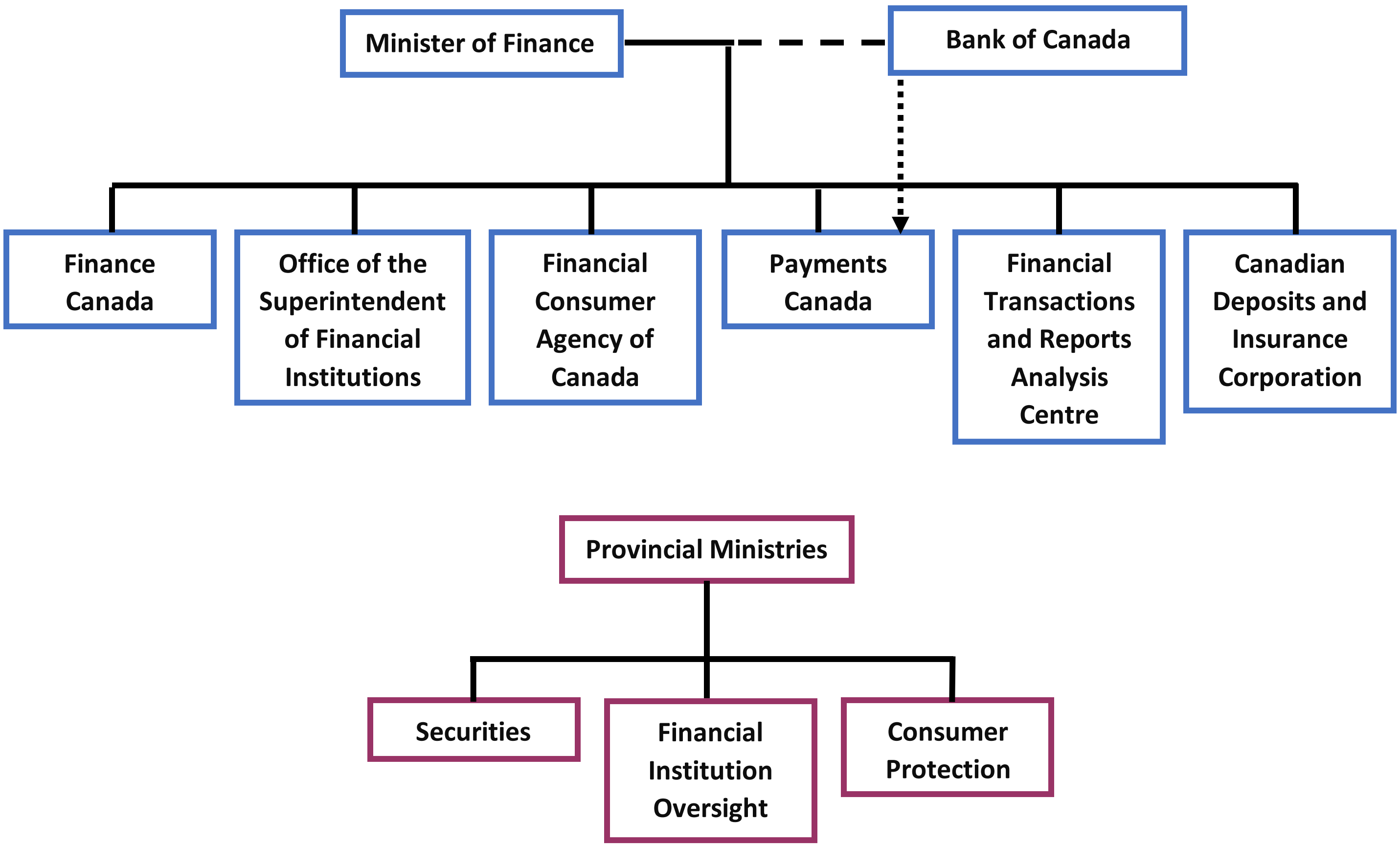
The Canadian financial sector is based on the Scottish national branch banking system and has proven resilient in preventing banking failures (Bordo, Redish and Rockoff 2015) Over its 153 year history Canada and its financial sector have experienced significantly fewer banking failures than the U.S. (Bordo, Redish and Rockoff 2015). During the GFR Canada's regulatory safeguards proved resilient in that that Canada did not have any banking failures occur in its financial sector gaining international praise for managing this feat (Bordo, Redish and Rockoff 2015; BOC 2011). The GFR was not the first time that Canada has managed to weather a global financial crisis without a domestic banking crisis. Even during the 1930s great depression Canada experienced no banking failures, albeit this did not fully protect it from the economic ramifications experienced in that era (Bordo, Redish and Rockoff 2015).

As a result of its financial sector resilience Canada is recognized globally for the stability and security of its banking sector (Canada 2019; IMF 2019). The Canadian financial sector is defined by strong regulatory bodies at both the provincial and federal level whose combined regulatory frameworks are considered strong enough to maintain sector stability even during severe economic shocks (IMF 2019). Canada's financial sector has earned the trust and confidence of Canadians and its policymakers work closely with industry players to ensure that its regulatory structures are up to date (Canada 2019; BOC 2011). Canadian regulators do this by closely monitoring evolving risks, learning from past experiences, and working with industry stakeholders to ensure regulations are compatible with the evolving global business environment (Canada 2019).

Canada has a robust and growing fintech sector. As of January 2019, Canada had 850 fintech firms within its fintech ecosystem of the 6000 firms present in the Americas (Cadence Fintech et al. 2019). Just under half (47%) of the fintech firms in Canada are based in Ontario with another 24% located in Quebec (Cadence Fintech et al. 2019). Canada is also notable for having a higher number of fintech bank partnerships then the global average (Watson and LaPlante 2018). In 2018, 62% of Canadian financial institutions were engaged in partnerships with fintech companies and 88% expected the number of partnerships to increase in the future (Watson and LaPlante 2018, 4).

The Canadian fintech regulatory ecosystem is divided between regulators at the federal and provincial level. There is relatively little regulatory fragmentation that occurs within the ecosystem as seen in Figure 2 below most of the financial systems regulatory responsibilities falls under federal jurisdiction (Clements 2019a; Canada 2017). There is potential for regulatory fragmentation at the provincial level especially in securities however, this largely does not exist because of the highly concentrated nature of the Canadian banking system with 85% of market share concentrated in just 5 banks (Clements 2019a; McKinsey 2019, 35).

Figure 2: Canada's Fintech Regulatory Ecosystem



Source: (Competition Bureau 2017, 18)

Efforts have been made by all of Canada's provinces and territories to reduce the potential fragmentation at the provincial level through the Canadian Securities Administrator (CSA) regulatory passporting system (CSA 2020a). This system allows for financial firms that are regulated in one jurisdiction to only deal with their home jurisdiction regulator and only deal with one set of harmonized laws for their securities activities (CSA 2020). While provincial securities oversight has been largely harmonized the harmonization of provincial consumer protection regimes has been mixed. Most Canadians want to see consumer protection laws and regulations harmonized across the country (OC 2015). To attempt to make this a reality the provinces/territories have signed treaties with intent to harmonize regulations, however, slight differences remain between different jurisdictions in Canada (OC 2015). As fintech firms' activities fall under provincial consumer protection laws (see Figure 2) the variations between them pose potential regulator fragmentation challenges within the fintech industry in Canada.

Although Canada is lauded for the stability and security of its banking sector it has room to grow when it comes to fostering a competitive financial sector that is conducive for new entrants. In its 2017 report the CBC (2017) found that other jurisdictions such as those in Europe and Asia are considered to have a more welcoming and innovation conducive regulatory environments then Canada (Canada 2017). This finding is echoed by commentators in Canadian media with calls for the government to do more to ensure Canada's financial sector remains competitive and does not wholly favour incumbent institutions (Carmichael 2019; Feller 2019; Zochodne 2019a; Shields 2018). The regulatory favoring of large incumbent financial institutions can be seen in Canada's high entry barriers that have led to most fintech developments occurring via fintech-incumbent partnerships (Clements 2019a). As a result, most Canadian fintech developments have been adopted within incumbent banks existing infrastructure and have been largely developed to enhance incumbent banks customer service and operations (Clements 2019a). The impact of this phenomenon is that the Canadian market has fewer stand-alone customer-facing fintech firms then other jurisdictions like the U.S. and maintains a highly concentrated banking system (Clements 2019a).

A lack of overall coordination between regulators at a national level and not having a financial regulator with a competition mandate have been identified as barriers within the Canadian fintech ecosystem (Clements 2019a; Deloitte 2017b). The lack of an identifiable coordinator for fintech policy leaves Canadian fintech firms at a disadvantage by making market entry more difficult for firms to navigate and creating a barrier for national regulatory harmonization efforts (Clements 2019a; Canada 2017). By not having a policy lead with a competition mandate Canada is at a disadvantage compared to its peers when it comes to stimulating fintech innovation in its market (Deloitte 2017b). Both of these issues if resolved could prove effective in giving Canada a more competitive and innovative fintech sector (Clements 2019a; Canada 2017).

Although Canada has some barriers to fintech development it has undertaken measures that are supportive of fintech development. Aside from the regulatory passport program described earlier the CSA has developed a regulatory sandbox where innovative firms can apply for relief from some regulations (CSA 2020b). Financial innovation has also been included as part of the federal governments Digital Technology and Scale AI superclusters which looks to connect firms and ideas with investors and resources to bring their products to market (Canada 2020c). Separate to the Federal superclusters provincial, municipal and private innovation hubs have been set up as well to help foster growth in the fintech sector (Clements 2019a).

Canada has also started the process of examining what an open banking framework would mean for its financial sector (Canada 2019). However, there are worries that Canada is still too timid in it's support of fintech and is not doing enough to ensure it gains from the potential technology fintech has to offer (Clements 2019b; Gill 2019). As an example Israel, another country with a conservative stable banking system, has managed to become an important global fintech innovation hub and is examined in the case study below.

Israel, an example for Canada?

Israel's financial sector is like Canada's in that it has a highly concentrated banking system with a handful of incumbents controlling most of the financial sector wealth (BOI 2011; Clements 2019a; McKinsey 2019). Both Canada and Israel domestic banking systems are known for being largely risk adverse and uniquely neither experienced any banking failures during the GFR (Carmichael 2019; Bordo, Redish and Rockoff 2015; BOI 2011). Israel's approach to fintech has been to fully embrace it has been recognized as a global leader in fintech innovation (Deloitte 2018). In 2019 the Israeli fintech industry was made up of over 500 firms and attracted $1.8 billion USD or 5.1% of global fintech investment (Solomon 2020).

The Israeli fintech sector is unique in that its firms are largely focused on exporting innovations internationally. 90% of Israeli fintech firms reported no intention of bringing their products to the domestic market in 2018 citing high market entry barriers and regulations that heavily favour incumbent banks (Deloitte 2018, 10). Israel is reducing these barriers and maximizing the potential of its fintech sector by forming regulatory sandboxes, establishing innovation hubs, developing an open banking framework, making fintech a pillar of its national digital program and including fintech in it's "Start-Up Nation" branding (Deloitte 2018; Start Up Nation Central 2018; Israel 2017). The Israeli government has also licensed an all digital bank which will allow fintech firms to test and launch products directly into the domestic and international markets (Walker 2020, Deloitte 2018).

In 2019 the Bank of Israel published a directive of guidelines for its open banking standards based on a staged implementation coinciding with the development of open API standards congruent with the EUs PSD2 (BOI 2019). The framework will initially allow for the sharing of customer balance and transaction data with a gradual increase in the types and kinds of financial information that can be shared with licensed TPP (BOI 2019). The Bank of Israel intends to ensure the framework is responsive to technology and industry developments through joint meetings with financial institutions and TPP (BOI 2019). Further, Israel has created a combined fintech-cyber innovation lab to facilitate the development of solutions to cybersecurity issues by its vibrant cybersecurity and the fintech sectors (Israel 2018).

By adopting fintech friendly policies Israel is ensuring it will continue to be a global fintech innovation leader and will reap fintech's benefits domestically (Deloitte 2018; Israel 2017). Israeli policymakers have made the choice to move beyond having a concentrated conservative domestic banking system and are fully embracing Israel's strengths in fintech innovation to fully capture economic benefits of fintech within its economy.

Starting Down the Road to Open Banking

As part of its Budget 2018 the Canada's federal government announced the initiation of a review into merits of open banking (Canada 2019). The Advisory Committee on Open Banking (ACOB) consulted stakeholders and assessed the potential impacts of establishing an open banking framework in Canada with the policy objectives of improving financial sector efficiency, utility and stability (Canada 2019). ACOB, following consultations, concluded that a 'consumer directed finance' (open banking) framework should be pursued as a priority by the government (Canada 2020a). The reasoning given for pursuing the policy was the opportunities 'consumer directed finance' could bring such as enabling Canadian financial firms to compete globally, improving consumer welfare, and reducing cyber risks within the financial sector (Canada 2020a).

Committee members recommended that in developing its open banking framework Canadian regulators should take a light touch approach and act as guard rails to protect firms and consumers but allow innovation to flourish (Canada 2020). It recommended that government collaborate with stakeholders to build a framework that protected consumer data, discouraged screen scrapping, assigned liability and promoted innovation (Canada 2020). The committee felt that doing so would promote competition in a way that would benefit both industry participants and consumers (Canada 2020). Without defining how it would be implemented the ACOB report recommended government should play a catalyst role in getting stakeholders to participate within the framework (Canada 2020). The ACOB also felt it would be advantageous to include other sector stakeholders so that the data sharing framework developed would have the potential to be interoperable within other sectors in the future (Canada 2020).

The ACOB report advocated as well for API standards to be industry led and market based (Canada 2020). They found a divergence in industry stakeholder opinions on whether that means a mandated common API standard should be created by a consortium of market players or mandated by a central government authority but agreed that a common API standard should apart of any new open banking framework (Canada 2020). The report emphasised that ensuring the common API standard was congruent with other global jurisdictions is important (Canada 2020). In response to the report 35 Canadian financial firms, in an attempt to get ahead of policymakers dictating to them what an common API standard would look like, have joined FDX to work on building a market-based industry common API standard for personal data transmission (Bradshaw 2020; FDX 2020b). This development will likely be beneficial within the North American market as the FDX common API standard is also being pursued by many American banks (FDX 2020a).

The ACOB report acknowledged that Canada's regulatory structure would mean implementation of a 'consumer directed finance' framework would be complex and challenging but nonetheless should be pursued (Canada 2020a). To overcome this complexity the report encourages the in of inclusion many stakeholders as possible in developing its framework as possible (Canada 2020). The ACOB report also identified in that by not being first movers on open banking Canada has the advantage of being able to develop a framework that allows it overcome challenges seen in other frameworks and catch up (Canada 2020) This sentiment has also been echoed in media (Zochodne 2019b). However, the ACOB report also identified that not moving quickly to develop a framework could put Canada's financial sector at a serious disadvantage globally (Canada 2020).

Upon receiving the report then Finance Minister Bill Morneau called for more consultations into the establishing of an open banking framework which were supposed to begin this spring but have now been moved to fall due to the Covid-19 pandemic (Zochodne 2020b). The delaying of further consultations on open banking in Canada due to the pandemic has be decried by industry stakeholders (Carmichael 2020). These stakeholders believe further delay of the development of an open banking framework will leave Canadian financial firms with a further competitive disadvantage compared to firms from jurisdictions with already established open banking frameworks (Carmichael 2020). Recent events may also have an impact on whether an open banking framework will be pursued in Canada. It is hard to determine what the potential implications the proroguing of parliament, Finance Minister Bill Morneau's resignation and the appointment Chrystia Freeland to the Finance Minister post may have in terms of priorities on the open banking file as the Trudeau government plots its economic 'roadmap' out of the current pandemic (Aiello 2020).

Discussion

Developing an open banking framework should be considered an important policy objective by Canadian policymakers in order to ensure Canada maintains a stable, secure and competitive financial sector. Given that 35 jurisdictions globally have adopted or are intending to adopt open banking frameworks, Canada's financial sector would face serious competitive disadvantages if it chooses not to adopt an open banking framework (McKinsey 2019, 12). If Canada did not adopt an open banking framework in the near-term its financial sector would remain competitive. However, as time progressed fintech innovations would develop faster in jurisdictions that foster more competitive and innovative financial firms through their open banking frameworks, and Canada's financial sector would find itself at an increasing disadvantage over time. This effect is reinforced by the fact that typically technological change's impact is overestimated in the short term but underestimated over the long term (Meyer, Rivadeneyra and Sohal 2017). The consequence of not adopting an open banking framework would be that Canada's world renowned stable and secure financial system would likely become less stable and secure over the long term as fintech produced outside its borders progressed faster in jurisdictions with more fintech innovation friendly open banking frameworks (FSB 2017).

The importance of speed in developing an open banking framework comes as the fintech industry is still relatively young and open banking developments are new and evolving. If Canada manages to quickly develop and implement technology agnostic and principle-based regulations congruent with the privacy, security, innovation and competition goals inherit within open banking its regulations will be more effective now rather then later (Canada 2017; Philippon 2017). Implementing fintech innovation frameworks, like open banking, when an industry like fintech is young and evolving has been found to have a much greater impact on industry success than when they are implemented later in the industries development (Canada 2017; Philippon 2016).

Although open banking is largely a new phenomena, the effects of its implementation became immediately apparent following its 2018 launch in the EU. Fintech adoption rates among European jurisdictions who have fully embraced open banking like the Netherlands, UK and Ireland are highest in the developed world (EY 2019). As discussed earlier the UK experienced a 65% increase in the number of fintech start-ups within its financial sector the year following the implementation of open banking (McKinsey 2019, 11). There is no reason to believe Canada wouldn't experience similar trends.

Following its open banking implementation Europe has seen a large increase in investment into its fintech sector. In 2017 Europe attracted just $12.3 billion USD in fintech investment (KPMG 2020). By the end of 2018 with the rollout of GDPR and PSD2 that amount jumped to $43.4 billion USD total fintech investment and that amount grew even further to $58.1 billion USD total investment in 2019 (KPMG 2020, 57). This amounts to a 353% increase in total European fintech investment between 2017 and 2018 with a further 34% increase in investment experienced in 2019 (KPMG 2020,57). Total fintech investment activity in Europe by 2019 has grown to become second globally to only the U.S. and the region now appears to be on track to overtake the U.S. in total annual fintech investment in the near future (KPMG 2020). Again there does not appear to be any reason Canada would not experience similar trends in fintech investment to the EU upon adoption of its own open banking framework.

The EU has gained advantages from being a first mover in developing its successful open banking framework. Besides a significant increase in fintech investment, as the first mover on open banking, the EU has seen its regulatory driven open banking framework exemplified as the global gold standard. This has meant the EU open banking framework and API standards have been largely copied and adopted by other jurisdictions like Israel and Australia in the development of their open banking frameworks (OECD 2020; Australia 2019; BOI 2019). ACOB, during its review of open banking in Canada, noted the importance of ensuring any standard took EU API standards into consideration as well to ensure Canadian firms could access the European market (Canada 2020).

By not being a first mover Canada is not necessarily at a huge disadvantage as of yet. As a potential ‘fast follower’ in Canada gains an advantage in that it has the opportunity to compare and learn from the experiences of other jurisdictions implementation of open banking frameworks. Canada can then incorporate these lessons into its open banking framework so that its financial sector opportunities are enhanced, and it avoids some of the pitfalls experienced in first mover jurisdictions. For comparison Figure 3 below compares important aspects of open banking framework developments observed within the jurisdictions examined in this paper.

Figure 3: Comparison of Open Banking Regulatory Frameworks Among Jurisdictions Examined

	CANADA	U.S.	EU	U.K.	AUSTRALIA	HONG KONG	ISRAEL	JAPAN	SINGAPORE
Open Banking Regulatory Framework	Consultation Phase	Market Driven	Yes	Yes	Yes	Yes	In Development	Market Driven	Market Driven
Open Banking Regulatory Policy Lead	N/A	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Financial Regulator Competition Mandate	No	Some	Yes	Yes	Yes	No	No	No	No
Regulatory Fragmentation Potential	Moderate	High	High	Low	Low	Low	Low	Low	Low
Common API Standard	Being Considered	No	No	Yes	Yes	Yes	In Development	No	No
Data Reciprocity	N/A	N/A	No	No	Yes	No	N/A	N/A	N/A
TPP Licensing Requirements	N/A	No	Yes	Yes	Yes	Yes	Proposed	Yes	No
Data Sectoral Interoperability	Being Considered	No	No	No	Yes	No	Undetermined	Undetermined	No

Source: (BOE 2020; Canada 2020a; Deloitte 2020; FSA 2020; OECD 2020; Open Banking 2020a; Australia 2019; BOI 2019; Clements 2019a; HKMA 2019; MAS 2019; ECB 2018; HKMA 2018; USDT 2018; Canada 2017; BOI 2011)

When adopting frameworks for open banking the jurisdictions examined have, as outlined in Figure 3, chosen to either take a regulatory or market driven approaches. Both approaches have advantages and disadvantages. Market driven approaches, which have few rules requiring financial data sharing, do end up seeing data driven consumer focused financial products available within their jurisdiction (BIS 2019). Jurisdictions that have undertaken regulatory driven approaches have experienced benefits from having clear consistent rules as well as common API standards that increase efficiencies for industry players (BIS 2019). A clear advantage of regulatory driven approaches is that they force incumbent involvement and the use of API which is important for reducing the utilization of screen scraping (BIS 2019). Incumbents, even when encouraged within market driven frameworks by regulators, are often apprehensive about giving access to personal financial data (BIS 2019). As a result, regulatory intervention is required in order to reduce the cyber risks fintech firms create by continuing to utilize screen scrapping (BIS 2019).

Competition is a theme among regulatory driven frameworks of open banking. Australia, EU, Israel and the U.K have all included competition mandates within their open banking frameworks and view increased competition within their financial sectors as a desired outcome of their frameworks. Both the U.K. and Australia have chosen to utilize regulatory bodies with a competition mandates as policy leads for the implementation and administration of their open banking frameworks. In the U.K. the competition authority CMA specifically created an entity in the form of the OBIE. In Australia they have chosen their competition authority to develop and implement their CDR framework.

The U.K. has specifically linked the increased competition mandate of its open banking framework as being important for increasing its banking sector security as well as overall consumer welfare (BOE 2020). Consumer protection and sector competition both have a common goal in that consumer welfare is at the base of both initiatives and they are not policy goals that are separate from one another (OECD 2020). The Bank of England (BOE) also understands competition as being important for maintaining overall sector stability. The BOE believes that the increased competition as a result of open banking's implementation will enable an increased number of new players and decrease consumer switching costs (BOE 2020). As a result the BOEs intended outcome is an overall reduction of the chance that banks will ever again become to big to fail as they did prior to the GFR (BOE 2020).

Figure 4: Market Share of Top 5 Banks by Assets in Select Developed Countries.

Market Share of Top 5 Banks by Assets

Country	Market Share %
Australia	80*
Canada	85
France	56
Germany	66
Japan	65
Italy	32
United Kingdom	80
United States	36

*Australia data based on top four banks

Source: (Statista 2019; McKinsey 2019)

As discussed in the previously both the U.K. and Australia identified an overall lack of financial sector competition and the desire to bring new entrants into their financial system. An important similarity identified in Figure 4 above is that both of these jurisdictions have financial sector concentration levels similar to that of Canada. All three jurisdictions top 4-5 banks have over 80% of total market share within their respective financial markets. Canada differs from the other 2 jurisdictions in that its open banking review did not identify competition as important specifically (Canada 2020). ACOB instead opted to use less direct references to competition by identifying open banking's abilities to bring increased efficiency and innovation (Canada 2020). This has many Canadian fintech firms worried that incumbents may be working to ensure they maintain their current advantages within Canada's financial system and a new framework if implemented may not bring the wholesale changes to competition seen in other jurisdictions (Zochodne 2019a; Zochodne 2019b).

Of the jurisdictions examined only the U.S. and EU do not have an open banking regulatory policy lead. Both jurisdictions also have the highest potential for regulatory fragmentation of the jurisdictions examined. In the case of the EU implementation has largely been left up to member states who were required to ratify its open banking framework legislation and have their own national financial regulators. In the U.S. the overlapping federal and state jurisdictional issues cited for pursuing a market only driven open banking framework is also reflected in its decision to not designated any specific policy lead. Canada, although it has more regulatory fragmentation potential then most of the jurisdictions examined, has differing circumstances than the U.S. in that Canadian regulatory responsibilities are cleanly divided with little overlap between different levels of government. Canada also differs from the EU in that it is not a transnational government body and has fewer jurisdictions (provinces) with fewer financial regulatory responsibilities to contend with than the 27-member trading bloc.

Having a regulatory lead appears to be important to avoid the developing the different regulatory pieces of an open banking framework in silos. As exampled by discrepancies between requirements contained within the EUs GDPR and PSD2 regulations this can lead to a lack of clarity on rules that make it harder for firms to identify what they need to do for compliance. Canada should strongly consider setting up a policy lead or create an entity to develop and implement its open banking framework. By designating a coordinating entity in development Canada could avoid the siloed regulation development pitfalls the EU experienced on the rollout of its framework. The coordinated framework development would help firms know who and how they will be regulated under any open banking framework Canada adopts.

In Figure 3 licensing requirements of TPP and incumbent participants were included in all jurisdictions undertaking regulatory driven open banking approaches. This would add a contact point with fintech that regulators indicated was lacking for some fintech's and their activities. This is decidedly missing in market-based approaches. The U.S.'s GAO (2018) did however, indicate that partnerships between banks and fintech's act as potential contact points for regulators to monitor their activities as part of their monitoring of the bank they are partnered with. Although less direct then licensing if the goal is to create a contact point for regulatory observation of fintech activities and their impact on stability both regulatory driven and market driven approaches to open banking provide avenues to accomplish this. Interestingly Japan who has taken a market driven approach to open banking does have licensing requirements for TPP entering data sharing contracts with banks (Deloitte 2020).

Standard API development is industry driven in both market and regulatory based frameworks. The adoption of a common API standard is less apparent with some jurisdictions like the EU letting the market eventually decide what this will look like. Other jurisdictions like have chosen to U.K. mandate a technology neutral common API standard to increase the efficiency now as opposed to when a market consensus is formed. Singapore poses an example as to why the initial adoption of a common API standard is important as its market driven approach has seen the development of many standard API with low utilization. It may be to early to tell if this will continue to occur in Singapore or if eventually, as the EU hopes to see happen in its framework, a common API standard will evolve within the market.

Israel and Australia have both chosen to ensure their common API standard is congruent with EU API standards. As market consensus on API evolves in other jurisdictions like the U.S. it will also be important for jurisdictions to make their common standard API congruent with those developments. Keeping a watchful eye on developments like the market driven FDX standards and enabling regulation to incorporate them within Canada's own API standards will be important for firms as it will allow them to more easily participate in those jurisdictions' markets.

There is potential with entirely industry driven approaches that API will be developed in a way that blocks out new entrants. The U.K. and Hong Kong common API standard prevent this as the regulators set the API specifications with a broad set of stakeholders rather then just industry players (Open Banking 2020a; HKMA 2018). Ensuring the API standards Canada develops do not pose entry barriers is important to consider as it has potential to affect how many firms choose to join the scheme. With every jurisdiction noting a desire to reduce screen-scrapping making the entry into any open banking framework Canada creates easy for firms will better encourage more firms to begin utilizing API for data transmission.

Efforts to level the playing field for banks through reciprocity by Australia are another interesting development. It is clear within the EU that not all players i.e. incumbent banks are treated equally under their open banking framework. It seems odd that this was not addressed as one of the arguments for implementing open banking in the first place was the leveling of the playing field through the transfer of consumer data. Australia, by defining what reciprocity means have learned from this omission from the EU framework and are insuring that one player is not disadvantaged over another within their open banking framework.

Australia's incorporation of sectoral interoperability considerations into its open banking framework is another interesting development from that jurisdiction. Canada's open banking review for its part also included framework sectoral interoperability as an important concept to incorporate into the open banking framework Canada develops. The exchanging of personal data is not exclusive to the financial sector and it makes sense that open banking data handling principals could to be transposed into other sectors where personal data is exchanged. As this is a relatively new development there is currently no known data that could be found as of writing that what economic benefits adopting sectoral interoperability into an open banking framework could have.

For Canada the U.S. and EU regulatory fragmentation reduction through regulatory harmonization stick out as themes. The U.S. has chosen to work towards eliminating these issues through its OCC special fintech banking charter development as well as harmonization of state regulators. In the EU the implementation of GDPR and PSD2 eliminated national differences in personal data protection and sharing across the trading bloc. In the case of the EU this has already been successful as their open banking framework is considered foundational and fintech investment has increased significantly post open banking implementation. In the U.S. if either the OCC charter or state regulatory harmonization efforts are successful it will immensely help to reduce regulatory fragmentation and administrative costs for the industry (USDT 2018). For the U.S. this means that one of its biggest fintech development disadvantages will disappear making their already innovative sector even more competitive globally. Given without these harmonization measures or an open banking framework in place the U.S. still attracts the largest share of global fintech investment, Canada cannot become complacent that its current regulatory advantages it has over the U.S. will remain indefinitely.

Recommendations

For Canada to maintain and enhance its stable and secure financial system the adoption of an open banking framework is essential. The consequences of not developing a framework risks Canada's financial sector being left behind and Canadians potentially losing their lauded financial sector stability over time. The success of the EU's regulatory driven open banking framework in increasing fintech adoption, attracting fintech investment and fostering new fintech start-ups provides ample evidence of the benefits Canada can expect to experience with the adoption of open banking that it would otherwise be leaving off the table. Further, Canada's financial system would benefit greatly from the increased cybersecurity that would occur through a reduction in screen scrapping use, increased consumer choice and financial access that new innovative products would provide, and sector stability gains increased financial sector competition that the adoption of an open banking framework will bring.

Canada if it acts quickly has the advantage in that as a 'fast follower' it can incorporate lessons from first movers into its future open banking framework and become not only a global financial sector stability and security leader but also a global fintech innovation leader. To ensure Canada achieves the best results from its future open banking framework the following recommendations have been developed from the jurisdictions analyzed within this paper.

1. Create an open banking lead to oversee and coordinate the creation and implementation of Canada's open banking framework.
2. Incorporate competition into Canada's financial regulators mandates
3. Harmonize regulatory efforts to avoid regulatory fragmentation
4. Take international and market development into consideration when developing API standards
5. Include data reciprocity in Canada's open banking framework
6. Take sectoral interoperability into consideration when developing an open banking framework

1. Create an open banking lead to oversee and coordinate the creation and implementation of Canada's open banking framework.

Most jurisdictions examined have chosen a regulatory lead for the development and implementation of their open banking frameworks. Canada should adopt this practice and create or assign a specific open banking lead for the implementation and monitoring of its future framework. Currently not having a fintech regulatory lead for fintech has been identified as a significant disadvantage for Canada's financial industry by the CBC. Creating an open banking framework lead will help ensure that the frameworks regulatory components avoid the complications faced by the EU by not being siloed in their development and ensure clarity for firms. It would also allow Canada to implement its framework more quickly as implementation of the framework would not be left to individual regulators to implement pieces on their own but be driven by a body with an implementation mandate. Other then the U.S. all of the national jurisdictions examined have chosen a policy lead to oversee the implementation of their open banking frameworks.

This body should be initiated at the federal level but include a mandate to work with provincial regulators to ensure regulatory fragmentation does not occur within the framework. The body should manage the licensing of framework participants and be a conduit between industry and regulators to help ensure their concerns within the open banking framework are addressed. The government should consider mandating incumbent bank membership to ensure they participate in the open banking framework and allow TPP access to their financial data. Ensuring participation will also help ensure reduction in screen-scrapping practices occurs as data access obligations through API use among framework members will help make it obsolete.

2. Incorporate competition into Canada's financial regulators mandates.

Currently Canada's financial regulators do not have competition mandates despite their being identified as important for consumer welfare and fostering innovation. Consumer welfare through increased data protection and competition are at the heart of open banking. Adding a competition mandate to financial regulators who will oversee firms participating within Canada's open banking framework only makes sense. Competition has been directly linked to innovation developments as well as financial sector stability and so complements the goals of any government looking to become an innovation leader while maintaining a stable financial sector.

Including regulator competition mandates will also help ensure they have to take all players into consideration within the market including large incumbents, consumers and larger firms. Competition mandates will be important for developing an inclusive open banking framework in Canada financial sector stability as increased competition reduces the chance of firms becoming to big to fail and undertaking risky market behaviours. It will also help reduce the concerns that have been raised regarding Canada's current regulatory regime too heavily favouring its oligarchic like incumbent financial institutions.

3. Harmonize regulatory efforts to avoid regulatory fragmentation.

Canada has a disadvantage in comparison to some of the jurisdictions examined in that it has a moderate potential for regulatory fragmentation due to financial sector regulatory responsibilities being present at both the provincial and federal levels. For its part at the provincial level Canada has seen regulatory fragmentation all but eliminated in securities through the CSA's passporting initiative. There is still room however for Canada to increase its regulatory harmonization in consumer protection. Like in the U.S. state harmonization efforts this would require significant collaboration between provincial and federal jurisdictions to accomplish but the benefits would be lower compliance costs and increased competitiveness for Canadian fintech firms and banks.

Any open banking framework adopted by Canada should help to facilitate these efforts wherever possible. Canada's open banking framework implementation lead should have a mandate to facilitate this process. This will ensure that administrative costs are kept to a minimum for financial firms participating within the framework and eliminate any disadvantages Canada would experience compared to jurisdictions with very little regulatory fragmentation potential. As well this will ensure sure Canada maintains at least a level footing with the U.S. as its harmonization efforts progress and bring similar upsides to its financial sector.

4. Take international and market development into consideration when mandating a common API standard.

When developing its API technical standards Canada should take into consideration the standards being put in place in other jurisdictions. This has a twofold effect in that it will allow for Canadian firms to more seamlessly participate in international financial markets while also allowing international firms to bring their innovative products into the Canadian financial sector. This will have the effect of providing new opportunities for consumers to benefit from the widest range of products available globally while also introducing more global scalability potential for Canadian innovators.

Mandating a standard that is industry led and market based is important to consider in conjunction with international considerations. Mandating a common API standard is important for ensuring a level playing field for firms whether they be new entrants or incumbent firms as they would only have to comply with a singular set of guidelines that are accessible to everyone. It is also important that the common API standard is responsive to market needs and flexible in adapting to including industry needs as they develop. Building this kind of flexibility into Canadas common API standard will allow it to remain responsive as the sector and technology evolve globally.

5. Include data reciprocity in Canada's open banking framework.

To ensure a level playing field Canada should ensure that there is reciprocity in its open banking framework. Equivalent data should have to be shared in an equivalent format within a mandate timeline for all firms participating within the framework. Although in the EU incumbent banks were unable to identify what they would do with TPP data if reciprocity was added into its open banking framework this does not mean that at some point in the future this would not leave them with serious disadvantages in comparison to TPP. As data monetization increasingly becomes more important creating a level playing field that goes both ways will ensure that incumbent banks are at least not excluded from potential data they could utilize to compete and innovate within the market in the future.

6. Take sectoral interoperability into consideration when developing an open banking framework.

Although this recommendation does not affect the financial sector currently, keeping sectoral interoperability should be viewed as preparation for Canada's economic future. Open banking principles like consumer consent and control over their data and who it is shared with do not only apply within the financial sector context. Data monetization occurs in multiple sectors and as such Canada should ensure it is mindful of interoperability considerations when developing its open banking framework. By including these considerations open banking can act as a gateway for other sectors to develop consumer centric products and further enhance consumer control of their personal data within the broader marketplace.

Conclusion:

Fintech is a disruptive force within the global financial sector that is increasing consumer choice and financial inclusion for unbanked and underbanked consumers. Regulators are concerned that fintech developments may come with negative consequences for the financial sector in terms of reduced sectoral stability, increased cybersecurity threats and consumer data protection vulnerabilities. Open banking, by combining consumer data consent with incentives to move firms to more secure API data transmission practices has the potential to reduce the increased risks fintech developments pose while also increasing consumer welfare, competition and innovation within the financial sector. Several jurisdictions have already seen success in their financial sector by developing open banking frameworks through either regulatory or market-based measures. Canada by not having yet adopted an open banking framework is running the risk that its financial sector will become uncompetitive globally, potentially making it less stable and secure in the future. Canada, if it moves quickly, can now leverage lessons learned from early adopters to develop an open banking framework that will attract significant investment and further enhance its already stable and secure financial sector while turning it into a global fintech innovation leader.

Appendix A

U.S. Federal and State Financial Regulators (OSC 2020)

Federal Regulators	
Commodity Futures Trading Commission	Consumer Financial Protection Bureau
Federal Deposit Insurance Corporation	Federal Reserve Board
Financial Crimes Enforcement Network	Financial Industry Regulatory Authority
Financial Regulatory Authority	Investment Advisor Association
Investment Company Institute	Municipal Securities Rulemaking Board
National Credit Union Administration	National Futures Association
Office of the Comptroller of the Currency	Securities and Exchange Commission
U.S. Department of the Treasury	Securities Industry Financial Markets Association
National Association of Insurance Commissioners	

State Regulators
Alabama State Banking Department, Alaska Division of Banking Securities, American Samoa Government of Financial Institutions, Arizona Department of Financial Institutions, Arkansas State Bank Department, California Department of Business Oversight, Colorado Division of Banking, Connecticut Department of Banking, Delaware Office of the State Bank Commissioner, District of Columbia Department of Insurance, Securities and Banking, Florida Office of Financial Regulation, Georgia Department of Banking and Finance, Guam Department of Revenue and Taxation, Guam Public Utilities Commission, Hawaii Department of Commerce and Consumer Affairs, Idaho Department of Finance, Illinois Department of Financial and Professional Regulation, Indiana Department of Financial Institutions, Iowa Division of Banking, Kansas Office of the State Banking Commissioner, Kentucky Department of Financial Institutions, Louisiana Office of Financial Institutions, Maine Bureau of Financial Institutions, Maryland Office of the Commissioner of Financial Regulation, Massachusetts Office of Consumer Affairs and Business Regulation, Michigan Department of Insurance and Financial Services, Minnesota Department of Commerce, Mississippi Department of Banking and Consumer Finance, Missouri Division of Finance, Montana Division of Banking and Financial Institutions, Nebraska Department of Banking and Finance, Nevada Department of Business & Industry Financial Institutions Division, New Hampshire State Banking Department, New Jersey Department of Banking and Insurance, New Mexico Regulation and Licensing Department, New York State Department of Financial Services, North Carolina Commissioner of Banks, North Dakota Department of Finance Institutions, Commonwealth of the Northern Marianas Islands Department of Commerce, Ohio Department of Commerce, Oklahoma State Banking Department, Oregon Division of Financial Regulation, Pennsylvania Department of Banking and Security, Commissioner of Financial Institutions Puerto Rico, Rhode Island Department of Business Regulation, South Carolina Office of the Commissioner of Banking, South Dakota Department of Labor and Regulation, Tennessee Department of Financial Institutions, Texas Department of Banking, Utah Department of Financial Institutions, Vermont Department of Financial Regulation, Virgin Islands Division of Banking, Insurance and Financial Regulation, Virginia State Corporation Commission, Washington State Department of Financial Institutions, West Virginia Division of Financial Institutions, State of Wisconsin Department of Financial Institutions, Wyoming Division of Banking

References:

Aiello, Rachel. 2020. "PM prorogues Parliament until Sept 23." *CTV News.* Accessed August 18, 2020. https://www.ctvnews.ca/politics/pm-trudeau-prorogues-parliament-until-sept-23-1.5068461.

Alini, Erica. 2020. "How Covid-19 is luring Canadians into the stock market." *Global News.* Accessed August 15, 2020. https://globalnews.ca/news/7200337/covid-19-investing-stock-market-canada/.

Australia. 2019. "Consumer Data Right Overview." Accessed July 31, 2020. https://treasury.gov.au/sites/default/files/2019-09/190904_cdr_booklet.pdf.

-- -- --. 2017. "Review into open banking: giving customers choice, convenience and confidence." Accessed July 29, 2020. https://treasury.gov.au/sites/default/files/2019-03/Review-into-Open-Banking-_For-web-1.pdf.

Badour, Ana., Dominic Presta. 2018. "Open Banking: Canadian and International Developments." *Banking and Finance Law Review.* 34 (1). 41-47.

BIS (Bank for International Settlements). 2019. "Basel Committee on Banking Supervision. Report on open banking and application interfaces." Accessed Aug 5, 2020. https://www.bis.org/bcbs/publ/d486.pdf.

BOC (Bank of Canada). 2019. "Non-Bank Financial Intermediation in Canada: An Update." *Bank of Canada Staff Discussion Paper*. Accessed June 27, 2020. https://www.bankofcanada.ca/wp-content/uploads/2019/03/sdp2019-2.pdf.

-- -- -- (Bank of Canada). 2011. "The Great Recession in Canada: Perception vs Reality." Accessed July 27, 2020. https://www.bankofcanada.ca/wp-content/uploads/2011/03/sp280311.pdf.

BOE (Bank of England). 2020. "Why is competition important in banking?" Accessed August 22, 2020. https://www.bankofengland.co.uk/knowledgebank/why-is-competition-important-for-banks.

BOI (Bank of Israel). 2020. "Israel and the Global Crisis 2007-09." Accessed July 9, 2020. https://www.boi.org.il/deptdata/mehkar/crisis/crisis_2007_2009_eng.pdf

-- -- --. 2019. "The Bank of Israel publishes guidelines for the banks and credit card companies for implementation of the open banking standard in Israel." *Bank of Israel Press Releases.* Accessed July 28, 2020. https://www.boi.org.il/en/NewsAndPublications/PressReleases/Pages/4-12-19.aspx.

-- -- --. 2011. "The Bank of Israel Explained: Goals Function and Authority." Accessed September 13, 2020. https://www.boi.org.il/en/Education/Documents/boi_eyelevel_eng.pdf.

Bradshaw, James. 2020. "Canadian financial institutions join data exchange to speed up development of open banking." *Globe and Mail.* Accessed July 29, 2020. https://www.theglobeandmail.com/business/article-canadian-financial-institutions-join-data-exchange-to-speed-up/.

Cadence Fintech., Holt., Lab Zed., and Ivey School of Business. 2019. "The Canadian Fintech Ecosystem Map." Accessed August 22, 2020. https://ecosystem.formfintech.com/.

Canada. Department of Finance. 2020a. "Consumer-directed finance: the future of financial services." Accessed July 14, 2020. https://www.canada.ca/en/department-finance/programs/consultations/2019/open-banking/report.html.

-- -- --. Competition Bureau Canada. 2020b. "Canada's progress in FinTech." Accessed June 8, 2020. https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04392.html.

-- -- --. Innovation, Science and Economic Development Canada. 2020c. "Canada's New Superclusters." Accessed May 29, 2020. https://www.ic.gc.ca/eic/site/093.nsf/eng/00008.html.

-- -- --. Department of Finance Canada. 2019. "A Review on the Merits of Open Banking." Accessed July 20, 2020. https://www.canada.ca/en/department-finance/programs/consultations/2019/open-banking.html.

-- -- --. Competition Bureau Canada. 2017. "Technology-Led Innovation in the Canadian Financial Services Sector." Accessed June 8, 2020. https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/vwapj/FinTech-MarketStudy-December2017-Eng.pdf/$FILE/FinTech-MarketStudy-December2017-Eng.pdf.

Carmichael, Kevin. 2020. "Refusal to embrace open banking puts Canada behind yet another curve." *Financial Post.* Accessed July 14, 2020. https://financialpost.com/technology/canadas-refusal-to-embrace-open-banking-puts-us-behind-yet-another-curve.

-- -- --. 2019. "Innovation Nation: Canada's Banks are holding back the knowledge economy." *Financial Post.* Accessed July 27, 2020. https://financialpost.com/technology/innovation-nation-how-canadas-banks-are-holding-back-the-knowledge-economy.

Chiu, Iris H-Y. 2016. "Fintech and Disruptive Business Models in Financial Products, Intermediation and Markets — Policy Implications For Financial Regulators," *Journal of Technology Law and Policy.* 21. 55-112.

Clements, Ryan. 2019a. "Regulating Fintech in Canada and the United States: Comparison, Challenges and Opportunities." *SPP Research Paper*. Accessed July 6, 2020. https://www.policyschool.ca/wp-content/uploads/2019/08/Fintech-Clements-final.pdf.

-- -- --. 2019b. "Stability is important, but Canada needs to take more chances with FinTech." *Financial Post*. Accessed June 24, 2020. https://business.financialpost.com/opinion/stabilitys-important-but-canada-needs-to-take-more-chances-with-fintech.

CSA (Canadian Securities Administrators). 2020a. "Who we are." Accessed July 29, 2020. https://www.securities-administrators.ca/aboutcsa.aspx?id=77.

-- -- --. 2020b. "CSA Regulatory Sandbox." Accessed May 29, 2020. https://www.securities-administrators.ca/industry_resources.aspx?id=1588.

CSBS (Conference of State Bank Supervisors). 2020. "About Modernization." Accessed July 1, 2020. https://www.csbs.org/about-nmls-modernization.

-- -- --. 2019a. "Fintech Industry Advisory Panel Recommendations and next steps." Accessed July 1, 2020. https://www.csbs.org/sites/default/files/2019-02/FIAP%20Chart%20and%20Next%20Steps.pdf.

-- -- --. 2019b. "Fintech advisory panel Accountability report." Accessed July 1, 2020. https://www.csbs.org/system/files/2020-01/Fintech-Accountability-Report.pdf.

Deloitte. 2020. "Open Banking around the world: towards a cross-industry data sharing ecosystem." Accessed July 22, 2020. https://blogs.deloitte.co.uk/financialservices/2018/11/open-banking-around-the-world-towards-a-cross-industry-data-sharing-ecosystem.html#_ftn11.

-- -- --. 2018. "Israel Fintech Landscape Report." Accessed May 29, 2020. https://www2.deloitte.com/content/dam/Deloitte/il/Documents/technology/Israel%20Fintech%20Landscape%20Report.pdf.

-- -- --. 2017a. "How to flourish in an uncertain future. Open Banking." Accessed Aug 8, 2020. https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/financial-services/deloitte-uk-open-banking-how-to-flourish-in-an-uncertain-future.pdf.

-- -- --. 2017b. "Closing the gap. Encouraging fintech innovation in Canada." Accessed August 9, 2020. https://www2.deloitte.com/content/dam/Deloitte/ca/Documents/financial-services/CA-2017-FSI-EN-Closing-the-gap-AODA.PDF.

-- -- --. 2017c. "How to flourish in an uncertain future. Open banking and PSD2." Accessed August 18, 2020. https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/financial-services/cz-open-banking-and-psd2.pdf.

-- -- --. 2017d. "PSD2 and GDPR -friend or foes?" Accessed August 18, 2020. https://blogs.deloitte.co.uk/financialservices/2017/08/psd2-and-gdpr-friends-or-foes.html.

Desai, Falguni. 2015. "The Evolution of Fintech." *Forbes.* Accessed July 14, 2020. https://www.forbes.com/sites/falgunidesai/2015/12/13/the-evolution-of-fintech/#75fdc1dc7175.

EC (European Commission). 2020a. "Data protection in the EU." Accessed August 18, 2020. https://ec.europa.eu/info/law/law-topic/data-protection/data-protection-eu_en.

-- -- --. 2020b. "GDPR – the fabric of a success story." Accessed August 18, 2020. https://ec.europa.eu/info/law/law-topic/data-protection/eu-data-protection-rules/gdpr-fabric-success-story_en.

ECB (European Central Bank). 2018. "The revised Payment Services Directive (PSD2) and the transition to stronger payments security." Accessed August 18, 2020. https://www.ecb.europa.eu/paym/intro/mip-online/2018/html/1803_revisedpsd.en.html.

Edgington, Tom. 2020. "Brexit: What is the transition period?" *BBC NEWS.* Accessed August 18, 2020. https://www.bbc.com/news/uk-politics-50838994.

EP (European Parliament). 2016. "Regulation (EU) 2016/679 of the European Parliament and of the council." Accessed June 9, 2020. https://eur-lex.europa.eu/eli/reg/2016/679/oj.

Eroglu, Hakan. 2019. "The Asia Pacific way of Open Banking regulation." *Finextra.* https://www.finextra.com/blogposting/17396/the-asia-pacific-way-of-open-banking-regulation.

EU (European Union). 2012. "Charter of Fundamental Rights of the European Union." Accessed August 17, 2020. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:12012P/TXT.

EY (Ernst and Young). 2019. "Global FinTech Adoption Index." Accessed July 27, 2020. https://www.ey.com/en_gl/ey-global-fintech-adoption-index.

-- -- --. 2017. "EY Fintech Adoption Index 2017." Accessed July 27, 2020. https://www.ey.com/Publication/vwLUAssets/ey-fintech-adoption-index-2017/$FILE/ey-fintech-adoption-index-2017.pdf.

-- -- --. 2016. "EY FinTech Adoption Index – Germany." Accessed July 27, 2020. https://start-up-initiative.ey.com/wp-content/uploads/2016/08/EY_FinTech_Adoption_Index.pdf.

FDX (Financial Data Exchange). 2020a. "About." Accessed August 17, 2020. https://financialdataexchange.org/FDX/About/FDX/About/About.aspx?hkey=dffb9a93-fc7d-4f65-840c-f2cfbe7fe8a6.

-- -- --. 2020b "Members." Accessed August 17, 2020. https://financialdataexchange.org/FDX/The-Consortium/Members.aspx?WebsiteKey=deae9d6d-1a7a-457b-a678-8a5517f8a474&hkey=362ecd23-b752-48aa-b104-a99e916276c8&New_ContentCollectionOrganizerCommon=1#New_ContentCollectionOrganizerCommon.

Feller, Greg. 2019. "Greg Feller: Canadian banks are about to have their Apple moment." *Financial Post*. Accessed June 24, 2020. https://business.financialpost.com/opinion/greg-feller-canadian-banks-are-about-to-have-their-apple-moment.

Finch Capital and Dealroom.com. 2019. "State of European FinTech" accessed May 29, 2020. https://blog.dealroom.co/wp-content/uploads/2019/10/The-State-of-European-Fintech-2019.pdf?_ga=2.34433569.1466205195.1571827244-2104247381.1571407367.

Finextra. 2020. "Fintechs take flight as FCA freezes customer accounts at Wirecard UK." Accessed July 29, 2020. https://www.finextra.com/newsarticle/36108/fintechs-take-flight-as-fca-freezes-customer-accounts-at-wirecard-uk.

Flitter, Emily. 2020. "Big Banks, Ready for Recession, Set Aside Billions." *New York Times.* Accessed July 29, 2020. https://www.nytimes.com/2020/04/14/business/bank-earnings-jpmorgan-wells-fargo.html#:~:text=The%20chief%20executive%20of%20JPMorgan,the%20same%20quarter%20last%20year.

Frost, John. 2020. "The economic forces driving fintech adoption across countries." *BIS Working Papers*. Accessed July 21, 2020. https://www.bis.org/publ/work838.pdf.

FRBSF (Federal Reserve Bank of San Fransico). 2019. "The Slow Introduction of Open Banking and API's in Japan." Accessed August 18, 2020. https://www.frbsf.org/banking/asia-program/pacific-exchanges-podcast/open-banking-apis-japan/.

FSA (Financial Services Agency). 2020. "Financial Services Agency." Accessed September 13, 2020. https://www.fsa.go.jp/en/about/pamphlet_e.pdf.

FSB (Financial Stability Board). 2017. "Financial Stability Implications from FinTech." Accessed June 27, 2020. https://www.fsb.org/wp-content/uploads/R270617.pdf.

FSI (Financial Stability Institute). 2020. "Policy responses to fintech: a cross country review." Accessed July 2, 2020. https://www.bis.org/fsi/publ/insights23.pdf.

FSOC (Financial Stability Oversight Council) 2019. "2019 Annual Report." Accessed https://home.treasury.gov/system/files/261/FSOC2019AnnualReport.pdf.

Gill, Darren. 2019. "One size doesn't fit all: Strict regulations meant for big banks holding back fintech in Canada." *Financial Post.* Accessed June 24, 2020. https://financialpost.com/opinion/one-size-doesnt-fit-all-strict-regulations-meant-for-big-banks-holding-back-fintech-in-canada.

GAO (United States Government Accountability Office). 2018. "Financial Technology: Additional Steps by Regulators Could Better Protect Consumers and Aid Regulatory Oversight." *Report to Congressional Requesters*. Accessed June 29, 2020. https://www.gao.gov/assets/700/690803.pdf.

HKMA (Hong Kong Market Authority). 2019. "Mandate of the HKMA to Oversee Financial Market Infrastructures." Accessed September 13, 2020. https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/financial-market-infrastructure/oversight-of-financial-market-infrastructure-fmi/mandate-of-the-hkma-to-oversee-financial-market-infrastructures/.

-- -- --. 2018. "Open API framework for the Hong Kong Banking Sector." Accessed August 18, 2020. https://www.hkma.gov.hk/media/eng/doc/key-information/press-release/2018/20180718e5a2.pdf.

IMF (International Monetary Fund). 2019. "Canada Financial Stability Assessment." Accessed June 17, 2020. file:///C:/Users/ajtay/Downloads/1CANEA2019003.pdf.

Investopedia. 2019. "Application Programming Interface (API)." Accessed Aug 9, 2020. https://www.investopedia.com/terms/a/application-programming-interface.asp.

Israel. Ministry of Finance. 2018 "Israel's National Fintech-Cyber Innovation Lab." Accessed June 7, 2020. https://mof.gov.il/en/About/Units/CyberEmergenciesSafetyDraft/Pages/Cyber-Fintech.aspx.

-- -- --. Ministry for Social Inequality. 2017. "The Digital Israel National Initiative: The National Digital Program of the Government of Israel." Accessed May 29, 2020. https://www.gov.il/BlobFolder/news/digital_israel_national_plan/en/The%20National%20Digital%20Program%20of%20the%20Government%20of%20Israel.pdf.

KPMG. 2020. "Pulse of FinTech H2 2019." Accessed May 29, 2020. https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/02/pulse-of-fintech-h2-2019.pdf.

McKinsey. 2019. "The last pit stop? Time for bold late cycle moves. McKinsey Global Banking Annual Review 2019. "Accessed July 20, 2020. https://www.mckinsey.com/~/media/mckinsey/industries/financial%20services/our%20insights/global%20banking%20annual%20review%202019%20the%20last%20pit%20stop%20time%20for%20bold%20late%20cycle%20moves/mckinsey-global-banking-annual-review-2019-vf.pdf.

Mengyu Li, Mandy. 2020. "2020 – End or Revival of the OCC FinTech Charter?" *Jolt Digest*. Accessed June 25, 2020. http://jolt.law.harvard.edu/digest/2020-end-or-revival-of-the-occ-fintech-charter.

Meyer Aaron, Francisco Rivadeneyra and Samantha Sohal. 2017. "Fintech: Is This Time Different? A Framework for Assessing Risks and Opportunities for Central Banks." *Bank of Canada Staff Discussion Paper.* Accessed June 27, 2020. https://www.bankofcanada.ca/wp-content/uploads/2017/07/sdp2017-10.pdf.

MSA (Monetary Authority of Singapore). 2019. "About Us." Accessed September 13, 2020. https://www.mas.gov.sg/who-we-are/about-us.

Moufakkir, Marouane & Qmichchou, Mohammed. (2020). "The Nexus Between FinTech Adoption and Financial Inclusion." In *Impact of Financial Technology (FinTech) on Islamic Finance and Financial Stability*. 193-209. DOI: 10.4018/978-1-7998-0039-2.ch010.

Muhleisen, Martin. 2018. "The Long and Short of the Digital Revolution." *IMF Finance and Development Magazine*. 55 (2): 4-8.

OC (Option Consommateurs). 2015. “The views of Canadians on the harmonization of consumer protection standards.” Accessed August 22, 2020. https://option-consommateurs.org/wp-content/uploads/2017/08/option-consommateurs-2014-2015-harmonisation-normes-protection-consommateurs-eng.pdf.

OCC (Offices of the Comptroller of the Currency). 2016. “Exploring Special Purpose Banking Charters for Fintech Companies.” Accessed June 25, 2020. https://www.occ.gov/publications-and-resources/publications/banker-education/files/exploring-special-purpose-nat-bank-charters-fintech-companies.html.

OECD. 2020. “Digital Disruption in Banking and its Impact on Competition.” Accessed May 29, 2020. http://www.oecd.org/daf/competition/digital-disruption-in-banking-and-its-impact-on-competition-2020.pdf.

O’Kane, Josh. 2020. “Shopify’s revenue doubles as COVID-19 sparks boom in online retail.” *Globe and Mail.* Accessed July 29, 2020. https://www.theglobeandmail.com/business/article-shopifys-revenue-doubles-marking-companys-second-profitable-quarter/.

Open Banking. 2020a. “About Us.” Accessed August 18, 2020. https://www.openbanking.org.uk/about-us/.

-- -- --. 2020b. “Meet the regulated providers.” Accessed August 9, 2020. https://www.openbanking.org.uk/customers/regulated-providers/.

OSC (Ontario Securities Commission). 2020. “The U.S. Financial Regulatory System.” Accessed July 14, 2020. https://research.osc.gov.on.ca/globalreg/usreg.

Peirce, Hester. 2018. “Keynote Address,” Speech, Fintech Unbound: The Cato Summit on Financial Regulation. Accessed May 29, 2020. https://www.cato.org/ events/cato-summit-financial-regulation-2018.

Philippon, Thomas. 2016. “The Fintech Opportunity.” *NBER Working Papers.* Accessed July 30, 2020. https://www.nber.org/papers/w22476.pdf.

Sahay, Ratna, Martin Čihák, Papa N’Diaye, Adolfo Barajas, Srobona Mitra, Annette Kyobe, Yen Nian Mooi and Seyed Reza Yousefi. 2015. “Financial inclusion: can it meet multiple macroeconomic goals?”, *IMF Staff Discussion Note.* Accessed July 30, 2020. https://www.imf.org/external/pubs/ft/sdn/2015/sdn1517.pdf.

Shields, Lisa. 2018. “Why all Canadians should care about open banking.” *Globe and Mail.* Accessed July 9, 2020. https://www.theglobeandmail.com/business/commentary/article-why-all-canadians-should-care-about-open-banking/.

Solomon, Shoshanna. 2020. “Investment in Israeli fintech industry surged to record $1.8 billion in 2019.” *The Times of Israel*. Accessed July 10, 2020. https://www.timesofisrael.com/investment-in-israeli-fintech-industry-surged-to-record-1-8-billion-in-2019/.

Statista. 2019. "Largest banks in Australia in financial year 2019, by assets." Accessed August 17, 2020. https://www.statista.com/statistics/434596/leading-banks-in-australia-assets/.

USDT (United States Department of the Treasury). 2018. "A Financial System that Creates Economic Opportunities. Nonbank Financials, Fintech and Innovation." Accessed July 1, 2020. https://home.treasury.gov/sites/default/files/2018-08/A-Financial-System-that-Creates-Economic-Opportunities---Nonbank-Financials-Fintech-and-Innovation.pdf.

Van Horne, Ryan. 2020. "Quadriga CEO committed fraud, OSC rules in investigative report." *CTV News.* Accessed June 29, 2020. https://atlantic.ctvnews.ca/quadriga-ceo-committed-fraud-osc-rules-in-investigative-report-1.4980923.

Walker, Mark. 2020. "First to Receive a Banking License in Israel in 40 Years, the New Bank has Partnered with Tata Consultancy Services' Banking Service Bureau to Offer Innovative and Differentiated Services." *The FINTECH Times*. Accessed May 29, 2020. https://thefintechtimes.com/first-to-receive-a-banking-license-in-israel-in-40-years-the-new-bank-has-partnered-with-tata-consultancy-services-banking-service-bureau-to-offer-innovative-and-differentiated-services/.

Watson, Charlotte and Alex LaPlante. 2018. "An Overview of Fintech in Canada." *Global Risk Institute, Financial Innovation Series*. Accessed May 29, 2020. https://globalriskinstitute.org/publications/an-overview-of-fintech-in-canada/.

WBG (World Bank Group). 2017. "The Global Findex Database 2017." Accessed July 14, 2020. file:///C:/Users/ajtay/Downloads/9781464812590%20(1).pdf.

WEF (World Economic Forum). 2017. "Beyond Fintech: A Pragmatic Assessment of Disruptive Potential In Financial Services." Accessed June 25, 2020. http://www3.weforum.org/docs/Beyond_Fintech_-_A_Pragmatic_Assessment_of_Disruptive_Potential_in_Financial_Services.pdf.

Viacom. 2013. "The Millenial Disruption Index." Accessed June 24, 2020. https://www.bbva.com/wp-content/uploads/2015/08/millenials.pdf.

Ziady, Hanna. 2020. "Europe's banks set aside billions more as they brace for bad debts." *CNN*. Accessed July 29, 2020. https://edition.cnn.com/2020/07/29/investing/europe-banks-covid-debts/index.html.

Zochodne, Geoff. 2020a. "Bank of Canada extends oversite of Interac's e-Transfer service." *Financial Post.* Accessed August 15, 2020. https://financialpost.com/news/fp-street/bank-of-canada-extends-oversight-to-interacs-e-transfer-service-as-digital-payments-surge.

-- -- --. 2020b. "Open banking review faces 'worrying' delay as pandemic drives Canadians to fintech." *Financial Post,* Accessed August 23, 2020. https://financialpost.com/news/fp-street/open-banking-review-faces-worrying-delay-as-pandemic-drives-canadians-to-fintech.

-- -- --. 2019a. “Inside the power struggle between big banks and fintech to modernize financial services.” *Financial Post.* Accessed June 24, 2020. https://business.financialpost.com/technology/watch-out-big-banks-you-might-wake-up-one-day-and-be-blockbuster.

-- -- --. 2019b. “Canada’s financial upstarts are lining up behind open banking, but bigger players may need convincing.” *Financial Post.* Accessed July 14, 2020. https://financialpost.com/news/fp-street/canadas-financial-upstarts-are-lining-up-behind-open-banking-but-bigger-players-may-need-convincing.