HOUSING RESEARCH REPORT

Canada Mortgage and Housing Corporation

Review of FinTech in Canada's Mortgage Industry

Canada

CMHC SCHL

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Canada Mortgage and Housing Corporation

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May 2020

Note to Reader

Deloitte LLP ("Deloitte") has provided this report to the Canadian Mortgage and Housing Corporation ("CMHC") as part of a project to review the footprint of financial technology ("FinTech") in Canada's mortgage industry. This report is accompanied by two databases of FinTech firms/products compiled by Deloitte (herein referred to as "databases") dated March 9, 2020[1], which have been submitted under separate covers. This report outlines the outcomes of our primary and secondary research, reflecting our review of (i) academic and business literature, (ii) FinTech products and relevant to the mortgage industry, as captured in our databases, (iii) consultations with stakeholders in the mortgage space, and (iv) CMHC's input and comments. Together, as it relates to the engagement, the report and databases present our complete review and analysis of FinTech in Canada's mortgage industry.

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We believe that our analysis must be considered as a whole and that selecting portions of the analysis or the factors considered by it, without considering all factors and analyses together, could create a misleading view of the issues related to the analysis. Amendment of any of the assumptions identified throughout this report could have a material impact on our analysis contained herein. Should any of the major assumptions not be accurate or should any of the information provided to us not be factual or correct, our analysis, as expressed in this report, could be significantly different.

1. Please note that selected stakeholder consultations were conducted after March 9, 2020. The March 9, 2020 date refers to the date that Deloitte's core analysis was completed.

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Executive Summary

About this Study

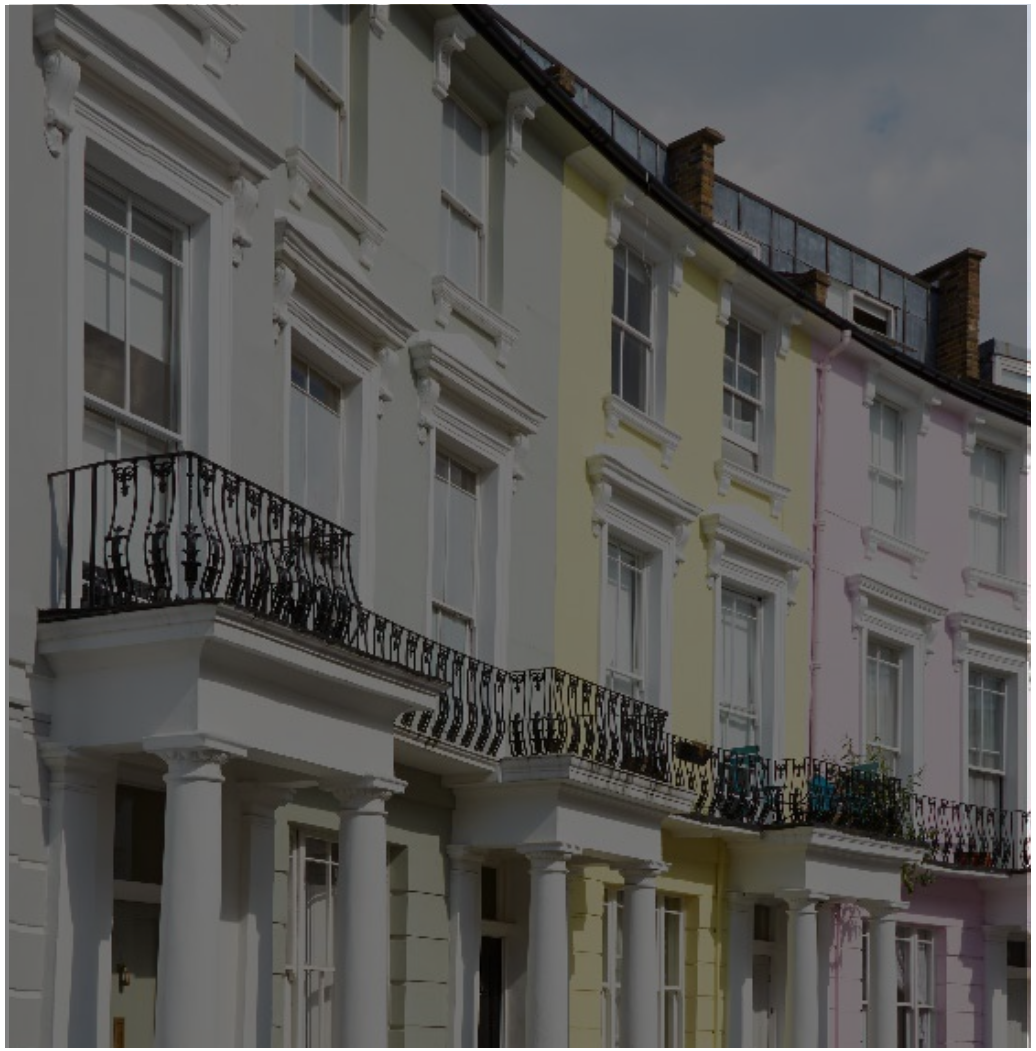
Technology adoption rates have expanded exponentially in almost every facet of society and industry. New technologies like artificial intelligence, blockchain, and cloud computing are revolutionizing everyday tasks and fundamentally transforming industries. The financial services industry is no different – and is undergoing a transformation of its own. In recent years, the growth of new financial technology ("FinTech") products and firms has accelerated in almost every facet of the financial services industry introducing new capabilities ranging from digital lending to payment solutions.[1] Consumers have adopted FinTech products and firms at a rapid pace – the global rate of consumer adoption reached 64% in 2019, significantly higher than 16% in 2015.[2]

FinTech is changing the way that people interact with their finances and financial institutions. As adoption rates in Canada lag behind peers, mortgages are a segment of the financial market that impact a large portion of the world's population: 61% of Canadian homeowners have a mortgage[3], while in the US[4] and UK[5] it is as high as 67%. As such, it is increasingly important for consumers, businesses, and policy makers to understand FinTech products and firms related to mortgages and to understand their associated trends and impact.

To develop a perspective on the matter, the Canadian Mortgage and Housing Corporation ("CMHC") engaged Deloitte LLP ("Deloitte") to review the footprint of FinTech in Canada's mortgage industry. At a high level, Deloitte's review focuses on:

- Defining FinTech products and firms relevant to the mortgage industry;
- Exploring the breadth and scope of innovative technologies in the mortgage industry;
- Analyzing the impacts of innovative technologies in the mortgage industry;
- Reviewing opportunities, threats, and regulatory considerations stemming from FinTech in the mortgage industry; and
- Developing databases to identify FinTech firms with active operations in Canada's mortgage industry, as well as FinTech firms based in international jurisdictions that may expand to Canada in future periods.[6]

This executive summary includes a selection of our key observations from this study. Please refer to the main body of the report for detailed information on our analyses and findings.



1. Please refer to page 19 of this document for more information on the capabilities of FinTech within subcategories.
2. Global Consulting Company, *Global FinTech Adoption Index 2019*, 2019.
3. Statistics Canada, *2016 Census of Population*, 2017.
4. Brenda Richardson, "Nearly 40% Of Homes In The U.S. Are Free And Clear Of A Mortgage", Forbes, July 26, 2019.
5. Sarah O'Grady, "Britain's homeowners now outnumber mortgage-payers such as cash buyers drive the trend", Express, March 1, 2017.
6. The domestic and international databases (dated March 9, 2020) have been submitted under separate covers.

Our Approach to Defining Mortgage FinTech

We define FinTech as technology enabled innovation focused on performing or supporting functions associated with the mortgage lifecycle

DISRUPTIVE TECHNOLOGIES

 Artificial Intelligence

 Robotic Process Automation

 Application Programming Interface

 Blockchain

What is FinTech?	**FinTech** is any business that applies a technologically enabled innovation specifically geared for the provision or distribution of financial services.
What are the most well-known subcategories of FinTech?[1]	• **Payment technology** ("PayTech") centers on the use of technology to enable the electronic transfer of value. The market participants in PayTech mainly focus on deposits, savings and payments, and are often tied to larger financial institutions. • **Capital markets** have increasingly seen innovations in platforms that enable institutional capabilities ranging from trading to settlement. This allows institutions to improve client relationships and experiences, streamline office costs, and optimize regulatory insurance. • **Personal finance management** ("PFM") innovations include digital tools to help people manage money – e.g., bills, personal banking, credit accounts – in a more seamless way. • **Wealth management technology** ("WealthTech") centers on platforms and analytics tools that re-define investment processes and/or leverage algorithms to automate or augment investment advice (e.g., robo-advisers). • **Insurance technology** ("InsurTech") covers a range of innovation initiatives for insurance companies, from upgrading and digitizing legacy operations to enhancing the experience of policyholders, distributors, and employees in the insurance industry. • **Regulatory technology** ("RegTech") disrupts the regulatory landscape by providing technologically advanced solutions to the ever increasing demands of compliance within the financial industry, helping organizations better handle regulatory and risk management requirements. • **Lending technology** ("LendTech") centers on digital lending services or platforms that focus on re-designing one or more stages of the lending lifecycle, or in a particular segment (e.g., credit, auto, mortgage, peer-to-peer).
What is mortgage technology?	• A definition for mortgage technology has not achieved consensus, unlike the more well defined FinTech subcategories summarized above. Mortgage technology is considered to be an extension of LendTech. However, some technological capabilities can be found in FinTech firms within the mortgage industry often related to RegTech, InsurTech, and capital markets technology. We define mortgage technology as the application of technologically enabled innovation focused on the following mortgage functions: – Mortgage search – Loan origination – Loan processing and underwriting – Insurance and servicing – Investment management – Funding (securitization) – Fundraising (crowdfunding)
Selected Definition	**Fintech situated within the mortgage industry applies technologically enabled innovation focused on performing or supporting functions associated with the mortgage lifecycle.**

1. Deloitte's analyses reveal that these seven subcategories of FinTech have generated the most interest from stakeholders in recent years.

Key Impacts of FinTech on Canada's Mortgage Industry

FinTech can impact Canada's mortgage industry by enabling a range of opportunities and challenges relevant to borrowers, lenders, investors, and the ecosystem

Based on our literature review and stakeholder consultations, we explored the potential impacts of FinTech on Canada's mortgage industry. The impacts are multifaceted and can relate to a number of personas – borrowers, lenders, investors, and the mortgage ecosystem. The table below presents a summary of our analysis on potential impacts in four key categories, as well as the expected timeline of each impact and the persona(s) most affected by the impact.

Area of Impact	Time Horizon[1]	Most Impacted Personas[2]			
		Borrowers	Lenders	Investors	Eco-system
Customer Efficiency					
FinTech enabled mortgage loans are processed faster than traditional mortgages	Short Term	✓	✓	✓	
Fintech enabled mortgage loans may be associated with more accurate risk analysis compared to traditional mortgage loans	Short Term		✓	✓	✓
Underserved Borrowers					
FinTech lenders can expand credit access for borrowers in non-metropolitan areas	Short Term	✓	✓		✓
FinTech can reduce personal bias towards minority groups in the mortgage lending process	Short Term	✓	✓		✓
Structural Market Changes					
FinTech can positively impact homeownership rates and mortgage supply elasticity	Medium Term	✓	✓		✓
FinTech can enable cross-border competition in financial services	Medium Term				✓
Non-bank FinTech lenders have the potential to enable systemic risk if they capture a significant market share	Long Term		✓		✓
Cost Savings and Operational Efficiencies					
FinTech can reduce instances of fraud in mortgage applications	Short Term		✓	✓	✓
FinTech can enable cost reductions and operational efficiencies for lenders	Medium Term		✓		
Mortgage brokers can realize many advantages from FinTech in serving their client base	Medium Term	✓	✓	✓	

1. Definitions of each time horizon: short-term (0 to 2 years), medium-term (2 to 5 years), long-term (5 to 10 years).
2. Given the dynamic nature of the industry, this should not be viewed as a comprehensive list of impacted personas. Other personas may be impacted as the industry matures and changes over time.

Summary of Potential Barriers to Entry Identified

FinTech firms looking to expand operations into Canada may face a range of barriers to entry

We identified eight potential barriers to entry that may inhibit the ability of FinTech firms located internationally to expand operations into Canada's mortgage industry. The potential barriers were primarily identified through secondary research and stakeholder consultations. We describe how each barrier to entry compares to the US and UK (i.e., our selected comparator jurisdictions). Our jurisdictional comparison provides key insights into how Canada can mitigate some barriers to entry.

The table below summarizes the identified potential barriers to entry.

Potential Barriers to Entry	Brief Description
1. Regulatory Complexity	Complex regulatory frameworks have been identified as a key barrier to FinTech adoption in Canada
2. Cybersecurity Considers	Concerns over cybersecurity are limiting consumer acceptance of FinTech firms in the mortgage industry
3. Consumer Acceptance	Canadian customers often lack awareness and acceptance of mortgage FinTech products
4. Lack of Experience Completing Financial Cycles	The literature identified lack of industry specific knowledge as a key factor shaping FinTech adoption in the mortgage industry
5. Limited Mortgage-Backed Security Opportunities	Mortgage securitization activities are heavily regulated in Canada, potentially limiting available funding sources for smaller institutions
6. Traditional Reliance on Income Verification	Alternate methods to calculate creditworthiness may not be accepted and recognized in an environment with a strong traditional reliance on income verification
7. Open Banking in Nascent Stages	Despite the potential benefits of open banking in promoting innovation in the financial services industry, Canada has yet to establish open banking capabilities
8. Lack of Private Investment in Canada	Relative to peers, Canada's funding ecosystem is limited – therefore potentially limiting the scope of investment activity in FinTech

Key Observations and Lessons on Canada's Regulatory Approach

Based on our review of regulatory environment in comparator jurisdictions, we identified several relevant insights on Canada's regulatory approach to FinTech

Regulatory fragmentation between different levels of government, sub-national bodies, and other regulatory organizations can hinder expansion of FinTechs. This fragmentation exists in Canada due to a complex regulatory framework – which is complicated because certain financial institutions are regulated federally, while others provincially. Additionally, regulations are entity based, meaning that FinTech firms must comply with entity-specific statutes. Creating a framework in which firms can easily expand within the country, without having to comply with several different regulators and entity-specific statutes will encourage the scaling of domestic FinTechs as well as the expansion of international FinTechs to Canada. This may include a shift towards a more functions-based approach as well as greater coordination between provincial legislators.

Fostering a collaborative environment between regulators and FinTech firms can be beneficial to all parties. Regulators can gain access to new technologies and approaches, while FinTechs can better ensure regulatory compliance. The FinTech industry is dynamic and fast-changing, therefore forging **sustainable partnerships between public and private stakeholders** can ensure that regulatory activities are up-to-date and conducive to innovation. For example, there is opportunity for regulators to co-create business models with FinTech firms, offer regulatory support to FinTechs during the incubation phase to ensure compliance, and simply publish a comprehensive set of tools and resources for FinTechs looking to undertake regulated activities. In addition, this form of collaboration may allow regulators to gain a better understanding of potential emerging risks arising from innovative business models and services.

Promoting international cooperation and collaboration can help attract and grow innovation in the FinTech sector. Cross-border regulatory coordination can stimulate market development by helping FinTechs expand internationally. In addition, knowledge-sharing on innovation in financial services can ensure that regulators are informed by best practices, lessons learned, and different regulatory approaches to innovation.

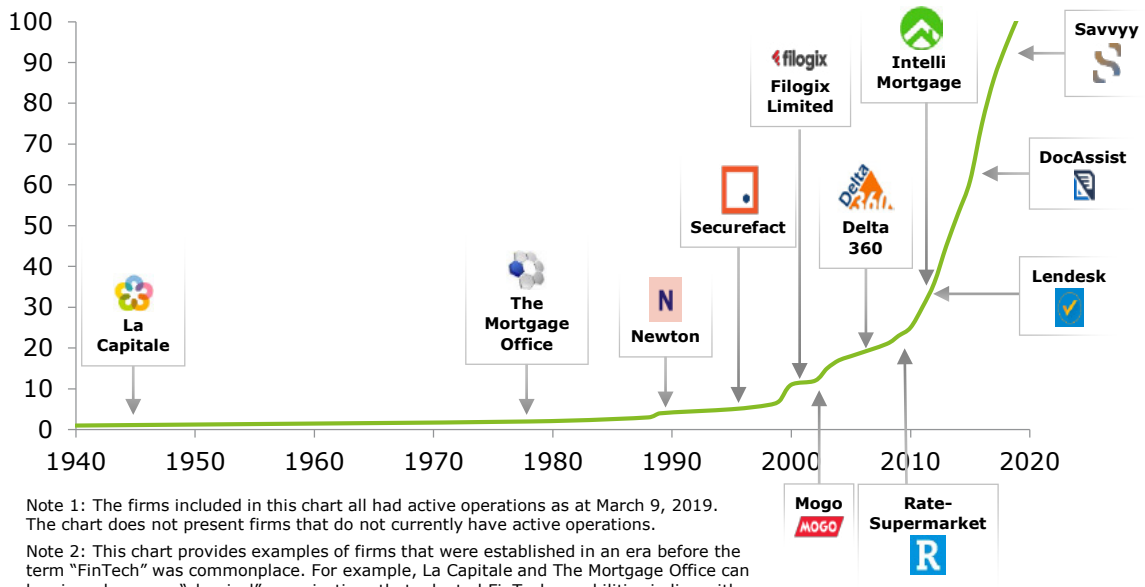
Given the fast pace of technological change, regulators may benefit from **co-design and regular stakeholder engagement** in the development of regulatory and financial innovation activities. To foster this flexibility, regulations should be principle-based (i.e., based on guiding principles and best practices). This approach may involve monitoring key developments in the industry and working directly with FinTech firms and other external stakeholders where knowledge gaps exist. The importance of adaptability may be especially salient when considering the development of FinTech capabilities that are traditionally heavily regulated.

It is important to recognize that learning from the experiences of international jurisdictions can provide valuable guidance, however, **there does not exist a one-size-fits-all solution** to regulating FinTech. Regulations and initiatives designed to promote innovation need to be tailored to the Canadian context, created with a deep understanding of the existing FinTech market and the key risks involved.

High-Level Observations on Domestic FinTech Database

A majority of FinTech firms are concentrated in earlier phases of the mortgage process, executing functions such as mortgage search and loan origination

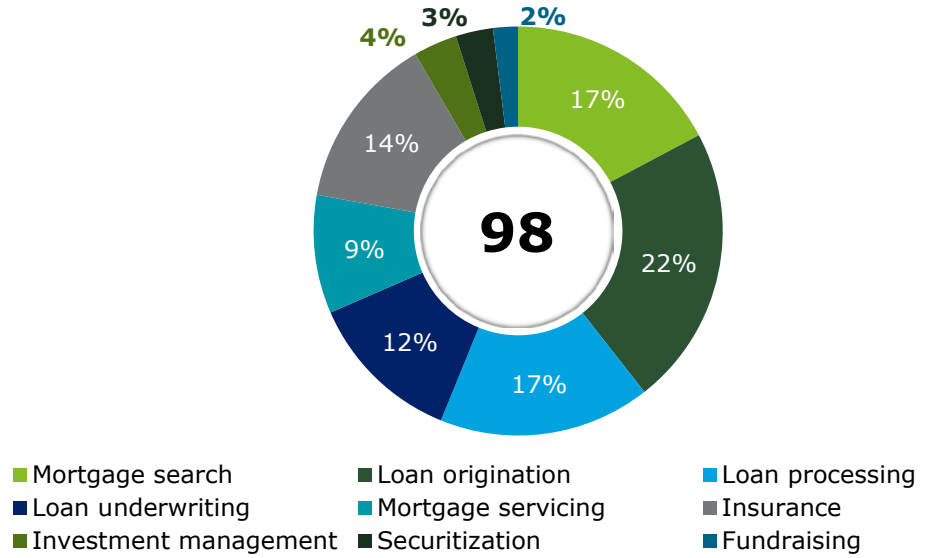
Mortgage FinTechs Currently Operating in Canada (by year of establishment)



Note 1: The firms included in this chart all had active operations as at March 9, 2019. The chart does not present firms that do not currently have active operations.

Note 2: This chart provides examples of firms that were established in an era before the term "FinTech" was commonplace. For example, La Capitale and The Mortgage Office can be viewed as once "classical" organizations that adopted FinTech capabilities in line with our search strategy.

Distribution of FinTech Firms by Mortgage Function



- FinTech firms in Canada's mortgage industry have significantly increased in number over the past decade.
- Deloitte's domestic database includes **98 FinTech firms** operating in Canada's mortgage industry – 90 of which are headquartered in Canada and 8 headquartered internationally.
- The largest number of Mortgage FinTechs exist in **Ontario (65%)**, and the second and third largest numbers of Mortgage FinTechs exist in **British Columbia (19%)** and **Quebec (9%)**.
- More than half of Mortgage FinTechs in Deloitte's domestic database operate under a B2B market context. These firms provide a core part of the technology stack in banks, credit unions, and other lenders.

- We find that Mortgage FinTechs are concentrated in the initial phase of the mortgage process – the top two categories of mortgage functions associated with FinTech firms in Canada are **mortgage search and loan origination**. This observation was echoed and validated through our stakeholder consultations.
- Other major functions associated with FinTech firms are loan processing and insurance. There is least activity within the securitization, fundraising, and investment management functions – together accounting for less than 10% of mortgage functions associated with FinTech firms. This observation is consistent with our findings from the literature and stakeholders consultations, which inform a lack of technological innovation within the securitization process in Canada.

1. Purpose of Report

Purpose of Report

This report outlines the outcomes of our primary and secondary research, reflecting our review of (i) academic and business literature, (ii) FinTech products and firms relevant to the mortgage industry, as presented in our databases, (iii) consultations with stakeholders in the mortgage space[1], and (iv) CMHC's input and comments. The data and analysis in this report are presented in line with eight key sections, as outlined below.

Definitional Approach to FinTech	We describe our perspective on how the FinTech sector is identified in secondary literature from around the world - both in broad terms and specific to the mortgage industry. The definitional approach is key to align on taxonomy and set the stage for subsequent analyses.
Overview of FinTech	It is important to understand the broader FinTech landscape in order to contextualize the market size of mortgage-focused FinTech products and firms. This section provides an overview of the global and Canadian FinTech landscape.
Observations on FinTech within Canada's Mortgage Industry	This section outlines high-level trends and observations related to technological innovation in the mortgage space, including the key drivers of mortgage-related FinTech in Canada, considerations around technological expansion and adoption, and broader patterns of innovation.
Impacts of FinTech on Canada's Mortgage Industry	This section describes the impacts of FinTech on Canada's mortgage industry to key stakeholders in the mortgage space (i.e., borrowers, lenders, investors, and the ecosystem). We present evidence from the literature and insights from our stakeholder consultations to substantiate the impacts.
Regulatory Context and Considerations	This section presents a high-level overview of Canada's regulatory environment as it relates to FinTech in the mortgage space. The relevant regulatory environments of two comparator jurisdictions (i.e., US and UK) are explored to derive key lessons for Canada in enabling a more friendly regulatory environment for FinTech.
Examples of Potential Barriers to Entry	This section outlines potential barriers to entry for both domestic FinTech firms looking to scale within Canada and FinTech firms based internationally looking to expand into Canada. We explore the market and structural barriers in Canada that inhibit the scale and expansion of FinTech firms.
Overview of Deloitte's Domestic FinTech Database	This section outlines the search strategy and selection criteria employed to identify FinTech products and firms in Canada's mortgage industry. Herein, we present our data-driven observations on the distribution and magnitude of the mortgage FinTech space across several dimensions.
Overview of Deloitte's International FinTech Database	This section outlines the search strategy and selection criteria employed to identify FinTech products and firms in comparator jurisdictions that may expand to Canada in future periods. Herein, we present our data-driven observations on the distribution and relevance of FinTech products and firms in comparator jurisdictions.

1. Please refer to Appendix 2 of this document for the list of stakeholders we interviewed for this engagement.

2. Definitional Approach to FinTech

Framework for Defining FinTech

As there is no formal agreed upon definition of FinTech, several steps were undertaken to develop a definition for CMHC

For the purposes of understanding mortgage-related FinTech, several definitional dimensions need to be considered to understand the precise population of firms and economic activity of FinTech firms relevant to the mortgage industry. Accordingly, we assessed six dimensions to develop a definition that could guide the selection of a firm that is relevant to the mortgage industry.

1. **Review of FinTech Definitions**
2. **Identifying Cross-Cutting Technologies**
3. **Identifying Subcategories of FinTech**
4. **Situating Mortgages Within FinTech**
5. **Identifying Mortgage Functions and Applied Applications**
6. **Characterizing Market Activity**

In this section, we walk through each of the aforementioned dimensions.

Review of FinTech Definitions

Several examples of FinTech definitions were uncovered during our literature review

An analysis of mortgage-related FinTechs should be situated in a broader understanding of FinTech. Unlike classically defined segments of the economy, which benefit from well-defined and agreed upon classification systems such as the North American Industrial Classification System, there is no agreed upon definition or taxonomy of FinTech firms or capabilities globally. In recent years, several approaches to defining and explaining what capabilities are included under the umbrella term 'FinTech' have been developed. Most definitions do not list or identify specific technological capabilities due to the dynamic and rapidly changing nature of the sector. However, most definitions explicitly acknowledge the role of technology or innovation, thereby centering on the provision of financial services in a new way shape or form. We have presented below a sample set of FinTech definitions.

Fintech is any business that applies a technologically enabled innovation specifically geared for the provision or distribution of financial services.[1]

[FinTech refers to] computer programs and other technology used to support or enable banking and financial services.[2]

[FinTech refers to] new entrants that promised to rapidly reshape how financial products were structured, provisioned and consumed.[3]

Beside indirect financing via commercial banks and direct financing through security markets, a third way to conduct financial activities will emerge which we will call 'internet finance'.[4]

Fin-tech is an economic industry composed of companies that use technology to make financial systems more efficient.[5]

Fintech is a service sector which uses mobile-centered IT technology to enhance the efficiency of the financial system. As a term, it is a compound of finance and technology and collectively refers to industrial changes forged from the convergence of financial services and IT.[6]

Fintech is a financial industry that applies technology to improve financial activities.[7]

Technology applied to financial services (Fintech) has a significant impact on our daily lives, from facilitating payments for foods and services to providing the infrastructure essential to the operation of the world's financial institutions.[8]

1. Findexable Limited, *The Global Fintech Index 2020*, 2019.
2. Oxford University Press, *Oxford English Dictionary*, 2019.
3. World Economic Forum, *Beyond Fintech: A Pragmatic Assessment of Disruptive Potential in Financial Services*, 2017.
4. Xie Ping and Zou Chuanwei, *The Theory of Internet* Finance, 2013.
5. Daniel McAuley, "What is FinTech?", Wharton Finance, October 22, 2015.
6. Yonghee Kim et al., *The Adoption of Mobile Payment Services for Fintech*, 2016.
7. Patrick Schueffel, *Taming the Beast: A Scientific Definition of Fintech*, 2016.
8. Sue Langley, *Landscaping UK Fintech*, 2014.

Review of FinTech Definitions (continued)

Based on our literature review, we have put forward a proposed definition of FinTech within which to situate analysis of mortgage related FinTechs

Our review of the literature on FinTech definitions revealed some common observations:

- Definitions acknowledge that technologies are applied within the financial services industry;
- Definitions often do not specify specific technologies (e.g., artificial intelligence) that are being applied – so as to 'future proof' the applicability of definitions; and
- Definitions of FinTech are often complemented with other forms of sub-definitions or taxonomies to communicate the 'family of technologies' that comprise FinTech.

Accordingly, below we present a proposed definition of FinTech:

> ***FinTech*** *is any business that applies a technologically enabled innovation specifically geared for the provision or distribution of financial services*.

This definition was selected for the following reasons:

1. Flexibility/adaptability: We can anticipate significant market maturation and change in coming years, as FinTech adoption becomes more pervasive, the aforementioned definition is broad enough to have longevity in the future. This can be contrasted with a narrowly defined approach to FinTech which may not evolve as well and use phases/words that could be out-of-date as the industry continues to changes its approach to self-identification.
2. Explicit recognition of financial services: FinTech can be powered by processes and technologies that lie in other fields of science and are applied elsewhere. For example, artificial intelligence is being applied in financial services as well as in the health sciences field. By anchoring the definition within the financial services industry, the definition limits firms/capabilities that are 'industry agnostic' (e.g., a company that has a tool or process that could be deployed across the industry).

Potential limitations:

- The definition does not explicitly state categories within FinTech – and therefore requires additional explanation/context to operationalize the definition. In the forthcoming slides, we detail subcategories of FinTech to provide this clarity.
- The term "innovation" contained within this definition can vary in definition by source and context, thus potentially creating ambiguity in a standardized definition.

Based on this broader definition, we have put forward a proposed definition of FinTech situated within the mortgage industry.

> ***Fintech*** *situated within the mortgage industry applies technologically enabled innovation focused on performing or supporting functions associated with the mortgage lifecycle.*

Identifying Cross-Cutting Technologies

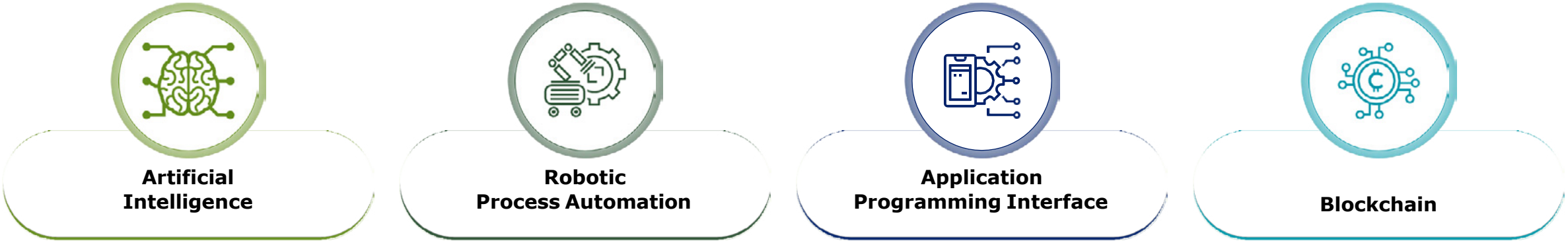
FinTech products and firms employ several innovative technologies, including artificial intelligence, robotic process automation, application programming interface, and blockchain

FinTech firms relevant to the mortgage industry often rely on technologies and capabilities across several fields of technology. As a result, several technologies that are not unique to the financial services sector may combine to impact the mortgage ecosystem. These technologies can have their own market drivers and are comprised of companies that often sell into other sectors. Reviewing the secondary literature, four key examples of such technologies that have been identified as having capabilities that could be relevant to the mortgage and lending process.

These technologies were selected based on the following characteristics:

- High level of applicability and adoption across industries including within financial services;
- Relevance to the tasks and requirements of the activity of borrowing and/or lending in the mortgage industry;
- Potential for high level of impact on business processes within the mortgage industry; and
- Appearance within business descriptions of FinTech firms identified by Deloitte as relevant to the mortgage industry.[1]

The four innovative technologies are: artificial intelligence ("AI"), robotic process automation ("RPA"), application programming interface ("API"), and blockchain.



Please refer to Appendix 3 for detailed descriptions of these four cross-cutting technologies.

1. It is important to note that the call out of these cross-cutting technologies within the business descriptions of firms often occurs for marketing purposes.

Identifying Subcategories of FinTech

FinTech can be divided into several subcategories – each with different market contexts

'FinTech' can be viewed as a broad, blanket statement. To understand where mortgage related activities 'fit' into the FinTech universe, one must break FinTech up into subcategories. As there are different perspectives on what FinTech is, there are also different approaches to defining subcategories within FinTech. These subcategories can be viewed as similar to subsectors in classically defined parts of the economy (e.g., automotive manufacturing as a subsector of manufacturing). We have presented below a summary view of FinTech's subcategories that synthesize approaches that we reviewed as well as perspectives from Deloitte's global literature:

FinTech Subcategories:

Payment technology centers on the use of technology to enable the electronic transfer of value. The market participants in PayTech mainly focus on deposits, savings and payments, and are often tied to larger financial institutions.

Capital markets innovations include technological advancements that enable institutional capabilities ranging from trading to settlement. The market participants in capital markets mainly focus on capital-raising activities by trading in equities, debt instruments, and other long-term investments.

Personal finance management innovations include digital tools to help people manage money – e.g., bills, personal banking, credit accounts – in a more seamless way

Wealth management technology centers on platforms and analytics tools that re-define investment processes and/or leverage algorithms to automate or augment investment advice (e.g., robo-advisers).

Insurance technology covers a range of innovation initiatives for insurance companies, from upgrading and digitizing legacy operations to enhancing the experience of policyholders, distributors, and employees in the insurance industry.

Regulatory technology centers on the provision of technologically advanced solutions to the ever increasing demands of compliance within the financial industry, helping organizations better handle regulatory and risk management requirements.

Lending technology centers on digital lending services or platforms that focus on re-designing one or more stages of the lending lifecycle, or in a particular segment (e.g., credit, auto, mortgage, peer-to-peer).

Situating Mortgages within FinTech

Given the breadth of the mortgage industry, relevant technologies and firms are spread across different subcategories of FinTech

Mortgage technologies can mainly be viewed as a part of the FinTech subcategory known as LendTech. LendTech enables a range of lenders – e.g., lenders involved in syndicated lending, commercial lending, consumer lending, mortgage lending – to adopt innovative technologies that focus on re-designing one or more stages of the lending lifecycle.

However, it is important to note that the functions associated with the mortgage industry are broader than direct lending activities. There are ancillary functions within the financial services industry that support the mortgage process – such as insurance, compliance, investment management, and securitization. As such, FinTech products and firms within the mortgage industry also overlap with other subcategories of FinTech like insurance technology, regulatory technology, wealth management technology, and capital markets. For more information on mortgage functions and applied mortgage technologies, please refer to pages 21-23 of this document.

We have presented below selected examples of FinTech firms in Canada that are associated with each aforementioned subcategory of FinTech. These examples were selected based on a review of the business descriptions of the company for alignment to any of the definitions.

Lending Technology

Savvyy builds automated, configurable, and next-gen mortgage platforms to enhance lender efficiency.

Manzil is an online lender that offers home financing options for Canadians who seek to balance mortgages with spiritual obligations.

Insurance Technology

Square One Insurance provides digital home insurance solutions to homeowners.

FNF Canada is an innovative provider of mortgage related services, including digital solutions for title insurance.

Regulatory Technology

Celero provides a range of digital solutions for retail financial service providers, including automated risk compliance.

ESC builds digital platforms for retail financial service providers that includes KYC/AML processes.

Wealth Management

Senso is a cloud-based portfolio management platform the for the retail banking industry, including mortgages.

Finn AI develops a conversational AI for the retail banking industry that enables mortgage businesses to provide highly personalized services.

Capital Markets

SIT provides digital solutions to financial institutions in their creation of CMHC mortgage-backed securities with Portfolio+.

The Mortgage Office offers software solutions designed to automate the managing of mortgage pools to financial institutions.

Identifying Mortgage Functions

A range of lending and ancillary functions are performed by mortgage businesses – below we present the functions traditionally associated with the mortgage industry

For the purposes of this report, the mortgage industry includes a range of functions relevant to lenders, borrowers, investors, and the ecosystem. These functions consist of activities directly involved in mortgage lending (i.e., mortgage search, loan origination, loan processing, loan underwriting, and mortgage servicing), as well as ancillary activities related to the mortgage and home-buying process (i.e., investment management, securitization, and fundraising).

We have described below the traditional functions associated with the mortgage industry, all of which are being transformed by FinTech as shown in the next page.

Mortgage Function	Description
Mortgage search	The mortgage search function involves the intermediation of a borrower and lender. This function has traditionally been performed by a mortgage broker (frequently in coordination with the 'loan origination' function described below).
Loan origination	Loan origination is the 'front door' to the mortgage transaction process. This involves a sales role that establishes communication with lenders, educates the borrower on mortgage types, and provides guidance through the loan closure. We consider pre-qualifications to be a part of this phase.
Loan processing	The mortgage application must be processed by the lender upon receipt – the activities performed include reviewing for application accuracy and completeness, verifying applicant information, and retrieving data points relevant to the underwriting phase.
Loan underwriting	After the application is checked for completeness and verified, the lender begins the underwriting process. The lender assesses the risk level of the applicant and makes suggestions on loan types and terms. We consider credit decisions to be a part of this phase.
Mortgage servicing	Mortgage servicing involves the day-to-day management of a loan, distinct from the responsibilities of the lender. Examples of activities that a mortgage servicer performs include: (i) managing and accepting of loan payments, (ii) calculating variable interest rates in applicable mortgages, (iii) managing any tax or insurance matters, (iv) handling borrower escrow accounts, (v) loan default management and prevention, and (vi) fraud detection and mitigation.
Insurance	This categories involves companies that provide homebuyer's insurance and lender's insurance. Homebuyer's insurance, typically required for homebuyers seeking a mortgage, is a form of property insurance that covers losses and damages to the home or property. Lender's insurance takes the form of mortgage loan insurance (which protects the lender in case the borrower cannot make mortgage payments) and lender's title insurance (which protects the lender in case there are problems with the title of the property).
Investment Management	This category involves all activities related to the provision of asset management services for residential real estate to investors. Examples of activities performed include residential property management (including tenants/rentals) and generation of investment-focused analytics.
Securitization	This category involves all activities related to the securitization of mortgage assets (i.e., mortgage-backed securities). This phase involves the process of repackaging individual mortgages of similar characteristics and selling them as interest-bearing securities.
Fundraising	For the purposes of this report, the fundraising function includes alternatives methods for potential homebuyers to raise funds (alternative to seeking funds from an incumbent financial institution). Specifically, this category focuses on peer-to-peer investing via crowdfunding platforms as alternatives to traditional financial institutions.

Identifying Mortgage Technologies

FinTech is bringing a range of innovative technologies into the Canadian mortgage industry which has previously remained unchanged for decades

FinTech is bringing a number of different digital solutions to the Canadian mortgage industry which has lagged in innovation for decades. Traditionally, the mortgage process has been slow and arduous given the various procedures followed by lenders to approve mortgage transactions.[1] Lenders must coordinate with several internal and external parties that require different types of information about the borrower, and often face obstacles in coordination due to inconsistent systems and file structures. Mortgage applications and associated documentation often pass through several internal and external parties – e.g., loan officers, processors, underwriters, mortgage servicers, etc.[2] The many steps undertaken in a mortgage approval process, along with non-standardized systems and file structures, result in a fragmented and time-consuming process for both borrowers and lenders.

To remedy this, digital mortgage solutions aim to bring disjointed systems together to increase efficiency and improve customer experience while streamlining the complexity associated with the extensive amounts of data involved in mortgage transactions. Below is a high-level summary of these technologies, as well as examples of Canadian firms that provide one or more of these technologically enabled mortgage solutions to consumers or businesses.

Mortgage Function	Sample Applications of Mortgage Technology	Example FinTechs in Canada[3]
Mortgage search	• Algorithm-based search platforms allow consumers to compare mortgage rates and products online, as well as connect to a wide network of lenders through a single query • Online mortgage counseling provides user-friendly and interactive online platforms to educate potential homebuyers	RateHub, LowestRates
Loan origination	• Loan origination systems (LOS) allow frictionless communication between all parties in the – borrowers, processors, underwriters, and closers – through the mortgage origination process by employing distributed ledger technology (e.g., blockchain) and application programming interfaces • Instant mortgage pre-qualifications through automated assessments of borrower profiles	Lendesk, Mogo
Loan processing	• Algorithms decipher borrower's financial data to identify missing data points and may automatically request required documents from the borrower • Automated data/document collection and verification to streamline the lending process	DocAssist, Xpertdoc Technologies

1. Stephen Poloz, "Poloz talks mortgages: Innovation could improve flexibility", *Bank of Canada*, May 6, 2019.
2. Brandon Cornett, "Why Do Mortgage Lenders Take So Long to Process and Approve Loans?", *Home Buying Institute*, 2019.
3. Examples selected based on assessment of the business descriptions of the companies listed. Note that each company may provide services in addition to the mortgage function ascribed herein.

Identifying Mortgage Technologies (continued)

FinTech is bringing a range of innovative technologies into the Canadian mortgage industry which has previously remained unchanged for decades

Mortgage Function	Sample Applications of Mortgage Technology	Example FinTechs in Canada[1]
Loan underwriting	• Generation of analytics and data points relevant to the loan officer, such as metrics based on borrower income, debt, and other financial information • Overall digitization of the underwriting process, including consistent underwriting assessments, automated valuation models to generate home price estimates, and management of application flow	Savvyy, Judi.AI
Mortgage servicing	• Digital solutions in mortgage servicing to help borrowers and lenders manage, track, and take control of mortgage payments • Automated generation of recommendations to homeowners based on borrower profiles with respect to mortgage options such as pre-payment and re-financing	Delta 360, The Mortgage Office
Insurance	• Homebuyers can search and compare homeowner's insurance rates online and instantly purchase insurance products (made possible through automated insurance underwriting systems) • Lenders can see faster processing times when obtaining insurance (e.g., title insurance) from technology-enabled insurers who employ automated underwriting systems	Square One Insurance, FNF Canada
Investment management	• Property technologies automate the day-to-day management of residential real estate for investment purposes • Cloud-based property management software allow landlords to seamlessly connect with tenants through mobile apps and support accounting, tenant screening, or rent collection activities	Pendo, Fineo
Securitization	• End-to-end platforms that allow originators and investors to directly connect and transact asset-backed securities in a secure, transparent environment • Creation of digital securities through stack solutions that enable issuance and management of mortgage-backed securities, enabling financial institutions to lend faster, increase productivity, and transparently communicate with capital markets	Strategic Information Technology, The Mortgage Office
Fundraising	• Peer-to-peer funding mechanisms that allow micro-lenders to participate in the real estate market and borrowers to find alternative financing solutions	NexusCrowd, REITIUM

1. Examples selected based on assessment of the business descriptions of the companies listed. Note that each company may provide services in addition to the mortgage function ascribed herein.

Characterizing Market Activity

FinTech firms operate primarily in two distinct market contexts – business-to-business and business-to consumer – each have different characteristics in terms of products, services, and consumers

A notable feature of FinTech firms within Canada's mortgage industry is that they can have different business profiles and market characteristics. To understand these firms, one must determine whether or not it serves other businesses to support mortgage related activities, or directly interfaces with consumers. These two approaches can be influenced by a different set of market conditions and drivers. Broadly, FinTech firms within Canada's mortgage industry fall into one of two market contexts: business-to-business model ("B2B") or business-to-consumer model ("B2C").

B2B Business Model

B2B FinTech firms sell their products and services to other businesses, not consumers. These firms provide a core part of the technology stack in financial institutions.

In the mortgage context, this category includes technology firms that provide software and related services to banks, credit unions, and other lenders. The products and services of B2B FinTech firms can include, amongst others:

- Digital infrastructure for the lending industry, such as platforms that help lenders underwrite and service loans intelligently and efficiently;
- Document collection and verification solutions, such as digital solutions that automate the manual process of down payment verification; and/or
- Customer relationship management tools for mortgage brokers, such as a platform that tracks and automates client interactions.

Example FinTech Firm in Canada

Doorr designs and develops broker management platforms for the mortgage industry

B2C Business Model

B2C FinTech firms are consumer-facing and sell their products and services directly to end consumers. They employ innovative technologies to compete with traditional firms for the consumer market.

In the mortgage context, this category includes firms with products and/or services that target potential homebuyers and borrowers. The products and services of B2C FinTech firms can include, amongst others:

- Mortgage search platforms that provide rate/product comparisons and connect potential homebuyers to lenders;
- Mortgage lenders that directly lend funds to potential homebuyers;;
- Insurance companies that offer consumers an efficient and seamless process to obtain homebuyer's insurance; and/or
- Crowdfunding platforms that allow potential homebuyers to connect with micro-lenders.

Example FinTech Firm in Canada

Mogo is a digital challenger to banks, empowering consumers with simple solutions to manage and control their finances.

3. Overview of FinTech

Understanding FinTech Activity

Mortgage related FinTech activity is an emerging segment within a broader FinTech industry in Canada

A review of FinTech activities within the Canadian mortgage ecosystem should be placed into context. In recent years, FinTech activity in Canada has grown. In the later stages of this study, we will seek to characterize the impact of mortgage related FinTech activity on the Canadian mortgage ecosystem.

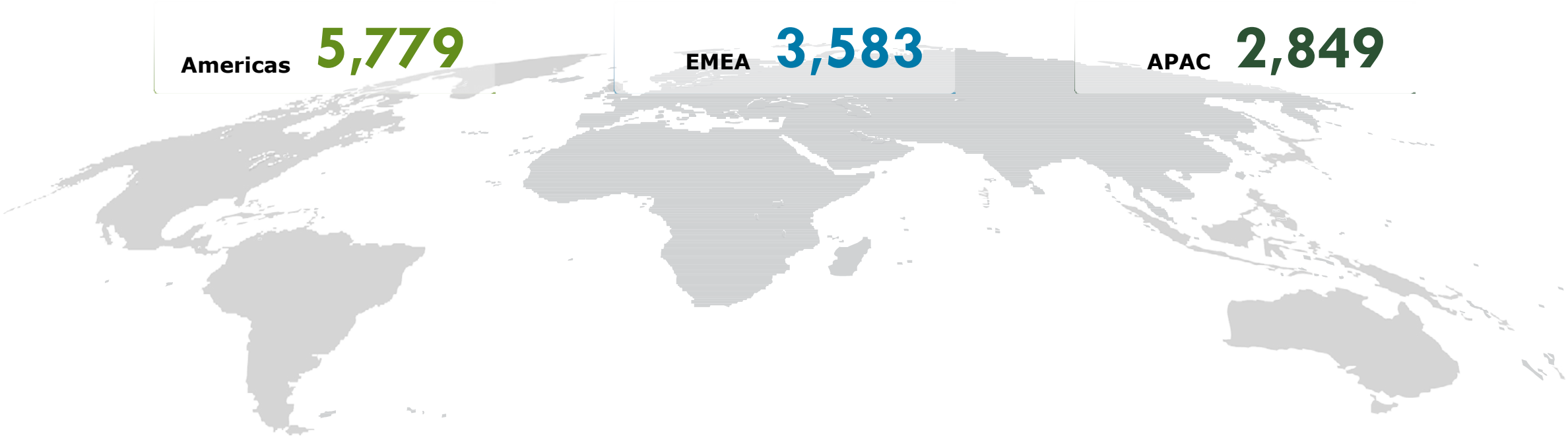
To do so, we first examine the high level characteristics of FinTech activity in global and Canadian contexts. This step is important to help frame forthcoming analyses in the project.

Estimated Size of the Global FinTech Landscape

FinTech firms are largely concentrated in the Americas, followed by the EMEA and APAC regions

In 2019, Statista estimated that there are over 12,000 FinTech firms operating around the world[1], although the number varies by source and could be anywhere from 10,000 to over 20,000.[2] Of the estimated 12,000 firms, approximately 47% of FinTech firms are in the Americas, 30% are in EMEA, and 24% are in APAC.

Estimated Number of FinTech Firms by Global Region by Statista (February 2019)[3]



1. Statista, *Number of Fintech Startups Worldwide as of February 2019*, 2019.
2. FinTech Growth Syndicate, *Fintech: Executive Summary*, 2019.
3. Statista, *Number of Fintech Startups Worldwide as of February 2019*, 2019. Note: The estimates from Statista have been cited frequently in industry reports, including: (i) Nestor Gilbert, "79 Key FinTech Statistics 2020", FinancesOnline, Accessed on March 20, 2020: https://financesonline.com/fintech-statistics/#link11, (ii) *FinTech Market Forecast (2020-2025)*, IndustryArc, 2019.

Estimated Size of the Canadian FinTech Landscape

The size of the Canadian FinTech industry varies considerably by source, based on differing definitions and classifications of FinTech firms

We reviewed several data sources that seek to estimate the number of FinTech firms in Canada. This review can help to contextualize the magnitude of our dataset of firms (submitted under separate cover). In our review, we noted that estimates of the number of FinTech firms operating in Canada vary significantly by source. We suspect that the primary driver of these variations is differences in the taxonomy of FinTech.

Broadly, our reviews of the source indicate that there are between **a minimum of 600 and maximum of 1,300 FinTech firms in Canada**. We note that each source uses a different methodology to estimate the size of the market. For example, in some cases, self-reported classifications are included within data sets. In other cases, varying approaches to defining FinTech are provided. Below is a summary of our findings:

FGS	FGS	crunchbase	Cadence · Holt FINTECH ACCELERATOR · LAB ZED TECHNOLOGY CONSULTING · IVEY · Scotiabank Digital Banking Lab	Luge CAPITAL
The November 2019 FinTech Growth Syndicate report documents **1,300** FinTech firms operating in Canada as of November 2019.	The January 2019 FinTech Growth Syndicate report documents **995** FinTech firms operating in Canada in 2018.	Crunchbase documented **738** FinTech firms in Canada as of February 3, 2020.	A Canadian FinTech database, provided by multiple partners, reported **850** FinTech firms in Canada in 2018.	According to Luge Capital, **600** FinTech firms were operating in Canada in 2018.
Fintech Growth Syndicate ("FGS") is an information technology and research company specialized in FinTech. FGS is considered to be a leading source for research and statistics on FinTech, illustrated by their provision of research services to the Government of Canada.		Crunchbase is an aggregated database which includes self-reported business information about private and public companies.	A database and ecosystem map of FinTech firms developed by a consortium of industry and academic partners, including Ivey Business School at the University of Western Ontario.	Luge Capital is a FinTech focused venture capital fund that partnered with CFA Montreal in 2018 to characterize the Canadian FinTech landscape.

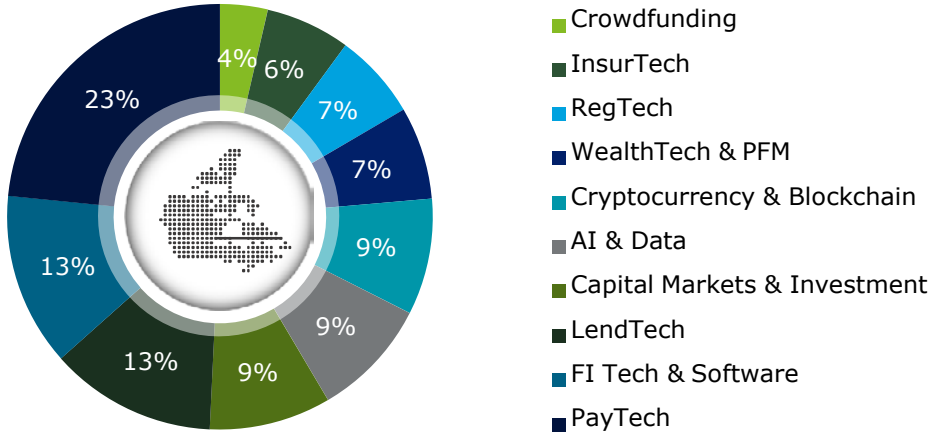
Spotlight: FGS's Estimated Size of the Canadian FinTech Landscape

FGS estimates that there are 1,300 FinTech firms, of which 9% are concentrated in LendTech – a segment closely related to the mortgage industry

According to FGS, the Canadian FinTech ecosystem is estimated to comprise about 1,300 firms as at November 2019.[1] FGS's analysis is novel as it further assesses the geographic distribution of Canadian FinTech firms and applies its own subcategorization approach to identify what types of FinTech firms are active in Canada. Both of these insights can help to form meaningful policy insights. FGS's key findings included:[2]

- The majority (64%) of Canadian FinTech firms are located in Ontario, in which 62% of firms are focused in the Greater Toronto Area.
- The other leading provinces in terms of number of FinTech firms are Quebec and British Columbia.
- A majority of FinTech firms operating in the country are headquartered in Canada.
- FGS' subcategorization of the PayTech sector accounts for the highest percentage of FinTech firms reflecting over 20% of the FinTech landscape in Canada.
- Other sectors dominant in the Canadian FinTech landscape include FI Tech & Software. Notably, 9% of firms in FGS's analysis were concentrated in LendTech the subcategory of FinTech most directly
- Notably, FGS defines LendTech as "companies that are designed to improve or reimagine the current lending life cycle stages of origination, underwriting, settlement, closing and discharge of loans provided by existing financial institutions".[3] FGS's classification system of FinTech subcategories differs from Deloitte's definitional approach.[4]

Estimated Proportion of Canadian FinTech Firms by FinTech Subcategory by FGS (2018)[4]



Note: The above diagram employs a classification system for FinTech's subcategories different from the one provided by Deloitte. Please refer to Appendix 5 for a summary of the classification system employed by FGS.

1. FinTech Growth Syndicate, *Canadian Financial Industry: Corporate Innovation Report*, 2019.
2. FinTech Growth Syndicate, *Fintech: Executive Summary*, 2019.
3. Ibid.
4. Please refer to Appendix 5 for a summary of the classification system employed by FGS.

Observations on Canadian FinTech Landscape

Canada's FinTech adoption rate lags behind global peers

The adoption rates described herein are based on a third-party consumer survey that included 27,103 online interviews with digitally active adults between February 2, 2019 and March 11, 2019. The rate of adoption is defined as the number of survey respondents that used two more FinTech services relative to the number of survey respondents with internet access. The survey results were based on respondents' use of FinTech products within five categories – (i) money transfer and payments, (ii) budgeting and financial planning, (iii) savings and investments, (iv) borrowing, and (v) insurance. We understand that mortgage lending activities fall within the 'borrowing' category.[1]

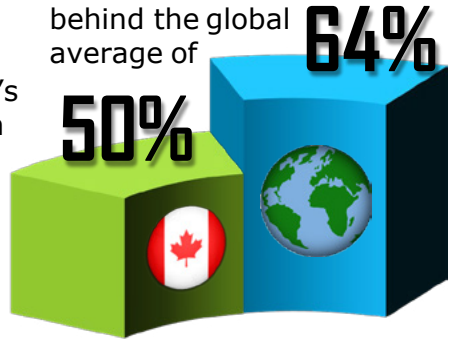
Key insights on adoption rates:

- In recent years, there has been strong growth in the adoption of FinTech by Canadian consumers – 50% of Canadians used FinTech products in 2019, more than double the adoption rate in 2017.[2]
- Canada's FinTech adoption rate is lower than the global adoption rate (64%), but higher than the adoption rate of the United States (46%).[3] The relatively low rate of adoption in the US been linked to a number of roadblocks for FinTech adoption, including regulatory uncertainty around banking, lending, and payment services.[4] However, further investigation is required to comprehensively understand adoption dynamics.
- For Canadian consumers, the main drivers behind this adoption were better rates and fees, ease of setting up an account, and the ability of FinTechs to offer more innovative products and services.[5]

According to a 2017 review by the Competition Bureau, FinTech entrants in Canada have stated that other jurisdictions have more welcoming and innovation-conducive regulatory environments than Canada. Specific examples cited include the United Kingdom, the United States, Singapore, Germany, Australia, and Hong Kong – all of which have been identified as leading FinTech hubs based factors such as talent, funding availability, government policy, and demand for FinTech. These countries have a unified financial sector regulatory framework, and as such, many have been able to take a national, unified approach to encourage FinTech development.[6]

Most of these countries are encouraging experimentation in a controlled environment and, at the same time, creating flexible regulatory frameworks proportional to the risks presented by FinTech innovation.

In 2019, Canada's FinTech adoption rate was 50% behind the global average of 64%



1. Global Consulting Company, *Global FinTech Adoption Index 2019*, 2019.
2. Ibid.
3. Ibid.
4. Philip Rosentein, *Fintech Adoption Poised for Growth in US Despite Lag,* 2019.
5. Government of Canada, Competition Bureau. *Technology-led Innovation in the Canadian Financial Services Sector*, 2017.
6. Ibid.

Observations on Canadian FinTech Landscape (continued)

Several factors could explain Canada's relatively lower technology adoption rates

The key reasons for why adoption rates have lagged in Canada include:

- **Lack of trust and consumer awareness:** Consumers have a tendency to trust incumbent financial institutions over FinTech challengers (i.e., non-bank financial institutions that employ technological innovations such as digitization and automation) – a phenomenon that could stem from a number of factors, such as older generations doubting a still-nascent industry or the lack of trust-building initiatives from start-ups. Relatedly, the top-cited reason for why consumers opt for an incumbent institution is due to a lack of awareness about how FinTech products and firms operate.[1] Broadly, this observation could be related to the fact that Canadian banks were viewed as successful during the 2008-09 financial crisis. As Canadian banks were largely insulated from the pressures faced in other jurisdictions (e.g., the US), Canadian consumers' overall trust and confidence in banks was not shaken. This is in contrast to other jurisdictions such as the US in which consumer mistrust during the financial crisis acted as a push factor towards FinTech innovation.
- **Complex and fragmented regulatory framework**: The Canadian financial services sector is regulated by both federal and provincial levels, which can create a complicated and fragmented regulatory environment for FinTech firms to navigate within. Provinces are not obliged to have harmonized regulations governing financial services or FinTech. Moreover, political and local business conditions can make efforts to harmonize challenging and time consuming. This makes it difficult for FinTech firms to navigate the various federal and provincial laws – inhibiting their ability to penetrate the market. Regulation can play a role in winning consumer confidence for FinTechs, and as such, there is a need for more appropriate and balanced regulation.[2]
- FinTech challengers need to **invest in trust-building and consumer awareness initiatives** to mitigate the lack of trust and awareness in the consumer market. In addition, it is increasingly important for FinTech firms to be as transparent as possible in their service offerings and provide rules-of-thumb guidance on the benefits of mortgage digitization.
- **Greater collaboration between regulators and businesses** has been identified as a meaningful enabler of greater FinTech activity and momentum in Canada. Collaboration is specifically called out as an enabler to developing a clear and unified approach to risk, innovation, and competition in the market that can help to create a hospitable setting for firm creation and scaling. Examples of collaborative techniques identified in the literature include: (i) the use of regulatory sandboxes and innovation hubs and (ii) regulatory encouragement towards the development of still-nascent technologies that will ultimately result in innovative service offerings for consumers.
- **Concentrated nature of the financial sector in Canada:** Partnering with incumbent banks can be a key pathway to commercial success for FinTechs in Canada. As Canada's financial services sector is highly concentrated with a small number of banks and a relatively smaller population of financial services firms relative to jurisdictions such as the US and UK, FinTech firms may have limited options for partnerships. The pool of potential partnership pathways is further restricted given that banks must abide by regulatory restrictions that identify what type of investments/partnerships can be made.

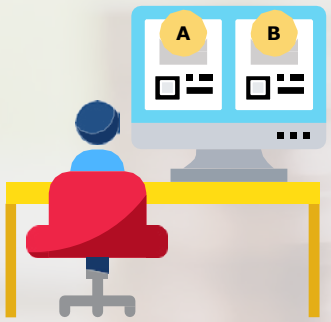
1. Global Consulting Company, *Global FinTech Adoption Index 2019*, 2019.
2. Please refer to pages 54-55 of this document for more information on Canada's regulatory environment.

Observations on Canadian FinTech Landscape (continued)

Canadian adoption of FinTech in the mortgage industry appears to be on the rise, with more consumers leveraging digital mortgage tools

The upward trend in FinTech adoption is illustrated by the increasing rate at which Canadian consumers leverage technology during the home buying and mortgage process (based on CMHC's mortgage consumer survey). A directed and comprehensive analysis of digital mortgage adoption rates is not available in the public domain, making it difficult to gauge changes in adoption levels for digital mortgage technologies in Canada.

However, CMHC's mortgage consumer survey provide useful information on how consumers are leveraging, or wish to leverage certain mortgage-related innovations.[1] We present below key insights from CMHC's mortgage consumer survey.



87%

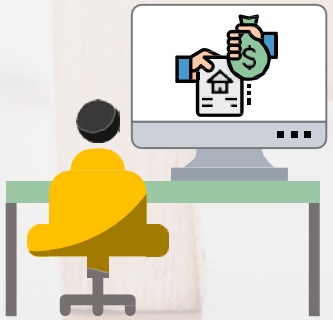
of buyers used online sources to **compare mortgage rates**

82%

of buyers reported use of an online **mortgage calculator**

77%

of potential homebuyers used **online sources** to gather information about mortgages or buying a home



38%

of potential homebuyers would be comfortable managing the **entire home-buying and mortgage process** without having to meet with a mortgage professional

1. Canada Mortgage and Housing Corporation, *The State of Homebuying in Canada: 2019 CMHC Mortgage Consumer Survey,* 2019.

Observations on Investments in FinTech

Investments in FinTech products and firms have increased exponentially worldwide – the Canadian market is no exception to this global surge in FinTech investment

Investment in the FinTech sector has been on the rise across the world, with global investment in FinTech firms more than doubling between 2017 and 2018 to $111.8 billion. Of this investment, $54.5 billion was invested in the America across 1,245 deals, $34.2 billion was invested in Europe with 536 deals, and $22.7 billion was invested in FinTech firms in Asia across 372 deals. The private investment figures presented here include the following funding mechanisms: private equity ("PE"), venture capital ("VC"), and mergers and acquisitions ("M&A").[1]

Canada reached a record number of FinTech deals in 2018 with 119 deals totaling about $1.2 billion. In 2018, Canadian banks invested significantly in robo-advisory technologies – e.g., RBC's rollout of the RBC InvestEase platform or TD Bank's launch of a robo-advisory service through a partnership with US-based Hydrogen Technology Corporation. Despite this growth, FinTech investment in Canada trailed behind the US ($52.5 billion across 1,245 deals) and the UK ($20.7 billion, accounting for half of Europe's top 10 deals).[2] Investment in Canada's FinTech sector is expected to grow due to government-led initiatives, especially with regards to open banking, which should make it easier for FinTechs to scale and access funding.[3]

Note: The aforementioned estimations are of selected investment activity only and may not capture all investment activity related to FinTechs.

Real Ventures was the most significant investor in Canada's FinTech sector in 2018 through it's involvement in five deals. The venture capital's largest deal of 2018 was its $70 million investment in ClearBanc, an online platform that enables entrepreneurs to access capital. Other notable deals included investments in Instant Financial, LoginRadius, and Kooltra.[4]

The BDC IT Venture Fund manages over $300 million in venture capital investments in emerging and mid-stage internet, mobile, and enterprise companies. Although the fund is not exclusively focused on FinTech firms, it has provided significant capital to the industry. For example, BDC invested in Wave, a Toronto-based FinTech that specializes in providing financial services and software to small businesses.[5]

Portag3 Ventures is the venture capital arm of Sagard Holdings. It is an early-stage FinTech investor with the aim is to back innovative, technology-driven, consumer-centric financial services companies. It has invested in notable Canadian FinTechs such as Koho, Borrowell, Wealthsimple, and League. At the end of 2019, Portag3 closed a $427 million fund, making it the largest FinTech venture capital fund in Canada.[6]

1. Global Consulting Company, *The Pulse of Fintech 2018,* 2018.
2. Ibid.
3. FinTech Global, *Canadian FinTech Companies Have Raised More Than $3bn Over the Last Five Years,* 2019.
4. Ibid.
5. "IT Venture Fund", BDC Capital, Accessed on January 31, 2020. <https://www.bdc.ca/en/bdc-capital/venture-capital/strategic-approach/pages/it-venture-fund.aspx>.
6. Meagan Simpson, "Portag3 Sets Sights On Global Fintech Market As It Closes $427 Million Cad Fund II", Betakit, December 3, 2019.

4. Observations on FinTech within Canada's Mortgage Industry

Overview of Observations

Our research has led us to several observations with unique policy implications

Through our literature review and internal subject matter experts, we have developed several initial observations on the market and policy context of FinTech firms within Canada's mortgage industry. We anticipate these observations to evolve as the project is completed. In the forthcoming section, we profile observations we hope to expand on and further investigate. In this section, we introduce the observation, potential policy implications to the Government of Canada as well as any specific dimensions, elements relevant to specific stakeholders within the mortgage ecosystem. To organize these perspectives, we present 'personas' within the mortgage ecosystem:

Persona	Examples
 **Borrowers**	• First time home buyers • Existing home owners seeking to manage/change mortgages
 **Lenders**	• Institutional lenders (e.g., banks, credit unions) • Private lenders • Alternative lending mechanisms (e.g., peer-to-peer lending)
 **Investors**	• Investors investing in mortgage-backed securities or trading on the secondary mortgage market • Investors seeking to optimize and maintain their portfolio of mortgage assets
 **Ecosystem**	• Individuals or organizations not directly involved with lending or acquiring an investment (e.g., mortgage brokers, insurance companies) • Relevant industry associations • Regulatory organizations and/or government bodies (e.g., CMHC, Office of the Superintended of Financial Institutions ,etc.)

Key Observations on FinTech within Canada's Mortgage Industry

Our literature review saw Canadian banks framed as leaders in the development and adoption of mortgage technology

Observation 1: Canadian banks have driven innovations in mortgage technology

A global survey of banking executives shows that 81% of banks would collaborate with FinTech partners to execute digital transformation.[1] Canada is no exception to this global trend as banks in Canada, particularly the Big Five Banks, have a longstanding commitment to technological innovation. In recent years, Canadian banks have supported the development of innovative technologies – either through in-house initiatives or collaborative partnerships. This trend has been further stimulated by structural changes in the financial services industry. It should be noted however, that as banks are often operating on legacy systems, innovation related activities can include activities to 'upgrade' systems to reflect current conditions rather than 'game-changing' innovation projects which would radically transform how banks operate. Moreover, given high customer expectations, banks can be viewed as having lower risk tolerance levels which can limit the types of innovation projects that they invest in or their willingness to engage in partnerships.

Despite this, several Canadian banks have invested in FinTech to digitally enable their mortgage offerings. For example, Scotiabank and TD Bank developed fully end-to-end digital mortgage applications in 2019. Similarly, Bank of Montreal partnered with Blend, a leading digital lending platform provider, to deliver digital mortgage experiences to consumers. These examples of in-house developments and external partnerships illustrate the contribution of Canadian banks to the digital transformation of mortgages. However, in our stakeholder consultations, it was noted that while banks have a natural incentive to partner with FinTechs, they often operate older, relic software platforms that can be incompatible with the latest technologies. Anecdotally, banks were seen to operate in large enterprise-wide technology platforms dating as far back as the 1990s, with FinTechs hovering around technologies born in recent years. As a result, partnerships are used to co-create technologies, approaches that reflect the technical specifications of banks. In some cases, these specifications may not be 'best in class' technological innovations, but rather, incremental changes to help the industry keep up with the technologies that are available. In consultations with a major bank, it was noted that banks view partnerships with FinTech companies as a key channel to harness innovation.

Example policy implications

- While mortgage related FinTechs are often start ups or small-to-medium sized firms, incumbent financial institutions (e.g., banks, credit unions) should not be viewed as separate and distinct from mortgage start ups
- Canadian banks can help provide a platform to test and scale technologies and co-create customer-facing innovations.
- It is important to ensure regulations support banks execute partnerships can help to foster this type of activity.

Example implications for personas

Lenders

- Canadian banks are in a strong position to drive innovation given than they represent majority (75%) of the residential mortgage market in Canada.[2] To remain competitive in light of digital mortgages, alternative lenders should increase investments in innovative technologies thereby creating market conditions that could push them towards digital mortgage capabilities.
- Canadian banks have engaged in collaborative engagements with technology firms, creating potential partnership options for Canadian or global FinTechs that provide services to improve retail banking models (including mortgages). This could be a pull factor for FinTech firms within the mortgage industry to remain in Canada and/or invest in Canada.

Ecosystem

- Encouraging collaboration between banks and FinTech can be a positive step to support innovation.
  Regulators should adopt a technology-neutral viewpoint in policymaking exercises to allow firms to take advantage of reduced regulatory costs and red tap in innovation-driven initiatives.

1. "81% of banks would collaborate with fintech partners to executive digital transformation", Finextra, October 1, 2019.
2. Canada Mortgage and Housing Corporation, *Residential Mortgage Industry Report Q3 2019*, 2019.

Key Observations on FinTech within Canada's Mortgage Industry (continued)

Economic and market circumstances have resulted in the concentration of automation and technology approaches in the initial phases of the mortgage process

Observation 2: Automation and technology approaches are concentrated in the initial phases of the mortgage process

Canada's automation and technology approaches within the mortgage industry are concentrated in the initial phases of the mortgage process (e.g., mortgage search, loan origination), unlike the US and UK which have seen mortgage technologies innovate all aspects of the mortgage process. There are numerous FinTech firms in Canada that have enabled online mortgage rate/product comparisons and provided a means to initiate the mortgage process online. However, there are not many firms in Canada which have achieved a fully end-to-end digital mortgage process outside of select incumbent financial institutions.[1]

This lack of adoption in latter stages of the mortgage process is due to several reasons, including, amongst others:

- **Canadian approaches to regulation of Canadian residential mortgages:** The residential mortgage market in Canada is heavily regulated due to documentation, creditworthiness, and security requirements.
- **Small market size:** Canada's financial services sector is both relatively small (when measured by the total population of available consumers) and concentrated, decreasing its importance as a strategic market to global FinTech firms, including online lenders, considering expansion.[2] Moreover, the Canadian banking sector, a key hub of FinTech innovation is dominated by a small number of Canadian banks-therefore concentrating activity in a comparatively smaller number of firms (compared to peers such as the US). Moreover, Canadian banks have traditionally dominated all financial activities with an established level of consumer trust that can create an environment that makes it hard for FinTech companies to gain consumer confidence.
- **Relatively low impact of the financial crisis:** Canada was not subjected to the same upheaval in the financial services industry as in many other jurisdictions, preventing the shakeup of business models (including mortgages) that allowed FinTech to flourish in other countries (e.g., US and UK).[3] For instance, the 2008 financial crisis disrupted the US market, causing a high degree of mistrust in American financial institutions that gave way to a post-crisis market opening for FinTech products and firms.[4]

Example policy implications

- While the apparent concentration of technology/innovation in earlier stages of the mortgage process could be viewed as positive, initial progress, understanding why innovation levels differ later on in the process is critical to further understanding the Canadian FinTech market.

Example implications for personas

Borrowers

- There could be a lack of options to access Fintech in later stages of the mortgaging process. Potential homebuyers in Canada do not have the same optionality in alternative lenders that their neighbors south of the border do. FinTech lenders – of which there are many in the US and UK – offer convenience, speed, and a mobile customer experience to customers above and beyond incumbent financial institutions.

Lenders

- Incumbent financial institutions have dominated the Canadian banking industry, in part due to the relatively low impact of the financial crisis in Canada.
- As a result, FinTech lenders will find it difficult to break into the mortgage lending market and Canadian consumers may lack the desire to venture outside of the incumbent banking system and try new forms of lenders. This was not the case in the UK, where consumers were more inclined to support FinTech and innovative alternatives to traditional business models following the financial crisis.

1. Please refer to pages 75-76 of this document for more information on the mortgage technologies of Canadian financial institutions.
2. Deloitte LLP, *Closing the Gap: Encouraging Fintech Innovation in Canada*, 2016.
3. Ibid.
4. Douglas W. Arner et al., *The Evolution of Fintech: A New Post-Crisis Paradigm?*, 2016.

Key Observations on FinTech within Canada's Mortgage Industry (continued)

Open banking may support the critical path for the industry to more broadly achieve fully end-to-end digital mortgages

Observation 3: Open banking may enable fully end-to-end digital mortgage experiences for Canadian borrowers

Open banking has the ability to significantly disrupt retail banking business models by allowing consumers to seamlessly share their financial information with third parties through digital channels. This technology allows for increased interconnectivity between incumbent financial institutions, technology firms, and FinTech challengers. As such, open banking has the potential to enable fully end-to-end digital mortgage experiences by allowing lenders to automatically compile borrower information (contrary to the current tradition of collecting expansive amounts of paperwork from borrowers). The benefits of open banking for mortgages include:

- **Faster and more efficient evaluation of mortgage applications**. The adoption of open banking will (i) significantly decrease the stress and time of compiling borrower information, (ii) mitigate risks of applicant fraud as information comes directly from the source, and (iii) allow for near-instantaneous verification of identity, affordability, income, and banking transaction history. The faster and more efficient evaluation of mortgage applications will lessen stress for borrowers and lenders for a process that has traditionally been manual and intensive.
- **Automation potential for underwriting.** Open banking standardizes the sharing of borrower information between third parties. This high degree of data consistency enables the potential for the further automation of risk-scoring and underwriting decisions.
- **Increased competition in retail financial services.** The banking sector in Canada is largely dominated by the Big Five Banks which hold 90% of all bank assets.[1] As such, the five largest banks in Canada hold majority of consumers' financial data. Open banking gives consumers control over their financial data and allows them to share it with third parties, thereby reducing barriers to entry and increasing competition in the retail financial services market.

For more information on the development of open banking in Canada, please refer to Appendix 4 to this document.

Example policy implications

- Open banking frameworks have been implemented in a growing number of jurisdictions, including the UK, the European Union and Australia.
- Canada is currently in the second phase of its framework rollout, which includes consultations on the merits of open banking with respect to implementation considerations for a Canadian open banking regime. At a high level, the implementation of an open banking framework in Canada is currently being "deliberated among lawmakers".[3] The outcomes of this activity could significantly shape the extent to which Open Banking could take off in Canada.
- Ensuring buy-in and transparency by consumers is critical. Open Banking can often require application programming interface (API) technology, which generally speaking, includes a security framework and consent mechanisms. As a result, incumbent organizations may need to invest in securing public trust and co-create consumer protection mechanisms with government bodies in order to execute open banking approaches.

Example implications for personas

Borrowers

- Open banking allows for a faster and more efficient evaluation of mortgage applications by allowing lenders to automatically compile borrower financial data. This results in less stress for borrowers who have traditionally had to gather extensive amounts of paperwork.
- Increased competition in the mortgage space may provide borrowers with more mortgage options and better rates/products.

Lenders

- Similar to borrowers, lenders will benefit from reduced costs and time spent on the evaluation of mortgage applications.
- Open banking will allow more collaboration between parties involved in mortgage transactions, but may also reduce barriers to entry for non-bank lenders (including FinTech lenders).

1. Financial Stability Board, *Financial Stability Implications for Fintech: Supervisory and Regulatory Issues that Merit Authorities' Attention,* 2017.
2. Norton Rose Fulbright Canada LLP. *Canada: Open Banking in Canada – Current Regulatory Insights,* 2019.
3. Ibid.

5. Overview of Potential Impacts of FinTech on Canada's Mortgage Industry

Our Approach to Assessing Impact

We take a multifaceted approach to analyze the impacts of FinTech to Canada's mortgage industry, considering the effects of mortgage digitization for all stakeholders

Our analysis has provided a snapshot of the characteristics of mortgage-related FinTech firms in Canada and globally. We complement this with several qualitative observations within the mortgage FinTech space. When turning attention to the question of what impacts these firms will generate in the mortgage space, several elements should be considered:

- Which mortgage functions see the most activity in terms of the number and size of FinTech firms?[1]
- How will the mortgage process for borrowers evolve and change in light of technological innovation (e.g., online solutions to facilitate mortgage applications, digital interactions with lenders, etc.)?
- What new roles and considerations should ecosystem partners (e.g., organizations such as CMHC) keep in mind in the next five years?
- What new opportunities will be accessible to lenders (e.g., product innovation, expanded catchment area, operational efficiency)?
- What challenges or risks could impact borrowers, lenders, or the broader economy?

Each of these questions is complex and driven by several factors. In the forthcoming section, we identify four key areas of impact that can be viewed as relevant across personas in the near-term (e.g., one to two years) and medium-term (e.g., three to five years). These impacted were identified based on the following criteria:

- Recognition in global and Canadian literature/research within the mortgage FinTech space;
- Identification during stakeholder consultations;
- Inclusion in the value propositions of domestic and international FinTech firms; and
- Ability to potentially affect one or more stakeholders within the mortgage ecosystem space.

For each area of impact, we provided a high-level description, assessed the potential characteristics of personas most affected by the impact, and provided a summary of key research findings that validate our observations. We find that potential impacts are multifaceted – they can enable opportunities for Canada's mortgage industry (e.g., increased efficiency and accuracy in mortgage processes) or create challenges that must be monitored by regulatory authorities (e.g., increased moral hazard and excessive risk-taking practices).

1. Please refer to page 74 of this document for our observations on the concentration of FinTech activity by mortgage function.

Summary of Impacts of FinTech on Canada's Mortgage Industry

Innovative technologies can impact Canada's mortgage industry by enabling a range of opportunities and challenges relevant to borrowers, lenders, investors, and the ecosystem

We categorize our observations into four groups in light of the heterogeneity of impacts. We will explore each area of impact outlined in the table below, describing potential impacts to relevant personas and providing evidence from relevant literature where applicable.

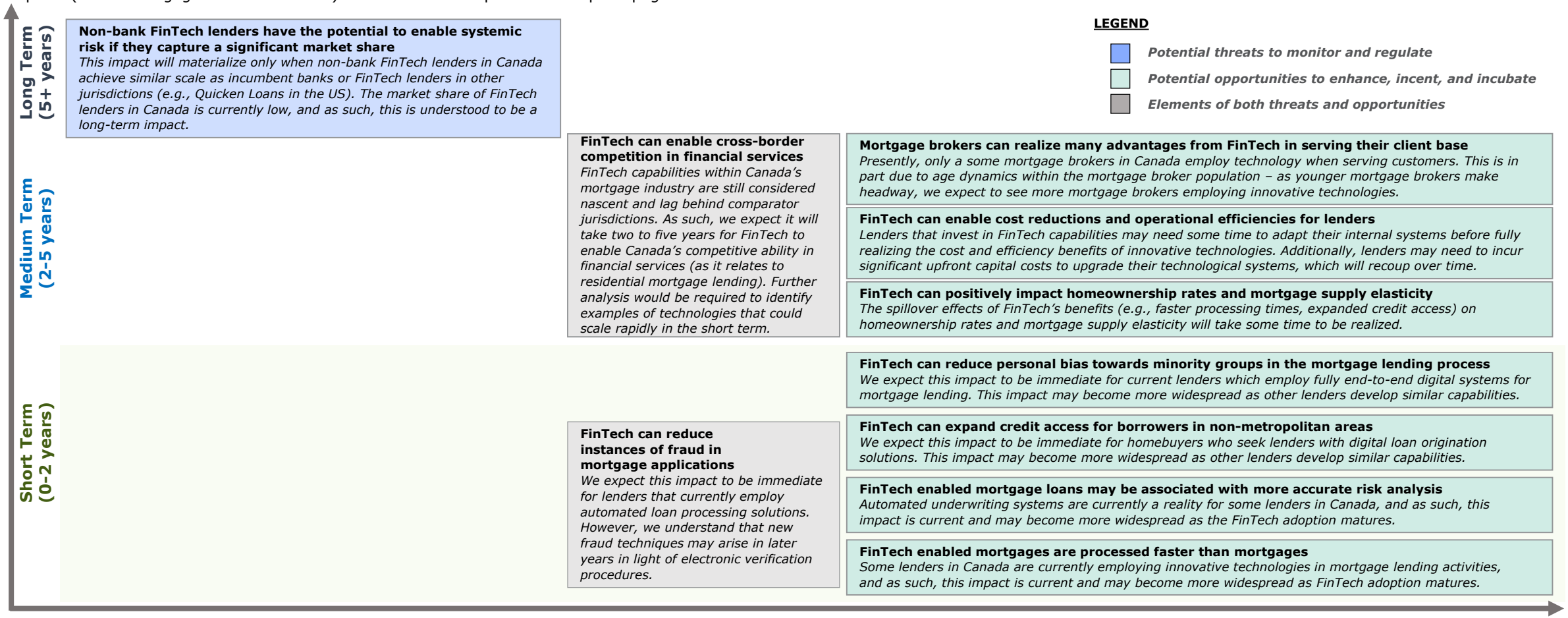
Area of Impact	Most Impacted Personas[1]			
	Borrowers	Lenders	Investors	Ecosystem
Customer Efficiency				
FinTech enabled mortgage loans are processed faster than traditional mortgages	✓	✓	✓	
Fintech enabled mortgage loans may be associated with more accurate risk analysis compared to traditional mortgage loans		✓	✓	✓
Underserved Borrowers				
FinTech lenders can expand credit access for borrowers in non-metropolitan areas	✓	✓		✓
FinTech can reduce personal bias towards minority groups in the mortgage lending process	✓	✓		✓
Structural Market Changes				
FinTech can positively impact homeownership rates and mortgage supply elasticity	✓	✓		✓
FinTech can enable cross-border competition in financial services				✓
Non-bank FinTech lenders have the potential to enable systemic risk if they capture a significant market share		✓		✓
Cost Savings and Operational Efficiencies				
FinTech can mitigate instances of fraud in mortgage applications		✓	✓	✓
FinTech can enable cost reductions and operational efficiencies for lenders		✓		
Mortgage brokers can realize many advantages from FinTech in serving their client base	✓	✓	✓	

1. Given the dynamic nature of the industry, this should not be viewed as a comprehensive list of impacted personas. Other personas may be impacted as the industry matures and changes over time.

Summary of Impacts of FinTech on Canada's Mortgage Industry (continued)

Based on secondary research and our understanding of Canada's mortgage industry, we have categorized our impacts across two dimensions – time of impact and whether the impact is an opportunity or threat

In the framework below, we outline our impacts across two dimensions –the probable and/or anticipated time of potential impact (short-, medium-, and long-term) and whether the impact is a threat, opportunity, or both to the Canadian mortgage ecosystem. This categorization is broadly based on secondary research and our understanding of Canada's mortgage industry. It is important to note that different stakeholders in the mortgage space may have different perspectives on the timelines associated with impacts. Additionally, future market factors could change the dynamics of each of these impacts (or the mortgage value chain itself). We detail each impact in subsequent pages of this document.



Customer Efficiency

FinTech can enable customer efficiencies through faster processing times and effective assessments of borrower risk

FinTech enabled mortgage loans are processed faster than traditional mortgages

The traditional mortgage process is often cited by borrowers as slow and time-consuming[1], particularly by millennials which make up half of Canada's first-time home buyers.[2] This is one of the key inefficiencies targeted by innovation technologies in the mortgage industry. It is well documented that mortgage applications facilitated by FinTech lenders are processed faster than those facilitated by non-FinTech lenders (and are not associated with higher risk profiles or increased default rates, as described in the impact below).

Supporting evidence from selected studies:

- Fuster et al. (2018) find that FinTech lenders in the United States improve borrower convenience by processing mortgages 15-30% faster than other lenders, on average.[3]
- Fuster et al. (2018) find that the processing duration from application to origination is one week shorter for FinTech loans compared with non-FinTech loans.[4]
- Buchak et al. (2018) find that the time from mortgage origination to sale of the mortgage to Fannie Mae or Freddie Mac for FinTech lenders is about two weeks faster than banks and about a week faster than other non-bank lenders.[5]

Borrowers, who often cite dissatisfaction with lengthy mortgage approval times, are provided more efficient and seamless mortgage experiences through faster processing times which can reduce the stress, burden and time spent accessing financing for homebuyers.

Lenders share the benefits of faster processing times, as they can handle more applications when controlling for time constraints and drive higher customer satisfaction levels. Notably, our stakeholder consultations reveal faster processing times benefit all types of mortgage brokers.

Investors are positively impacted since faster processing times result in faster sales of mortgages on the secondary market after origination.

Fintech enabled mortgage loans may be associated with more accurate risk analysis when compared to traditional mortgage loans

As described above, technological innovations in the mortgage process (particularly loan processing and underwriting) lead to faster processing times. Faster processing times are not substantially observed to come at the cost of higher risk profile or increased default rates. Unlike traditional systems, automation may lead to both faster processing times and more accurate risk analysis.

Many studies find that default rates of FinTech-source loans are lower after controlling for observable borrower risk factors, indicating that FinTech-source loans are associated with more accurate risk analysis. More accurate risk analysis is an outcome of automated underwriting systems that employ statistical power to predict mortgage default based on the actual performance of millions of mortgages. As such, underwriting systems account for the many ways in which risk factors relevant to repayment influence one another – a significant advantage over manual underwriting processes. Although the impact of automated underwriting systems on default rates is not homogenous across the literature, we observe a general consensus that default rates of FinTech-source loans are, at minimum, not significantly different to loans facilitated by traditional lenders.

Supporting evidence from selected studies:

- Fuster et al. (2018) find that (i) faster processing times do not come at the cost of higher default rates and (ii) no evidence of higher (conditional) default rates between mortgage loans originated by FinTech lenders and those by non-FinTech lenders.[6]
- Fuster et al. (2018) find that the default rate for FinTech-source loans is lower after controlling for observable borrower risk factors, suggesting that either the applicants or originated loans differ in some unobservable way between lender types.[7]
- Buchak et al. (2018) find that among conventional mortgages, default rates are not significantly different across lender types, conditional on controlling for observable borrower and loan characteristics.[8]
- Gates et al. (2002) find that automated underwriting systems more accurately predicts default, compared to traditional manual underwriting processes.[9]

Lenders who employ innovative technologies (e.g., automation) in mortgage processes may not increase their overall risk profile by deploying technological approaches in lending. This suggests that there will continue to be a need for robust due diligence procedures and processes to safeguard from risk.

Investors who purchase mortgages on the secondary market or mortgage-backed assets that were originated by FinTech lenders may not be exposed to higher mortgage default risks**.**

Establishing standards for compliance and lending can help regulators in the mortgage **ecosystem** ensure that FinTech lenders are not a more risky choice relative to traditional lenders. This would allow regulators to focus their attention in other risk dimensions. Further, the introduction of technologies that enable automation does not presently present a clear risk in current regulatory frameworks.

1. Velocify, *Digital Mortgage Experience: A Study of Shifting Borrower Expectations,* 2018.
2. Canada Mortgage and Housing Corporation, *The State of Homebuying in Canada: CMHC Mortgage Consumer Survey,* 2019.
3. Andreas Fuster et al., *The Role of Technology in Mortgage Lending*, 2018.
4. Ibid.
5. Greg Buchak et al., *Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks*, 2018.
6. Andreas Fuster et al., *The Role of Technology in Mortgage Lending*, 2018.
7. Ibid
8. Greg Buchak et al., *Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks*, 2018.
9. Susan Wharton Gates et al., *Automated Underwriting in Mortgage Lending: Good News for the Underserved?*, 2002.

Underserved Borrowers

FinTech can expand credit access for borrowers in underserved regions (e.g., non-metropolitan areas)

FinTech lenders can expand credit access for borrowers in non-metropolitan areas

Borrowers in non-metropolitan areas are at the risk of being underserved. In Canada, mortgage lenders have a limited physical and business presence in certain areas and across certain building types potentially leading to a lack of competition in mortgage products and potential lack of supply (since retail bank branches are can be sparse in non-metropolitan areas).[1] This can potentially lead to indirect effects for homebuyers, including: creating or reinforcing socio-economic disparities between rural and urban populations, price pressures due to lack of supply, a potential lack of mortgage loan options. Taken together, this scenario can create or reinforce barriers to accessing a mortgage, particularly for first-time homebuyers. Ensuring non-metropolitan populations have adequate access to mortgages is an important policy consideration, as almost 30% of Canada's population resides in non-metropolitan areas.[2,3]

FinTech lenders that are able to provide services that do not require a physical presence are well suited to reach these underserved borrowers through digital solutions (e.g., online applications and credit decisions), thereby expanding credit access for mortgages in low-density areas. This can help support mortgages for rural and small-town properties, which are cited to be underserved by traditional lenders.[4]

Supporting evidence from selected studies:

- Jagtiani et al. (2019) find that FinTech lenders are more likely than other non-bank lenders to lend to consumers from non-metropolitan areas with less lender competition. Evidence from the US suggests that mortgage loans are 5-10% more likely to be sourced from FinTech lenders, if it is in a non-metropolitan tract than if it is in a metropolitan tract.[5]
- Basten and Ongena (2019) find that banks seize the online channel in particular to lend more to regions where house price changes are less correlated with those in their home canton (e.g., nonmetropolitan areas).[6]
- Berger and DeYoung (2006) find that technological progress can reduce agency costs associated with greater distances between lenders and borrowers.[7]

Borrowers, in low-density areas, who are at the risk of being underserved, can benefit from innovative technologies that bring the mortgage process online. Borrowers could also benefit from having a wider range of mortgage options.

Lenders can access underserved borrowers in low-density areas through digital solutions (e.g., online applications and credit decisions).

Enabling adequate credit access for underserved borrowers is an important initiative for regulators in the mortgage **ecosystem,** as increased lending activity can help support investment and economic growth in non-metropolitan areas.

1. Canada Mortgage and Housing Corporation, *Residential Mortgage Industry Report: Q3 2019*, 2019.
2. Statistics Canada, *Table 17-10-0135-01 Population Estimates, July 1, By Census Metropolitan Area and Census Agglomeration,* Accessed on March 15, 2020.
3. Non-metropolitan areas are defined by Statistics Canada as areas which are not census metropolitan areas (i.e., region with a total population of at least 100,000 of which 50,000 or more live in the core based on adjusted data from the previous Census of Population Program). Note, the definitions of non-metropolitan areas in the literature may differ from Statistic Canada's definition.
4. Michael Calhoun et al., *Supporting Mortgage Lending in Rural Communities*, 2018.
5. Julapa Jagtiani et al., *Fintech Lending and Mortgage Credit Access*, 2019.
6. Christoph Basten and Steven Ongena, *The Geography of Mortgage Lending in Times of FinTech*, 2019.
7. Allen Berger and Robert DeYoung, *Technological Progress and the Geographic Expansion of the Banking Industry*, 2006.

Underserved Borrowers (continued)

FinTech can expand credit access for borrowers from minority groups (e.g., gender and visible minorities)

FinTech can reduce personal bias towards minority groups in the mortgage lending process

For regulators and government agencies, ensuring that technology in the financial services system does not introduce new biases, or reinforce existing biases is critical to uphold the integrity of the financial system. Based on evidence from the United States, traditional lenders that execute loans through in-person interactions can be susceptible to personal bias when approving mortgage loans.[1,2] This can result in higher interest rates or greater likelihoods of mortgage rejection for minority borrowers (e.g., gender and visible minorities).

FinTech lenders employ automation in borrower risk assessments, thereby reducing personal bias in credit approval decisions which often stem from traditional, face-to-face interactions. However, it is important to note that FinTech lenders do not completely remove personal bias, as automation methods have the propensity to generate statistical discrimination.

Supporting evidence from selected studies:

- Bartlett et al. (2019) find that FinTech lenders discriminate less than traditional, face-to-face lenders – by up to 40% less discrimination in terms of interest rates.[3]
- Bartlett et al. (2019) find a positive role of FinTech within the traditional discrimination of loan rejection rates. They suggest that fully automated underwriting may reduce the incidence of discrimination in loan rejections.[4]
- Mills (2018) finds that FinTech improves access to the mortgage application for low-income and minority groups.[5]
- Fuster et al. (2018) find that FinTech lenders attract a higher share of female borrowers.[6]

Borrowers, who may be at risk of being racially profiled during the lending process may be able to encounter a fairer mortgage process where acceptance and rejection are based on the financial profile of a prospective loan.

Lenders and brokers can employ innovative technologies that enable automation to mitigate instances where discrimination (e.g., in terms of gender and ethnicity) are factored in credit approval decisions, thereby complying with legislations and supporting broader inclusion/diversity targets.

Reducing risks of personal bias or discrimination in credit approval decisions allows regulators and government agencies in the mortgage **ecosystem** to uphold legislations (e.g., Canadian Human Rights Act) and achieve broader targets of inclusive economic growth (e.g., National Housing Strategy's vision to uphold non-discrimination and inclusion in housing markets).

Additionally, new investment opportunities (e.g., regional growth funds) can be contemplated to enable mortgage FinTech's role in inclusive economic growth.

1. Justin Steil et al., *The Social Structure of Mortgage Discrimination,* 2017.
2. There is no recent research on discrimination within mortgage lending practices in Canada. However, studies have found evidence of racial discrimination in Canada in the rental housing market (e.g., landlords unwilling to rent to visible minorities). Accordingly, there is no reason to believe that discrimination is absent from Canada's homeownership market. Source: University of Toronto, *Housing Discrimination in Canada: What Do We Know About It?, 2002.*
3. Robert Bartlett et al., *Consumer-Lending Discrimination in the FinTech Era*, 2019.
4. Ibid.
5. Alison Mills, *The End of the Mortgage "Dark Age"*, 2018.
6. Andreas Fuster et al., *The Role of Technology in Mortgage Lending*, 2018.

Structural Market Changes

FinTech can cause structural changes in the mortgage industry, which can have spillover effects into homeownership rates and cross-border competition

FinTech can positively impact homeownership rates and mortgage supply elasticity

As previously described, FinTech brings a number of benefits in customer efficiency and credit access. These benefits create indirect impacts on homeownership rates and mortgage supply elasticity – (i) faster processing times can enable FinTech lenders to adjust supply more easily than traditional lenders and (ii) underserved borrowers previously excluded from the market can look to FinTech lenders as an alternative.

Supporting evidence from selected studies:

- Gates et al. (2002) find that automated underwriting systems, trough increased accuracy of default, results in higher borrower approval rates, especially for underserved applicants.[1]
- Foote et al. (2018) find that innovations in mortgage technology (e.g., automated underwriting), increase homeownership rates, especially among those who previously were excluded from the market because of high debt-to-income ratios.[2]
- Fuster et al. (2018) find that FinTech lenders adjust supply more elastically than other lenders in response to exogenous mortgage demand shocks, thereby alleviating capacity constraints associated with traditional mortgage lending.[3]

Borrowers, can benefit from increased mortgage supply elasticity when mortgage demand levels are high. As described earlier, borrowers can also benefit from expanded credit access which support homeownership rates.

Lenders can leverage innovative technologies (e.g., automation) to minimize bottlenecks in mortgage approval processes when mortgage demand levels are high. This can enable increased activity for all types of lenders, an observation supported by our stakeholder consultations.

Increased homeownership rates will indirectly benefit ancillary businesses in the mortgage **ecosystem** (e.g., insurance companies will benefit from an increased demand for mortgages).

FinTech can enable cross-border competition in financial services

In recent years, cross-border competition in the financial services has been on the rise – with an increasing presence of foreign bank branches in Canada[4] and increasing expansion of Canadian banks into foreign markets.[5] Technological innovation in financial services could further enable cross-border competition in financial services over time in a number of markets[6] – including mortgages. As FinTech continues to drive cross-border competition in financial services, Canada is well positioned to see new entrants in its financial services industry in the near- and medium-terms.

As the industry matures, Canada can incubate and scale its FinTechs to enable cross-border competition in financial services. This will allow Canada's financial services industry to: (i) take advantage of greater diversification and risk-sharing and (ii) become competitive with other countries expanding FinTech capabilities on a global scale. Moreover, if mortgage businesses in Canada fall behind their global counterparts in terms of innovation, international FinTech firms which expand to Canada may be well-positioned to capture market share (notwithstanding the barriers to entry described in pages 59 to 67). This observation was echoed in our stakeholder consultations and highlights the importance of innovation within Canada's mortgage industry.

Lenders can adopt technological capabilities to gain a competitive edge when considering cross-border expansions

Regulators in the mortgage **ecosystem** should monitor new FinTech activities and capabilities coming into Canada to ensure its local market participants are safeguarded. Further, to enable cross-border competition, Canada should enable regulatory initiatives that support its FinTechs in international expansion.

1. Susan Wharton Gates et al., *Automated Underwriting in Mortgage Lending: Good News for the Underserved?*, 2002.
2. Christopher L. Foote et al., *Technological Innovation in Mortgage Underwriting*, 2018.
3. Andreas Fuster et al., *The Role of Technology in Mortgage Lending*, 2018.
4. Paul Belanger et al., *Cross-Border Lending to Canada: Bank Act Primer for Foreign Banks*, 2016.
5. James Champman and H. Evren Damar, *Shock Transmission Through International Banks: Canada*, 2015.
6. James Bradshaw, "Cross-border mergers and acquisitions poised for big 2018", The Globe and Mail, March 8, 2018.

Structural Market Changes (continued)

FinTech can cause structural changes in the mortgage industry, which can have spillover effects into systemic risk factors

Non-bank FinTech lenders have the potential to enable systemic risk if they capture a significant market share

Canada's mortgage industry is presently dominated by its top banking institutions, several which have driven innovation in FinTech lending capabilities. However, if non-bank FinTech lenders gain footing in Canada (which we understand is unlikely in the short- and medium-terms) and capture a significant share of the residential mortgage market, they may achieve similar scale as non-bank lenders in other jurisdictions (e.g., Quicken Loans in the US).

In this event, FinTech lenders have the potential to become systemically significant, and therefore, have an increased potential to enable systemic risk in the economy. This increased potential to enable systemic risk may stem from excessive risk-taking (e.g., if they were to not undertake the same level of due diligence and risk screening of potential clients) or regulatory elements unique to FinTech lenders (e.g., if FinTech lenders are subject to varying levels of regulation between provinces).[1] This hypothetical, long-term scenario (e.g., in the next five years or more) was validated as a possibility through our stakeholder consultations. It is important to note that the potential of this long-term risk will depend on the extent to which Canada drives and enables the prevalence of non-bank FinTech lending in the mortgage industry; our consultations with financial institutions inform that this change is not likely in the current mortgage lending environment (since banks keep constant their credit risk profiles between traditional and digital mortgage channels).

Regulators in the mortgage **ecosystem** may need to monitor systemic risks in the event that non-bank FinTech lenders achieve a large enough scale and become systematically important. Our stakeholder consultations and secondary research findings inform that such scaling is unlikely in the near- and medium-terms.

1. Jon Frost, *The Economic Forces Driving Fintech Adoption Across Countries*, 2020.

Cost Savings and Operational Efficiencies

FinTech can result in greater operational efficiency, risk reduction, and profitability for mortgage lenders and related stakeholders in the mortgage space

FinTech can reduce instances of fraud in mortgage applications

Mortgage fraud is the misrepresentation of borrower information to lenders – a problem faced by mortgage lenders around the world. Canada is no exception to this phenomenon – S&P[1] and Equifax[2] find that mortgage fraud is on the rise across Canada. Mortgage fraud in Canada is estimated to total hundreds of millions of dollars each year.[3] In consultations with a major Canadian bank, it was noted that the ability for technology to potentially reduce document fraud is a key benefit of innovation in the mortgage space.

FinTechs are well suited to address this problem, through the use of innovative technologies (particularly AI) that automatically compile and verify applicant data in real time. These electronic verification procedures match information provided by applicants with data obtained from public and third-party sources, which leads to fewer errors when compared to manual verification procedures.[4] Ultimately, FinTechs can reduce the number of fraudulent applications and lower the number of defaults.

Supporting evidence from selected studies:

- Goodman (2016) finds that automated mortgage underwriting systems may help identify fraud.[5]
- Marsha and Ross (2018) find that accurate fraud detection is a distinguishing characteristic of FinTech lenders.[6]

Lenders can better identify and report instances of mortgage fraud, resulting in increased cost savings and better performance in compliance standards.

The broader **ecosystem** can benefit from reduced mortgage fraud rates, through reduced impact on systemic risk and more accurate risk assessment for insurance companies. However, regulators and policing authorities should be cognizant that new fraud techniques may arise in light of electronic verification procedures.

Investors that purchase secondary mortgages or mortgage-backed assets will have the benefit of reduced risk if instances of mortgage fraud are reduced.

FinTech can enable cost reductions and operational efficiencies for lenders

Innovative technologies in the mortgage landscape bring a range of benefits for lenders, including reduction of administrative costs, faster decision-making capabilities, more accurate risk assessments, among others. For instance, majority of the processing costs for traditional lenders goes towards human labour – a cost that can be reduced by streamlined back-end processes.[7]

Furthermore, adopting FinTech capabilities allows lenders to be more competitive. Evidence from the US market shows that non-bank lenders have increased market share significantly in recent years through technological innovation.[8]

Supporting evidence from selected studies:

- Jagtiani and Lemieux (2019) finds that technological innovations (e.g., AI- and ML-driven algorithms) could reduce the cost of making credit decisions and/or credit monitoring and lower operating costs for lenders.[9]
- Mills (2018) finds that technological innovations have the potential to reduce transaction costs and origination fees of mortgages for lenders, which have been traditionally quite high.[10]

Lenders can adopt FinTech capabilities to reduce administrative costs, advance operational efficiencies, and gain a competitive edge in the mortgage market.

1. Allison McNeely, "S&P warns more mortgage fraud could emerge at Canadian banks", BNN Bloomberg, February 26, 2018.
2. "Equifax Canada: Mortgage Fraud on the Rise", Equifax Canada, January 11, 2017.
3. Nicolas Praet, "Mortgage fraud on the rise", Financial Post, February 21, 2012.
4. Kenny Zhu, "Fintech's Erosion of the Mortgage Monolith", Socialnomics, September 9, 2018.
5. Laurie Goodman, "Why Rocket Mortgage Won't Start Another Housing Crisis", Urban Wire, February 11, 2016.
6. Marsha J. Courchane and Stephen L. Ross, *Evidence and Actions on Mortgage Market Disparities: Research, Fair Lending Enforcement, and Consumer Protection*, 2018.
7. Andrej Kovacevic, *Fintech is Changing Everything in the Mortgage Industry*, 2019.
8. "Mortgage Tech 101: What Is It & Why It's Taking Off Now", CB Insights, December 7, 2017.
9. Julapa Jagtiani et al., *Fintech Lending and Mortgage Credit Access*, 2019.
10. Alison Mills, *The End of the Mortgage "Dark Age"*, 2018.

Cost Savings and Operational Efficiencies (continued)

FinTech can result in greater operational efficiency, risk reduction, and profitability for mortgage lenders and related stakeholders in the mortgage space

Mortgage brokers can realize many advantages from FinTech in serving their client base

A natural policy question is the extent to which new technologies will displace, or fully automate jobs. There are several occupations that are comprised of providing personal service along all stages of the mortgage process. Specifically, Canadian mortgage brokers are on the frontlines of lending activity across the country. When asked about the sentiment amongst mortgage brokers on the prospects of new technologies being introduced into the mortgage process, our stakeholders stated on balance, the sector is optimistic and views FinTech as an opportunity. While the individual recognized that some mortgage brokers could perceive technologies to be a threat, the representative stated that most will see it as an opportunity to better serve clients and improve mortgage broker capacity.

Specific benefits that could be realized include:

- Improving the mortgage search process to ensure that customers are able to execute thorough due-diligence;
- Creation of a digital experience to reflect the needs of millennials;
- Streamlining laborious tasks such as collection of financial data and/or personal information (e.g., employer income verification);
- Potential to directly connect banking statements into a mortgage application – enabling a lender to have a broader perspective on creditworthiness;
- Prevention of specific types of fraud (e.g., fictitious bank statements); and
- Developing platforms for micro lenders to potentially access capital.

Lenders, which frequently process loans originated by mortgage brokers, can see an uptick in mortgage loans and better cater to the needs of homebuyers through the enhanced functionality of mortgage brokers.

Mortgage brokers – a key part of the supporting **ecosystem** for mortgage lending – do not believe FinTech will displace their jobs or cause negative impacts on employment levels. Instead, they believe FinTech can be leveraged to better serve clients.

The new population of **borrowers** – millennials – search and shop for mortgages differently than older generations. They are accustomed to digital experiences in the provision of financial services, and as such, will benefit from digital tools adopted by mortgage brokers.

6. Regulatory Context and Considerations

Identifying Comparable Jurisdictions

Identifying the comparator jurisdictions of highest relevance to CMHC requires consideration of several factors

Around the world, several countries have sought to support Fintech that Canada can learn from. Deloitte has recommended a focus on the US and the UK for the jurisdictional scan. The rationale for the selection of these two markets include:

- Similarities in the legal and government context across the US, UK, and Canada;
- Evidence of established body of literature/analysis on the US and UK markets;
- High degree of potential for US based mortgage technology companies to establish or consider the Canadian market based on geographic proximity and established economic relationship;
- Similarities in the sophistication of public policy levers at hand to regulate and/or assess the impacts of mortgage technologies on the industry; and
- Similar levels of average mortgage loan debt (as outlined in the table below).

Country	Residential Mortgage Debt Outstanding (Q4 2019)	Average new mortgage balance
Canada	$1.5 trillion[1]	$289,000[2]
United States	$14.1 trillion[3]	$342,537[4]
United Kingdom	$2.5 trillion[5]	$230,165[6]

**All values expressed in $CAD (based on average 2019 CAD-GBP and CAD-USD exchange rates). The values above are provided for illustrative purposes only.*

Note: We also examined the comparability of Singapore's housing market, however our analysis showed some significant dissimilarities to the Canadian context. For the outcomes of this research, please see Appendix 6.

1. Statistics Canada, *Table 38-10-0234-01: Credit Market Summary Table at Book Value, National Balance Sheet Accounts*, Accessed on May 4, 2020: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3810023401.
2. Canada Mortgage and Housing Corporation, *Mortgage and Consumer Credit Indicators,* 2019.
3. Federal Reserve Bank of St. Louis, *Households and Nonprofit Organizations: One-to-Four Family Residential Mortgages*, Accessed on May 4, 2020: https://fred.stlouisfed.org/series/HHMSDODNS.
4. Consumer Financial Protection Bureau, *Home Mortgage Disclosure Act*, Accessed on May 4, 2020: https://www.lendingtree.com/home/mortgage/u-s-mortgage-market-statistics-2019/. Note: The average new mortgage balance was calculated by dividing the total number of records for originated loans by the total dollar amount for originated loans.
5. Financial Conduct Authority, *Commentary on Mortgage Lending Statistics – March 2020*, 2020.
6. Finder UK, *Mortgage Statistics,* Accessed on May 4, 2020: https://www.finder.com/uk/mortgage-statistics.

Summary and Observations of FinTech Regulatory Approaches

There are several convergences and divergences in the regulatory approaches taken across jurisdictions to regulate and support FinTech

Our review of FinTech regulations in Canada and in comparator jurisdictions illuminated several key similarities and differences between the jurisdictions' approaches to regulating Fintech. Overall, each jurisdiction has employed unique methods to regulate and support FinTechs. Below is a summary of our key findings. Additional details can be found in the forthcoming section.

High-Level Comparison of US and Canadian Regulatory Approaches


Convergences:

- Both Canada and the US have made **use of regulatory sandboxes** to promote FinTech innovation in their respective jurisdictions. Examples of regulatory sandboxes in Canada include the CSA Regulatory Sandbox and OSC LaunchPad.
- **Regulatory fragmentation** exists in both Canada and the US, where FinTechs may be subjected to various regulations at both the federal and state/provincial/territorial levels. However, both countries have developed initiatives in the direction of harmonizing these regulations.
- Both Canada and the US exhibit **nascent open banking regulations** which have been cited as a barrier to FinTech growth. Specifically, open-banking in the US is viewed as a non-regulated market in which there is no legal framework that governs the sharing of financial data and Canada lacks, while the concept of open-banking in Canada is currently absent.[1]

Divergences:

- Canada's financial system has fewer banks than the US – with about 30 domestic banks in Canada and above 7,000 in the US.[2] This phenomenon, coupled with the relatively strong nature of Canada's federal financial sector regulators, contributes to conservative risk-taking as Canadian regulators are more involved in everything banks do.
- In Canada, due to regulations for some FinTech market segments not being under federal oversight, FinTech has been largely driven by the big banks. This may lead to less FinTech firms that operate under a B2C context in Canada relative to the US.[3"]

High-Level Comparison of UK and Canadian Regulatory Approaches


Convergences:

- Both Canada and the UK have made **use of regulatory sandboxes** to promote FinTech innovation in their respective jurisdictions. The UK was the first country to introduce a regulatory sandbox, announcing the approach in 2015 and approving the first sandbox FinTech services in 2016.[4]
- **Fintech accelerators** are being used by regulators in both Canada and the UK to bridge the gap between the public and private sectors.
- Regulators in the UK and Canada have both forged **international partnerships** to support firms that wish to operate in multiple countries.

Divergences

- **Canada lacks a national champion** dedicated towards developing a competitive, unified, and strong policy environment for FinTechs. This observation contrasts the regulatory environment in the UK, which is nationally coordinated across public and private sector organizations and mandated to enable competition in the financial services sector.[5]
- Canada has made **limited progress on developing an open banking regime** compared to the UK, where open banking was introduced in 2018. Canada lags on the implementation of an open banking framework as compared to the UK, which was the first jurisdiction to implement a framework. In the UK, banks have opened up their data via secure APIs, enabling FinTech firms to provide customers with the best possible banking experiences.[6]

1. Stanley Ragalevsky et al., "Is Open Banking Coming to the United States?", Lexology, April 2019.
2. Lawrence Pruss, "The Differences Between Banking in the US and Canada", The Financial Brand, October 2015.
3. Ryan Clements, *Regulating Fintech in Canada and the United States: Comparison*
4. Financial Conduct Authority, *Regulatory Sandbox*, 2015.
5. HM Treasury, *Fintech Search Strategy: Securing the Future of UK Fintech*, 2018.
6. Open Banking Limited, *Open Banking, Preparing for Lift Off*, 2019.

Key Lessons for Canada's Regulatory Approach

Five key lessons can be drawn for Canada's regulatory approach based on the regulatory environment in comparator jurisdictions, based on research detailed in this section

Regulatory fragmentation between different levels of government, sub-national bodies, and other regulatory organizations can hinder expansion of FinTechs. This fragmentation exists in Canada due to a complex regulatory framework – which is complicated because certain financial institutions are regulated federally, while others provincially. Additionally, regulations are entity based, meaning that FinTech firms must comply with entity-specific statutes. Creating a framework in which firms can easily expand within the country, without having to comply with several different regulators and entity-specific statutes will encourage the scaling of domestic FinTechs as well as the expansion of international FinTechs to Canada. This may include a shift towards a more functions-based approach as well as greater coordination between provincial legislators.

Fostering a collaborative environment between regulators and FinTech firms can be beneficial to all parties. Regulators can gain access to new technologies and approaches, while FinTechs can better ensure regulatory compliance. The FinTech industry is dynamic and fast-changing, therefore forging **sustainable partnerships between public and private stakeholders** can ensure that regulatory activities are up-to-date and conducive to innovation. For example, there is opportunity for regulators to co-create business models with FinTech firms, offer regulatory support to FinTechs during the incubation phase to ensure compliance, and simply publish a comprehensive set of tools and resources for FinTechs looking to undertake regulated activities. In addition, this form of collaboration may allow regulators to gain a better understanding of potential emerging risks arising from innovative business models and services.

Promoting international cooperation and collaboration can help attract and grow innovation in the FinTech sector. Cross-border regulatory coordination can stimulate market development by helping FinTechs expand internationally. In addition, knowledge-sharing on innovation in financial services can ensure that regulators are informed by best practices, lessons learned, and different regulatory approaches to innovation.

Given the fast pace of technological change, regulators may benefit from **co-design and regular stakeholder engagement** in the development of regulatory and financial innovation activities. To foster this flexibility, regulations should be principle-based (i.e., based on guiding principles and best practices). This approach may involve monitoring key developments in the industry and working directly with FinTech firms and other external stakeholders where knowledge gaps exist. The importance of adaptability may be especially salient when considering the development of FinTech capabilities that are traditionally heavily regulated.

It is important to recognize that learning from the experiences of international jurisdictions can provide valuable guidance, however, **there does not exist a one-size-fits-all solution** to regulating FinTech. Regulations and initiatives designed to promote innovation need to be tailored to the Canadian context, created with a deep understanding of the existing FinTech market and the key risks involved.

Overview of Canada's Regulatory Context

Canada has a principle-based, decentralized regulatory environment that has been noted in reviews as a potential obstacle to FinTech innovation

Canada's entity-based approach to regulation:

Currently, Canada's financial services regulatory framework centers upon what you are, rather than what you do. This corresponds with an entity-based approach in which FinTech firms have to comply with entity-specific statutes (e.g., *Bank Act, Insurance Act, Trust and Loan Companies Act*), as opposed to a functions-based approach in which firms bear regulatory requirements according to the functions they perform. The current approach contributes to Canada's high degree of regulatory fragmentation in the financial services sector.

FinTech firms – which are magnitudes lower in size than incumbent financial institutions – find it difficult to adhere to the regulatory requirements of entity-specific statutes. As such, the Competition Bureau recommends shifting away from an entity-based approach to help level the playing field between different players and allow entities to bear regulatory requirements in line with the functions they perform.[1] This recommendation was echoed in our consultations with stakeholders in the Canadian regulatory environment which identified the current entity-based approach to regulatory as a potential barrier for the scaling/expansion of FinTechs. Notably, the upcoming Retail Payments Oversight Framework will be a first move toward functional based regulation in the federal financial sector sphere.

This approach, coupled with other regulatory impediments, is part of the puzzle as to why Canada has been lagging in FinTech development when compared to global peers like United Kingdom, Australia and United States.

Overview of Canada's regulatory structure:

There is no single Canadian regulatory body that has jurisdiction over FinTechs. However, there are specific roles, regulatory bodies, and legislations relevant to the sector, including:

- FinTech firms are not exempt from the entity-specific statutes applicable to incumbent financial institutions. Based on the products and services offered by FinTech firms, examples of federal statutes relevant to the sector include: *Bank Act, Insurance Act, Trust and Loan Companies Act, Payment Card Networks Act*, *Proceeds of Crime (Money Laundering) and Terrorist Financing Act,* and the *Canadian Payments Act.*
- The Minister of Finance and Department of Finance of Canada are responsible for fiscal policy and financial sector regulatory policy and legislation.
- The Minister of Finance oversees a number of federal agencies and Crown corporations in the financial services sector including the Office of the Superintendent of Financial Institutions ("OSFI"), Financial Consumer Agency of Canada, Financial Transactions and Reports Analysis Centre of Canada, and Canadian Deposit Insurance Corporation. Notably, the Minister of Finance sets policy and creates legislation, but these agencies (and others) carry out the enforcement of that legislation.
- The *Personal Information Protection and Electronic Documents Act* is federal statute aimed at protecting consumer data. The legislation is applicable to private sector organizations across Canada (including FinTechs) that collect, use, or disclose personal information. Our stakeholder consultations with financial institutions highlight that future changes to the act will result in a strengthened and more regulatory robust data protection regime due to the fact that it is such a pressing issue in the public conscience.

Generally, a FinTech firm may be subject to a combination of both federal and provincial/territorial regulations based on the services or products it provides. In line with the federal system of government in Canada, provinces/territories are empowered to draft and enact certain regulations for the financial services sector. For example, securities are regulated through 13 provincial and territorial authorities, and most provinces have consumer protection legislation. Referencing the example of securities regulation, further regulatory fragmentation can be observed by the duplicative regulatory oversight of Canada's self-regulatory organizations – e.g., both Investment Industry Regulatory Organization and Mutual Fund Dealers Association have duplicative regulatory oversight on mutual fund dealers.

Overall, FinTechs that provide certain services – such as banking, consumer credit, or insurance services – could be subject to the same regulations as incumbents in the sector. Small firms may find it difficult to achieve compliance as they will need to adhere to entity-based regulations fragmented regulatory oversight. This has the potential to hinder the ability of FinTech firms to scale and expand.

1. Competition Bureau of Canada, "Canada's progress in FinTech", Accessed on February 25, 2020. <https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04392.html>

Overview of Canada's Regulatory Context (continued)

Recognizing the importance of FinTech, Canadian regulators have implemented several initiatives to support innovation in the financial services industry

Examples of initiatives that have encouraged FinTech innovation:

Several initiatives have been put in place to create a more hospitable environment for FinTech innovation. While these efforts have not been specifically directed towards innovation in the mortgage space, they represent models that could be applicable and scaled to further support FinTech in the mortgage space. Some examples include:

- Recently, key Canadian legislation was updated to better support FinTech activity. For example, recent amendments to the *Bank Act, Trust and Loans Companies Act*, and *Insurance Companies Act* introduced changes (applicable to certain entities) such as:
  - Enhancing powers for financial institutions to refer customers to other entities;
  - Broad powers for financial institutions to collect, manipulate and transit information;
  - New powers for financial institutions to commercialize activities developed in-house;
  - New powers for financial institutions to provide identification, verification and authentication services; and
  - Enhanced abilities for Canadian banks to collaborate with Fintech firms. Recent amendments to the *Bank Act* removed barriers that restricted certain types of relationships between banks and FinTech firms, which were previously associated with lengthy approval processes and restrictions on the type of investments banks can make in FinTech firms. However, the same degree of regulatory change has not been observed for credit unions which are largely governed by provincial regulations. For example, credit unions in Ontario are not permitted to own more than a 30% stake in a list of prescribed subsidiaries under the current framework – a restriction which our stakeholder consultations identified as out of date in light of the emergence of FinTech. That being said, credit unions can be federally regulated as a result of amendments to the Bank Act in 2012; however, we understand through stakeholder consultations that this process is time-consuming. This is evidenced by the fact that only two credit unions have been federally expanded to date.
- In 2016, Bank of Canada established a series of partnerships (including with the Big Five Banks, Payments Canada, and the R3 consortium) to better understand the mechanics of blockchain, with the objective to understand how the technology could improve efficiency and transparency in the Canada's financial system. The Bank of Canada continues to enable innovation in the financial system, recently expanding to peer-to-peer lending and uses of distributed ledger technology.
- The Canadian Securities Administrators ("CSA") Regulatory Sandbox is an initiative to support FinTech businesses seeking to offer innovative products, services and applications in Canada. It allows firms to register and/or obtain temporary relaxations from certain securities laws requirements to test and innovate new products/approaches – allowing businesses to test their products, services, and applications throughout the Canadian market on a time-limited basis. The CSA sandbox has been identified to have some initial success such as helping launch, among other initiatives, ZED Network's blockchain-based "foreign exchange remittance network system," and Token Funder's platform for issuing "tokenized" securities.
- Moreover, the Ontario government announced its intention to create a regulatory "super sandbox" for FinTechs and launched the Ontario Fintech Accelerator Office to help connect startups to businesses and grow the province's FinTech sector.
- Several provincial securities commissions, including those in Ontario, Quebec and British Columbia, have established advisory offices or working groups to support FinTech growth. The Alberta Securities Commission also established a "new economy" division focused on "issues and opportunities relating to emerging financial technologies." This provincial effort towards innovation is echoed by provincial financial sector regulators – such as FSCO (Ontario), FICOM (British Columbia), and AMF (Quebec). For example, FSCO established a working group in 2016-17 to create a collaborative dialogue between Fintech firms that are already operating, or about to begin operations, in a regulated sector.
- Notably, OSFI's small deposit taking institutions division is dedicated towards the facilitation of FinTech related activities by regulated financial institutions.
- In addition, there are also many private innovation accelerators in Canada, such as the DMZ-BMO Fintech Accelerator, Holt Fintech AI Accelerator, Desjardins Lab, and FormFintech which work to bridge the gap between public and private sectors which can enable knowledge transfer on regulatory compliance as well as support collaboration.
- Notably, while interprovincial challenges are consistently highlighted – Canadian regulators have forged cooperation with international partners. In 2019, members of the CSA signed an agreement with the Monetary Authority of Singapore thereby forging collaboration with regulatory authorities in Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Quebec, Ontario, and Saskatchewan.

Overview of FinTech Regulations in the United States

Although the regulatory context in the United States has been cited as complex and fragmented, FinTech in the mortgage industry has grown considerably in the past few years

Regulatory approach:

The US has adopted a rules-based, enforcement-oriented approach to regulation. This approach involves determining which existing rules should apply to different firms, incorporating new entrants into the current regulatory framework rather than creating new regulatory structures around FinTech. It has been noted that the reason mortgage FinTechs have grown so rapidly in recent years could in part be due to regulatory arbitrage in the United States. To illustrate this, research suggests that the higher regulatory burden for banks following the 2008 financial crisis can explain up to 50% of the recent increase in non-banks, including FinTech lenders.[1]

Regulatory framework:

Fintech businesses in the United States are not subject to a FinTech-specific regulatory framework by any specific federal or state regulator. Fintech firms may be subjected to various regulations at both the federal and state levels based on the activities it conducts.

The type of licenses that may be required at the state level include consumer lending, money transmission, and virtual currency licenses.[2] A FinTech firm may find the compliance process to be extensive and tedious as each state has its own diverse set of rules and regulations. At the federal level, the Consumer Financial Protection Bureau ("CFPB") has jurisdiction over financial service providers to consumers. As many FinTech firms offer services directly to consumers, the CFPB can enforce a range of consumer protection laws that apply to the activities of these firms.

Examples of initiatives that have encouraged FinTech innovation:

- The CFPB has introduced a regulatory sandbox framework to help FinTechs develop and test innovative products. Some states, such as Arizona and Wyoming, have also developed their own statewide regulatory sandboxes for FinTech.
- The Federal Insurance Corporation launched FDiTech to promote the adoption of innovative and transformative technologies in the financial services sector.
- The banking regulators of seven US states, (Georgia, Illinois, Kansas, Massachusetts, Tennessee, Texas and Washington) have committed to a multi-state agreement that standardizes elements of the licensing process for money services businesses. Other states are expected to join in the future.[3]
- Broadly, state financial regulators in the US have launched an initiative known as "Vision 2020", aimed at harmonizing state regulation of non-bank financial companies. This initiative represents a step towards reducing regulatory fragmentation.[4]

1. Greg Buchak et al., *Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks*, 2018.
2. The International Comparative Legal Guides, *United States: Fintech 2019*, 2019.
3. "State Regulators Take First Step to Standardize Licensing Practices for Fintech Payments", The Conference of State Bank Supervisors, February 6, 2018.
4. The Conference of State Bank Supervisors*, CSBS Vision 2020: Progress Update,* 2018.

Overview of FinTech Regulations in the United Kingdom

The United Kingdom is considered a global FinTech leader, owing largely to it's strong regulatory environment and implementation of numerous programs aimed at supporting innovation in the financial services industry

Regulatory approach:

The UK government has championed a progressive approach to FinTech regulation. It was one of the first countries to develop regulatory standards and policies specifically for FinTech, including launch of the first regulatory sandbox in 2015 by the Financial Conduct Authority ("FCA").[1] The strength of the UK regulatory environment is attributable to several factors, including, the success of the FCA in supporting the growth of FinTechs, effective tax incentives (e.g., SME R&D tax credits, seed enterprise investment scheme) and various government programs designed to promote competition and innovation which indirectly support FinTechs (e.g., adoption of open-banking platforms).[1]

Regulatory framework:

FinTech firms in the UK are not subject to a specific regulatory framework, but rather are governed by the existing body of UK financial regulation. FinTechs will fall into the regulatory perimeter of these bodies if they execute certain activities, such as banking, consumer credit and insurance services, and crowdfunding.

Overall, a FinTech looking to engage in regulated activities (e.g., mortgage and home-finance related activities, investment activities, insurance-related activities) in the UK must obtain authorization from either the FCA or the Prudential Regulatory Authority ("PRA"), depending on the activities that the firm is undertaking.[2] The Financial Services and Markets Act 2000 establishes the statutory power of the FCA and PRA and their ability to make rules. These rules can be largely found in the FCA's Handbook of Rules and Guidance and the PRA's Rulebook, and FinTechs that fall under the regulatory perimeter of these rules will have to comply accordingly.

Examples of initiatives that have encouraged FinTech innovation:[3]

There exists several support systems to help FinTechs understand the regulatory framework as it applies to them. Examples of initiatives include:

- The FCA's 'Project Innovate' is an initiative that helps ensure that FinTech firms are compatible with regulations. The initiative was launched in 2014 and includes a regulatory sandbox, an advice unit, and an innovation hub.
- The Bank of England launched the 'FinTech Accelerator' in 2016, an initiative that allowed the central bank to partner with FinTech firms to develop innovations for central banking, while helping FinTech firms navigate existing regulations.
- The FCA collaborates with several international financial services regulators to facilitate the entry of overseas FinTech firms into the UK as well as the international expansion of UK-based FinTech firms.

1. Global Consulting Company, *UK FinTech: On the Cutting Edge*, 2018.
2. The International Comparative Legal Guides, *United Kingdom: Fintech 2019*, 2019.
3. "Innovate: Engagement", Financial Conduct Authority, June 30, 2017.

7. Examples of Potential Barriers to Entry

Summary of Potential Barriers to Entry

We present examples of potential barriers to entry for FinTech firms looking to expand operations into Canada and highlight key jurisdictional differences in the US and UK contexts

We identified eight potential barriers to entry that may inhibit the ability of FinTech firms located internationally to expand operations into Canada's mortgage industry. The potential barriers were primarily identified through secondary research and stakeholder consultations. We describe how each barrier to entry compares to the US and UK (i.e., our selected comparator jurisdictions). Our jurisdictional comparison provides key insights into how Canada can mitigate some barriers to entry.

The table below summarizes the identified potential barriers to entry, which are subsequently detailed in this section.

Potential Barriers to Entry	Brief Description
1. Regulatory Complexity	Complex regulatory frameworks have been identified as a key barrier to FinTech adoption in Canada
2. Cybersecurity Considers	Concerns over cybersecurity are limiting consumer acceptance of FinTech firms in the mortgage industry
3. Consumer Acceptance	Canadian customers often lack awareness and acceptance of mortgage FinTech products
4. Lack of Experience Completing Financial Cycles	The literature identified lack of industry specific knowledge as a key factor shaping FinTech adoption in the mortgage industry
5. Limited Mortgage-Backed Security Opportunities	Mortgage securitization activities are heavily regulated in Canada, potentially limiting available funding sources for smaller institutions
6. Traditional Reliance on Income Verification	Alternate methods to calculate creditworthiness may not be accepted and recognized in an environment with a strong traditional reliance on income verification
7. Open Banking in Nascent Stages	Despite the potential benefits of open banking in promoting innovation in the financial services industry, Canada has yet to establish open banking capabilities
8. Lack of Private Investment in Canada	Relative to peers, Canada's funding ecosystem is limited – therefore potentially limiting the scope of investment activity in FinTech

Regulatory Complexity

Complex regulatory frameworks have been identified as a key barrier to FinTech adoption in Canada

OVERVIEW

Several reviews have identified Canada's regulatory structure as a potential challenge for some types of FinTech firms. As Canadian banks have an established ability to comply with regulators, FinTech is often driven by big banks that have the in-house regulatory expertise to understand how to deploy new technologies in line with regulatory requirements. This can however, make it challenging for small start ups to access market opportunities.

- As a result, incumbents often partner with start up FinTech firms to develop products and services inside a bank's exiting infrastructure and regulatory domain.
- These forms of partnership are often complementary partnerships in which banks are able to enhance customer service and operations through partnerships rather than, wholesale disruption viewed in other markets.[1]

In addition, this dynamic has led to observations that Canada's market may be a less hospitable market for wholesale disruption – thereby limiting particularly innovative, ground-breaking approaches. Regulatory complexity can affect firms differently. Large firms can be on a position to have more resources/expertise available to them to ensure compliance. Conversely, small firms and/or startups can be challenged to take on regulatory compliance activities on their own and lack the resources to hire outside experts. Taken together, these conditions can favour large incumbents by inhibiting competition in financial services (which may have a positive impact on financial stability, on the other hand).

Key Jurisdictional Differences – United States

- While studies have cited similar levels of regulatory complexity in the US and Canada, the financial services industry is less concentrated in the US compared to Canada, allowing for more FinTech firms to enter the market. For example, Canada's five biggest banks accounted for two-thirds of the mortgage market in 2018.[2] In comparison, all US banks originated just 40% of all mortgage loans in 2017.[3]
- In general, Canadian banks play a significantly larger role in the FinTech industry compared to US banks. This is especially evident in the mortgage industry, as US banks have been subject to higher regulation, supervision, and fines in the lending market since the financial crisis. US FinTech lenders operate in a relatively less regulated environment, and as such, have been able to increase their market share in the residential mortgage industry in the past decade.[4]

Key Jurisdictional Differences – United Kingdom

- The UK government is working to establish the UK as the 'global capital of FinTech', through the provision of resources to the sector to advance the development of innovative financial products.[5] The support of the UK government in the FinTech sector helps new firms comply with regulations and compete in the market.[6] This approach is in contrast to the Canadian sector, where regulatory complexity is borne disproportionately by new, smaller firms.[7]
- The UK has invested in collaboration spaces to help create a hospitable regulatory environment. For example, the Financial Conduct Authority has established 'Project Innovate', an initiative that helps ensure FinTech firms are compatible with regulations through initiatives such as:
  - An *Innovation Hub*, which helps businesses understand the regulatory framework applicable to their business and provides assistance for authorization applications;
  - An *Advice Unit*, which provides regulatory feedback to firms that are using automation to provide advice to consumers in the mortgage sector and beyond; and
  - A *Regulatory Sandbox*, to help businesses test innovative financial products and services in a live environment, without bearing the usual regulatory consequences.[8]

1. Ryan Clements, *Regulating Fintech in Canada and the United States: Comparison, Challenges, and* Opportunities, 2019.
2. Matt Scuffham, "Big banks tighten grip on mortgage market after rule changes stifle competition", Financial Post, December 13, 2018.
3. Tendayi Kapfidze, *U.S. Mortgage Market Statistics: 2018*, 2018.
4. Greg Buchak et al., *Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks*, 2018.
5. The International Comparative Legal Guides, *United Kingdom: Fintech 2019*, 2019.
6. Ibid.
7. Stephen J. Redican et al., "Regulating Fintech in Canada: Financial Services Regulatory Bulletin", Borden Ladner Gervais, October 1, 2016.
8. Recently, Canada has also implemented regulatory sandboxes to encourage innovation in the financial services industry, such as the CSA Regulatory Sandbox and OSC LaunchPad. Please refer to page 55 of this document for more information.

Consumer Acceptance

Canadian customers often lack awareness and acceptance of mortgage FinTech products

OVERVIEW

While customers have become accustomed to levels of automation and 'paperless' transactions in banking (e.g., day-to-day banking, making investments, payment of bills etc.) it is possible that Canadian customers may not be comfortable with a fully automated acquisition of a residential mortgage (e.g., completely automated mortgage search, loan origination and underwriting, etc.) without speaking to a customer representative.

Further, customers may traditionally view parts of the mortgage process such as an agreement of mortgage terms and re-financing as opportunities to speak with their financial institutions. For example, for individuals with accounts in major banks, banks can use conversations with potential borrowers to discuss their banking needs more broadly, and use these opportunities to provide client service and general guidance and/or changes to one's portfolio of financial products that can support decision-making process for people looking for mortgages. For example, in consultations with a large bank, it was noted that while end-to-end capabilities exist, people continue to prefer or request in-person consultation throughout the mortgaging process.

Finally, a dominant perception amongst consumers is that regulated banks represent financial and regulatory stability that can be trusted.[1] For individuals buying homes, this perception can skew individuals to focus on banks as a source of mortgages – thereby reducing their interest in looking for more innovative approaches and opening up to FinTech firms in the mortgage industry.

Anecdotally, stakeholders emphasized that this challenge may be particularly pronounced for international companies seeking to expand to Canada, as Canadian consumers may be more open to 'Canada made' solutions due to an inherent level of trust in Canadian firms. Furthermore, it was noted that Canadian consumers often bank with the same institution throughout their lifespan, which is often the same institution their parents were with. As a result, Canadian consumers are likely to concentrate all financial activities within one institution and be hesitant or resistant towards changing banks. This tendency can limit the extent to which consumers would be willing to consider executing mortgage-related functions through a third party (e.g., FinTech firms).

Key Jurisdictional Differences – United States

- Customer retention rates are much lower for American banks compared to Canadian banks. It is estimated that 64% of Canadian customers have been with their current bank at least a decade, compared to 40% of American customers.[2] In addition, Canadian financial institutions engage in FinTech partnerships at a nine-percent higher rate than American financial institutions. This indicates that financial institutions play a larger role in the Canadian FinTech market compared to the US.[3] Where the Canadian consumers have strong ties to existing financial institutions, the American landscape allows for more consumer-facing market entrants.[4]
- The lower prominence of American financial institutions in the mortgage industry also stems from the turbulence from the financial crisis, which resulted in a post-crisis market opening for FinTech firms and products. The growing uptake of FinTech in the American mortgage industry shows how American consumers are more inclined to use non-bank institutions for the benefits they offer consumers compared to established institutions.[5]

Key Jurisdictional Differences – United Kingdom

- The UK's FinTech adoption rate is 71%, above the global average of 64% and above Canada's rate of 50%. This illustrates that there is a higher percentage of digitally active consumers in the UK's market compared to Canada. In fact, 23% of consumers use five or more providers for specific products and services, suggesting that consumers in the UK are taking advantage of the array of services offered by FinTech firms.[6] This is in part driven by open banking developments in the country that have enabled the sharing of financial data through APIs.[7]
- To illustrate, more than one fifth of UK consumers are using challenger banks for their primary banking needs, a figure that drops to one third for millennials.[8] Consumers cited ease of use, technology offerings, and compatibility with other apps as the key factors in their decision to use challenger banks. Of challenger bank customers, almost half indicated that they would consider using the bank as a mortgage provider if the service was offered.

1. Competition Bureau of Canada, *Technology-Led Innovation in the Canadian Financial Services Sector*, 2017.
2. Global Consulting Company, *The Digital Disruption in Banking: North American Consumer Digital Banking Survey*, 2014.
3. Charlotte Watson and Alex LaPlante, *An Overview of Fintech in Canada,* 2018.
4. Ryan Clements, *Regulating Fintech in Canada and the United States: Comparison, Challenges, and* Opportunities, 2019.
5. Greg Buchak et al., *Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks,* 2018.
6. Global Consulting Company, *Global FinTech Adoption Index 2019*, 2019.
7. Please refer to Appendix 4 of this document for a summary of our research on open banking platforms.
8. Simon Kent and Danil Makarov, "Challenger banks: how convenience, innovation, and trust will shape tomorrow's banking", Kearney.

Cybersecurity Considerations

Concerns over cybersecurity are limiting consumer acceptance of FinTech firms in the mortgage industry

OVERVIEW

While disruptive technologies and business models can have clear benefits to consumers, concerns for data privacy and consumer protection are a key consideration for all stakeholders in the mortgage FinTech ecosystem. For borrowers, new models/products would need to adequately ensure protection of customer data. For lenders, breaches can create significant reputational and business harm. For regulators, ensuring data protection and data management are integrated into forthcoming and existing regulations can be a key role to protect the public interest. In initial consultations with experts, it was noted that the mortgage FinTech space does not have unique cybersecurity challenges that are 'above and beyond' the classical considerations that most of the financial services. Nonetheless, for firms, ensuring that they are able to ensure high quality cybersecurity is pivotal in gaining market confidence. Breaches and/or an inability to communicate firm cybersecurity measures could limit consumer acceptance of FinTech firms in the mortgage industry.

This challenge was noted as particularly relevant to international firms seeking to enter into the Canadian market. Anecdotally, stakeholders noted that it is possible that Canadian consumers would be weary of sharing personal financial data with internationally head quartered companies. Moreover, cloud based storage capabilities may not be as trusted in other markets relative to Canada. Moreover, concerns over cybersecurity breaches, the international storage of personal financial data by global multinationals could also limit consumers' willingness to share data/information with foreign companies. This observation should be balanced with a view that consumers may be willing to provide information if they view the possibility of service efficiencies.

Key Jurisdictional Differences – United States

- The US cybersecurity and data protection framework has been cited as a complex patchwork of regulations and prohibitions that are sector-specific and apply to different practices, processes and behaviors. Instead of a single national data protection law, there are a number of regulations, including: the Gramm-Leach-Billey Act, Fair Credit Reporting Act, Federal Trade Commission Act, the Wiretap Act, and Electronic Communication Privacy Act.[1]
- In addition, each US state has its consumer privacy and protection framework that have requirements concerning the storage and safeguarding of data, privacy policies, data breach notifications, etc.[2] Because of this myriad of regulations, it is difficult to comment on the strength of the framework in deterring cybersecurity concerns with regards to FinTech lenders.

Key Jurisdictional Differences – United Kingdom

- The UK was subject to the General Data Protection Regulation ("GDPR") that came into force in 2018. It enforces strict data protection laws for companies that collect EU residents' data and applies to all FinTech firms in the UK that process personal data. The GDPR is associated with a range of sanctions, including large fines, criminal liability, and damages claims. In addition, the GDPR increases the transparency of data security, as financial organizations have to reveal a data breach within 72 hours after the incident.[3]
- Since the UK left the EU, the GDPR will no longer be applicable inside the UK after December 31, 2020. However, the UK drafted it's own Data Protection Act ("DPA") in 2018 and has issued a statutory instrument to merge the DPA with the requirements of the EU GDPR, creating the 'UK GDPR'. In fact, the European Withdrawal Agreement states that the UK "shall ensure a level of protection of personal data essentially to that under European Union law."[4]
- Because of framework of data protection in the UK, consumers are likely more trusting of sharing data with FinTech firms with the knowledge that cybersecurity is a key concern for the industry. This is particularly important because research shows that UK customers are highly sensitive to cybersecurity concerns, where 80% of customers in the UK would switch their bank or insurer in case of a data breach.[5]

1. The International Comparative Legal Guides, *United States: Fintech 2019*, 2019.
2. Ibid.
3. The International Comparative Legal Guides, *United Kingdom: Fintech 2019*, 2019.
4. UK Statutory Instruments, *The Data Protection, Privacy and Electronic Communications (Amendments etc)*, 2019.
5. Global Consulting Company, *The Currency of Trust: Why Banks and Insurers Must Make Customer Data Safer and More Secure,* 2017.

Lack of Experience Completing Financial Cycles

The literature identified a lack of industry specific knowledge as a key factor shaping FinTech adoption in the mortgage industry

OVERVIEW

As the housing market is exposed to several macroeconomic variables, mature firms that have been in operation can gain institutional knowledge on how to navigate financial downturns, housing corrections, or changes to government policies related to mortgages/home ownership. For new firms however, products and services may not have successfully gone through these types of scenarios, thereby increasing the risk for business owners and customers. This lack of experience can be overcome by modelling and scenario testing, however can be a significant hurdle when designing new mortgage related products or technologies. While partnership models allow start-up firms to be 'coached' or 'mentored' by requisite subject matter experts in incubators, this lack of foundational knowledge can limit entrepreneurs with out-of-the-box thinking to consider channeling efforts towards new innovation in mortgage technologies. Moreover, anecdotally in consultations, the strength and stability of Canada's financial system during the financial crisis was noted to indirectly not necessitate as much innovation in the financial services sector. Put simply, as the system was viewed by consumers as sound, their trust in the traditional banking system endured and thus curiosity to try alternative/emerging approaches to financial services.

Key Jurisdictional Differences – United States

- FinTech lenders in the US are generally larger and more established compared to their Canadian counterparts. For example, there are several large FinTech lenders in the US – such as Quicken Loans (founded in 1985) and Lending Club (founded in 2006) – that have been in operation for many years and have significant experience with financial cycles. Because of this maturity, these firms have had to navigate through the financial crisis, thereby gaining valuable institutional knowledge in the process.
- Anecdotally, stakeholders viewed the venture capital market in the US as more willing to invest in seed and/or pre-seed companies with less institutional experience within the FinTech sector. This can create a more hospitable dynamic for less experienced entrepreneurs. This dynamic is contrasted to the Canadian venture capital market, which was viewed as favouring later stage companies with an established clientele and demonstrated track record of success.

Key Jurisdictional Differences – United Kingdom

- Similar to the US, the UK has several established mortgage FinTech firms that have endured various economic conditions. For example, LendInvest is the UK's leading online property finance marketplace and has been in operation since 2008, following the credit crunch in the UK. This experience contrasts the relatively nascent FinTech firms in Canada's mortgage industry.

1. Stephen Poloz, "Risk Sharing, Flexibility and the Future of Mortgages", Bank of Canada, May 6, 2019.
2. Ibid.

Limited Mortgage-Backed Security Opportunities

Mortgage securitization activities are heavily regulated in Canada, potentially limiting available funding sources for smaller institutions

OVERVIEW

Current rules say that only insured mortgages can be used in government-supported mortgage backed securities. Since 2001, the Canada Housing Trust – which was set up by CMHC – has been buying insured mortgages from institutions to use in Canada Mortgage Bonds ("CMBs"). CMBs have been highly successful – more than $230 billion worth of CMBs are outstanding, equal to about 15% of total mortgage debt.[1] Overall, public securitization programs account for around 30% of residential mortgage funding, and include CMBs and National-Housing Act Mortgage-Backed Securities ("NHA-MBS").

However, funding for uninsured mortgages, particularly at smaller banks and mortgage finance firms, is comparatively expensive. Since 2007, Canadian institutions have been able to fund uninsured mortgages by issuing covered bonds. For smaller institutions however, the same economies of scale may not apply. In addition, OSFI has capped the percentage of covered bonds that any single institution can have among its assets. Taken together, firms seeking to develop new forms of MBS may find relatively limited opportunities in Canada in light of the current regulatory environment.[2]

Key Jurisdictional Differences – United States

- In 2018, agency mortgage backed securities, guaranteed by Fannie Mae, Freddie Mac or Ginnie Mae, accounted for 59% of the total mortgage market in the US. Private-label securities made up almost 5%.[3] This is higher than Canada, where public securitization represented 30% of the mortgage market in 2018, and private securitization represented approximately 1% of residential mortgage funding.[4]
- This suggests that the mortgage backed security market in the US is a larger source of financing compared to Canada, despite the fact that private securitization options have decreased substantially since the financial crisis.

Key Jurisdictional Differences – United Kingdom

- The involvement of UK authorities in mortgage securitization activities is understood to be more stringent than that of Canadian authorities.[5]
- With regards to private securitization, 6% of mortgage debt in the UK was financed through residential mortgage backed securities in 2018.[6] This represents similar levels to the US, and suggests greater private involvement compared to Canada.

1. Stephen Poloz, "Risk Sharing, Flexibility and the Future of Mortgages", *Bank of Canada*, May 6, 2019.
2. Ibid.
3. Urban Institute, *Housing Finance at a Glance*, 2018.
4. Canada Mortgage and Housing Corporation, *Residential Mortgage Industry Report Q3 2019*, 2019.
5. Bernard Clarke, "The Canadian mortgage market: it's not just about insurance", Council of Mortgage Lenders, February 19, 2013.
6. Bank of Canada, *Residential Mortgage-Backed Securities,* 2018.

Traditional Reliance on Income Verification

Alternate methods to calculate creditworthiness may not be accepted and recognized in an environment with a strong traditional reliance on income verification

OVERVIEW

In consultations, stakeholders noted that mortgage activity has traditionally been dominated by credit unions and banks that rely on income verification as the key determinant of an applicant's creditworthiness. As a result, mortgage-related innovations associated with assessing the creditworthiness of borrowers using alternative data may not be able to successfully enter the market. For example, alternative approaches to assessing credit worthiness have been deployed globally that factor in considerations such as financial cash flow history, tax information, or other forms of credit worthiness assessment.

This capability can be specifically beneficial for populations traditionally marginalized within the financial services sector (e.g., new Canadians who lack an established credit history). However, if traditional lenders continue to consistently rely on income verification, the opportunities for FinTechs that specialize in working with alternative credit worthiness assessments to thrive in Canada may be limited.

Key Jurisdictional Differences – United States

- Evidence suggests that FinTech mortgage lenders in the United States are able to capture a segment of the consumer market that is not well served by traditional lenders. Illustratively, the FinTech market share is larger in areas with greater mortgage denials and lower consumer credit scores.[1] With the growing importance of FinTech lenders in the mortgage industry, this suggests that there are growing opportunities for marginalized populations within the financial services sector to enter the market successfully.[2]
- To capture this segment of the market, FinTech lenders are making use of alternative data to supplement traditional credit scores in evaluating creditworthiness. For example, the United States Government Accountability Office ("GAO") found that several FinTech lenders are using alternative financial and nonfinancial data in assessing loans, such as an applicant's educational institution, on-time rental payments, social media activity, and utility payments.[3]

Key Jurisdictional Differences – United Kingdom

- Several FinTechs in the UK's mortgage industry have been developing solutions to overcome problems associated with income verification. For example, Experian and the Big Issue Group established the Rental Exchange, a solution that allows individuals to keep a record of their rental payments. This payment history is incorporated into Experian's credit reports, which are used by lenders to establish creditworthiness for mortgage applications. According to Experian, the Rental Exchange has helped increase the credit scores of 80% of tenants. In addition, the proportion of tenants that are able to validate their identity online has jumped from 39% to 84%.[4]
- Open banking developments have facilitated this verification process in the UK. Tandem, for instance, is a mobile bank that is developing an alternative credit scoring method that uses customers' aggregated financial data that is made accessible via open banking.
- Relying on alternative data points in verifying borrowers creditworthiness, such as rent records and spending patterns, can increase the accessibility of the mortgage industry and correspondingly the potential market for FinTech lenders.

1. Julapa Jagtiani et al., *Fintech Lending and Mortgage Credit Access,* 2019.
2. Please refer to pages 44-45 of this document for more information on the impact of FinTech on mortgage credit access.
3. United States Government Accountability Office, *Agencies Should Provide Clarification on Lenders' Use of Alternative Data,* 2019.
4. Liam Geraghty, "The Big Issue's Rental Exchange is Already Helping 1.2 Million Renters", The Big Issue, October 24, 2018.

Open Banking in its Nascent Stages

Despite the potential benefits of open banking in promoting innovation in the financial services industry, Canada has yet to establish open banking framework

OVERVIEW

As our research summarized on Appendix 4 of this document demonstrates, open banking capabilities in Canada are relatively limited. This has specific impacts to the plausibility of widespread adoption of mortgage-related FinTechs, especially in the Canadian context where incumbent banks play a large role in the financial services industry. Open banking enables the exchange of consumer and banking related knowledge that is traditionally not shared, which can enable innovation within the mortgage space. Particularly, sharing customer's financial data with third parties has the potential to help mortgage FinTechs create tailored and innovative products, scale and grow their businesses, and promote transparency regarding mortgage products available in the market.

It should be noted however, the Department of Finance issued a consultation paper entitled *Potential Policy Measures to Support a Strong and Growing Economy: Positioning Canada's Financial Sector for the Future* which sought input on, among other matters, the merits of open banking in financial services. The paper described the benefits of open banking as making it easier for consumers to interact with financial service providers. In a response to the consultation paper, the CBA noted that protection of consumer privacy will be a central component of any system which allows third party access to financial data. The CBA stated that both verifying customer instructions when third parties request access to information, and ensuring the legitimacy and capacity of the third party to handle the information would be considered before granting access. Taken together, the tension between a desire to ensure customer data privacy with enabling open banking could lead to a lag in the extent to which Canada adopts open banking technology.[1] In addition, in January 2018, the Department launched consultations into the merits of open banking with the release of a consultation paper. The consultations are led by an Advisory Committee appointed by the Minister of Finance. This was followed by cross-country roundtables. The study has been divided into two stages, the whether "should we move forward with open banking"; and the "what is the implementation model for Canada". The Advisory Committee issued its report on the first phase of consultations (the whether) in January of 2020. The report concluded there is a strong and urgent need for an open banking framework in Canada and set out the guiding principles for consultations on implementation considerations. The second phase of consultations is scheduled to begin in late May 2020.

Key Jurisdictional Differences – United States

- Currently, the United States does not have a national open banking regime. There is no requirement for financial institutions to release consumer data to third parties, even with the consent of the consumer. Still, there have been efforts to modernize data sharing in the financial services industry and move towards more consumer-centric banking.
- To illustrate, the Consumer Financial Protection Bureau issued a report that outlined several data sharing principles and non-binding guidelines for using consumer data. The report covers standards for consent, the accountability of parties involved, the types of data, and more.[2]
- Despite the efforts of regulatory bodies and some industry associations to push for open banking, there exists several hurdles to the development of a comprehensive open banking regime in the United States. Chiefly, it would require a significant change for existing institutions which may prove difficult given the lack of centralized regulations in the country. As a result, open banking will likely develop in the United States as an industry-led initiative.[3]

Key Jurisdictional Differences – United Kingdom

- The UK was the first country to take a consumer-first approach to data in this area. Prime Minister Gordon Brown established the Open Data Institute ("ODI") - an organization designed to make public data available and put user rights at the heart of the Freedom of Information Act in January 2010. Such approaches were later adopted by the Netherlands, France and Germany.
- The UK has an established open banking capacity which has been driven through leadership by regulators. The UK's Competition & Markets Authority ("CMA") and Open Banking Implementation Entity ("OBIE") have been key players in the process.
- Although still in it's early stages (the full open banking standard only came into effect in 2018), there exists significant potential for mortgage FinTechs to benefit from increased access to consumer's financial data, especially in the mortgage search and loan origination process. An example of a mortgage FinTechs that is leveraging open banking is the mortgage robo-advisor firm MortgageGym. The company matches applicants to mortgage lenders by analyzing customer's spending patterns against internal lending criteria.[4]

1. Department of Finance Canada, *Potential Policy Measures to Support a Strong and Growing Economy: Positioning Canada's Financial Sector for the Future*, 2017.
2. "What Is the Future of Open Banking in the U.S.?", Hydrogen, October 23, 2019.
3. Deloitte LLP, *Executing the Open Banking Strategy in the United States,* 2019.
4. Joanne Atkin, "Open banking tech set to revolutionize mortgage affordability", Mortgage Finance Gazette, April 15, 2019.

Lack of Private Investment in Fintech in Canada

Relative to peers, Canada's funding ecosystem is limited – therefore potentially limiting the scope of investment activity in FinTech

OVERVIEW

The Canadian startup funding ecosystem is not as sufficient compared to other jurisdictions, limiting the ability for FinTechs to access early-stage investments. One of the key reasons why FinTech firms in Canada's mortgage industry – particularly those directly involved in lending activities – are relatively absent from Canada (compared to other jurisdictions like the US and UK) is because they are not well-capitalized relative to other jurisdictions leading in FinTech development.[1] Canada's venture capital funding environment is insufficient to meet the needs of start-ups, and as such, start-ups are often left behind their US and UK counterparts.[2] This observation was echoed in our stakeholder consultations with industry experts.

Canadian investors are less likely to put forward competitive and significant sums of money. Narwhal Project, a research service provider, estimates that businesses with no Canadian investors received 2.7 times as much money as those with Canadian investors.[3] This phenomenon illustrates the lack of private investment in Canadian FinTechs, hindering the ability of FinTechs to scale in Canada as they have in other jurisdictions like the US and UK. Stakeholders acknowledged this as a key challenge for FinTechs in Canada broadly, which is not necessarily limited to mortgage FinTechs. However, given the other aforementioned barriers, innovation in the mortgage space could be looked upon cautiously by potential investors, particularly when customer acceptance may be in early stages.

Key Jurisdictional Differences – United States

- The US FinTech sector is cited as one of the most mature and dynamic jurisdictions in terms of the amount of venture capital invested. In 2018, the US invested $10.6 billion across 1,042 deals.[4] This is over 20 times more venture capital compared to Canada, where $384 million was invested across 85 deals in 2018.[5] This indicates that there is significantly more funding available for FinTech start-ups in the US compared to Canada.

Key Jurisdictional Differences – United Kingdom

- The UK is Europe's leading destination for FinTech investment, and attracts more venture capital than any other European country. Venture capital invested in 2018 amounted to $1.73 billion across 261 deals in the UK.[6] The UK ranked third in venture capital investments globally, after China and the United States. By comparison, Canada ranked sixth in terms of amount invested.
- The Alternative Lending & Financing sector received the third highest amounts of investments in 2018, with $306.6 million across 23 deals.[7] This indicates that mortgage companies are relatively well positioned to receive private investment in the UK.

1. Neil Sharma, "FinTech absent in Canadian mortgage space, but for how long?", Mortgage Broker News, August 21, 2019.
2. Narwhal Project, *Canadian Venture Capital Sufficiency,* 2019.
3. Ibid.
4. Innovate Finance, *2018 FinTech VC Investment Landscape,* 2019.
5. Ibid.
6. Ibid.
7. Ibid.

8. Overview of Deloitte's Domestic FinTech Database

Overview of Domestic Mortgage FinTech Database

We reviewed over 2,000 firms to identify a dataset of 98 FinTech firms[1] within Canada's mortgage industry through a rigorous data review approach

Based on our definitional approach (outlined in page 17 of this document), we conducted a search for FinTech firms within Canada's mortgage industry. The search culminated in a database of FinTech firms in Canada that performed or were directly associated with one or more of the mortgage functions outlined on page 21 of this document.

Search and review criteria

We performed a search for potentially relevant firms using several external and internal data sources (refer to Appendix 1 of this document for more information on the data sources employed). Our initial search identified more than **2,000** potentially relevant firms across a range of sectors, including: consumer finance, retail banking services, enterprise software, real estate, and mortgages.

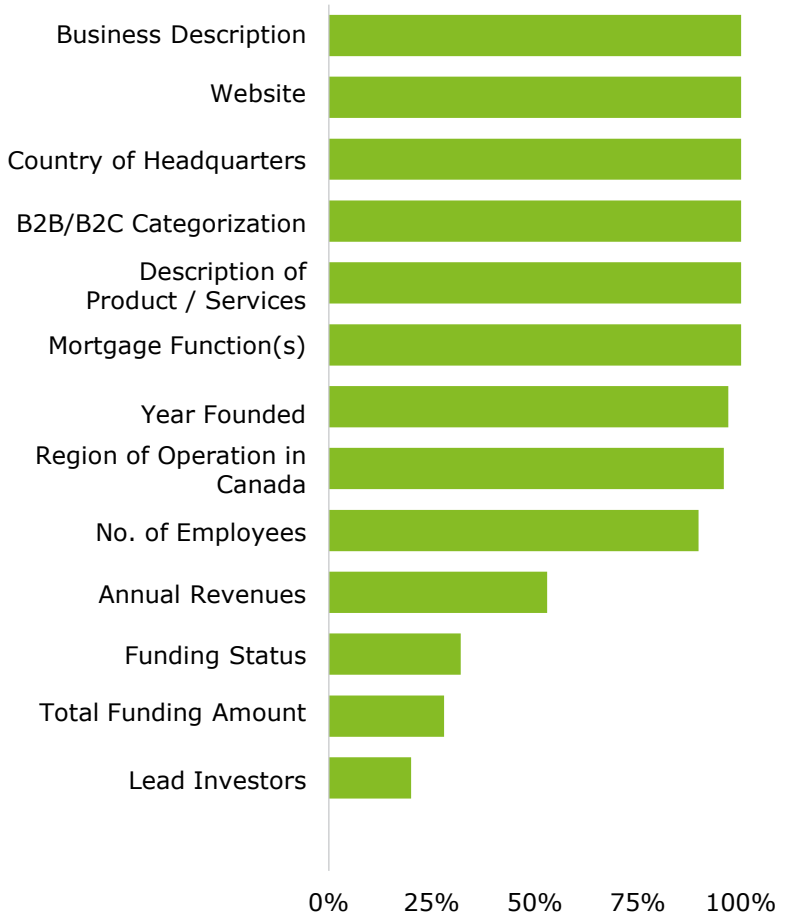
Next, we reviewed the business information of these firms and applied the following criteria to narrow the list of firms. Firms were excluded if they:

- could not be determined to perform or associate with any of the mortgage functions outlined in page 21 of this document upon review of business description;
- could not be determined to employ mortgage technologies outlined in pages 22-23 of this document;
- were not currently operational due to acquisition, bankruptcy, or another event that halted operations;
- did not have any known operations within Canada;
- did not have a functional website; or
- were a duplicate observation of another firm.

This was a highly manual process. We individually reviewed the business descriptions, websites, products and services, and related external information of these potentially relevant firms to determine inclusion or exclusion.

Based on our review of approximately 2,000 firms, we qualified **98** FinTech firms as being relevant within Canada's mortgage industry. As we deployed a bespoke definitional process, please note that it is possible that other sources/listings of FinTech firms in Canada's mortgage industry may showcase different figures. These deviations may occur because of differences in definitions of FinTech and mortgage technologies. For example, FGS's January 2019 report included only 24 FinTech firms in Canada under their "mortgage and related tech" subcategory of LendTech.[2] In this instance, FGS could be viewed as underestimating the breadth of activity we have captured.

Data Dimension Percentage Completion



1. In this section, all references to "FinTech firms" in our domestic database also include the digital mortgage offerings of Canadian banks and credit unions (refer to pages 75-76 of this document for more information).
2. FinTech Growth Syndicate, *Fintech: Executive Summary*, 2019.

Key Observations from Domestic Database

Most FinTech firms in Canada's mortgage industry are headquartered domestically

Deloitte's primary dataset of FinTech firms in Canada's mortgage industry (herein referred to as "Mortgage FinTechs") provides insights on the status of Canadian FinTech landscape with respect to the mortgage industry. This section contains our observations on the distribution of firms by country of headquarters, year of establishment, primary location, business model, firm size, and associated mortgage functions.

Number of Mortgage FinTechs in Canada by Headquarters Location

98 MORTGAGE FINTECHS in Canada

90 HEADQUARTERED in Canada

8 HEADQUARTERED INTERNATIONALLY

More than 90% of Mortgage FinTechs that operate in Canada are headquartered domestically. This observation could indicate that the Canadian market is currently more hospitable to Canadian-based firms. Alternatively, it could indicate that international firms have not yet substantially penetrated the Canadian market.

Selected examples of Mortgage FinTechs by country of headquarters include:

Headquartered in Canada

Canadian Mortgage App is a free mobile app that helps consumers estimate homeownership costs and compare mortgage rates.

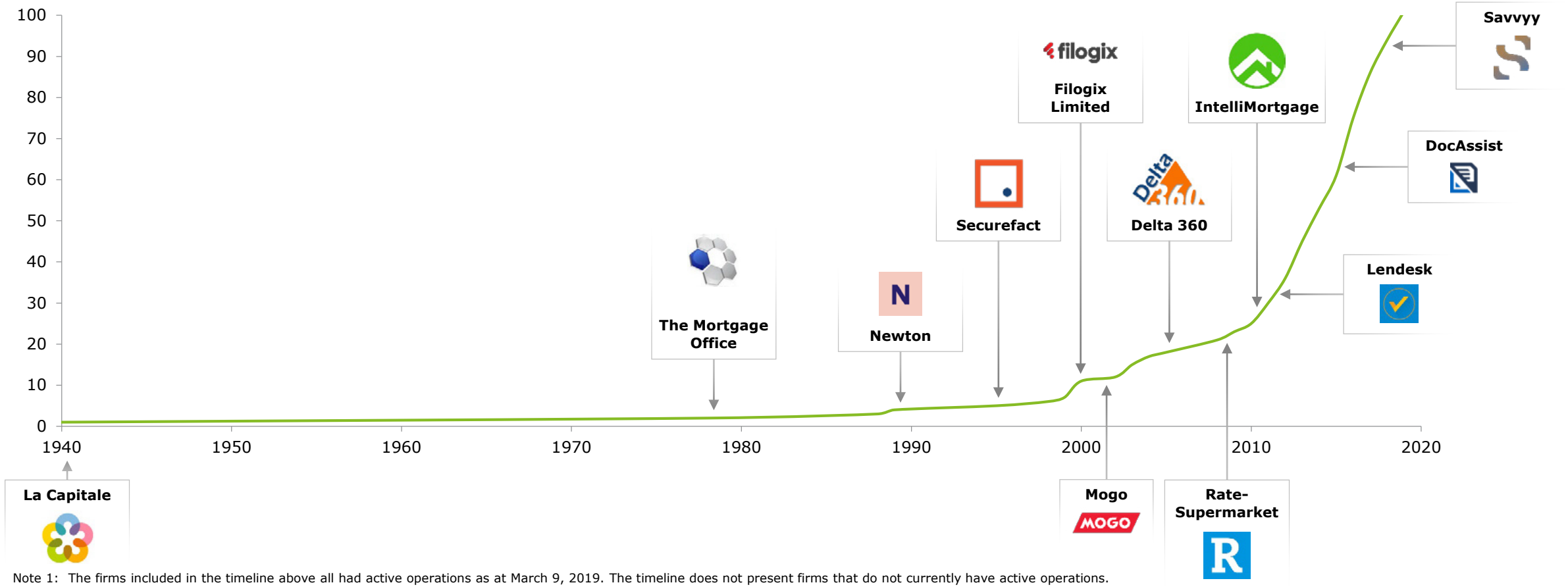
Headquartered Internationally

NestReady partners with mortgage lenders to offer a seamless digital home-buying experience for their consumers.

Key Observations from Domestic Database (continued)

FinTech firms in Canada's mortgage industry have exponentially increased in number over the past decade – a timeline with selected firms is presented below

Overview of Mortgage FinTechs Currently Operating in Canada (by year of establishment)

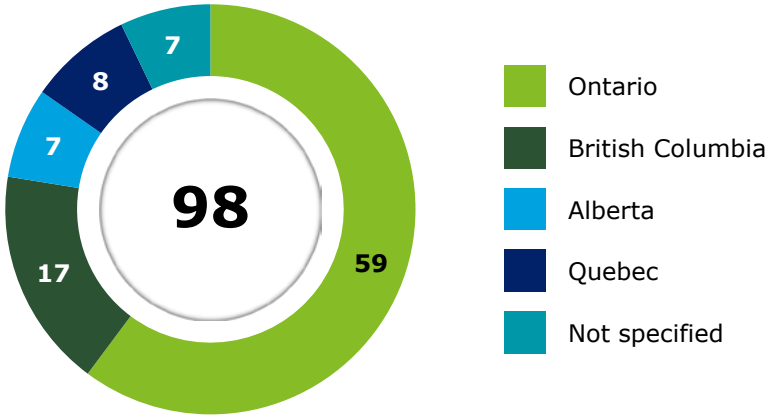


Note 1: The firms included in the timeline above all had active operations as at March 9, 2019. The timeline does not present firms that do not currently have active operations.
Note 2: The timeline above provides examples of firms that were established in an era before the term "FinTech" was commonplace. For example, La Capitale and The Mortgage Office can be viewed as once "classical" organizations that adopted FinTech capabilities in line with our search strategy presented on page 69 of this document.
Note 3: We explored the possibility of identifying the average years of activity by mortgage function. However, this would not be a robust analysis as FinTech firms are often associated with more than one mortgage function. For example, a FinTech firm may only have a small portion of its business associated with the insurance function, and as such, it should not have equal weight to a FinTech firm purely focused on the insurance function. Due to data limitations, we cannot determine the portion of a firm's business that relates to specific mortgage functions.

Key Observations from Domestic Database (continued)

FinTech firms in Canada's mortgage industry are concentrated in Ontario and significantly operate under a B2B market context

Number of Mortgage FinTechs by Canadian Province



The largest number of Mortgage FinTechs exist in Ontario (about 65%) – an unsurprising proportion given that the province has one of the highest concentrations of technology firms in North America.[1] The second and third largest numbers of Mortgage FinTechs exist in British Columbia (19%) and Quebec (9%). This observation is aligned with the literature which calls out the three provinces for having received most FinTech funding across Canada.[2]

Additionally, the primary head offices of Mortgage FinTechs are primarily concentrated in two Canadian cities – Toronto (44%) and Vancouver (12%).

Selected examples of Mortgage FinTechs by province include:

Ontario

IntelliMortgage is an online mortgage broker that enables a "do-it-yourself" mortgage experience for consumers.

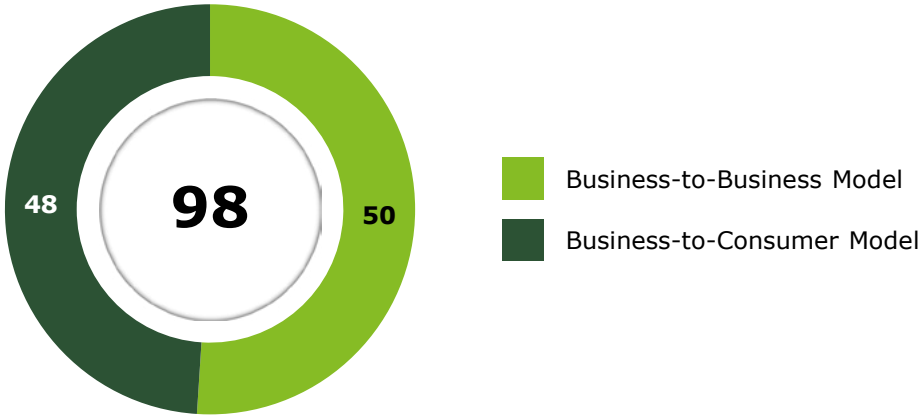
British Columbia

DocAssist provides digital solutions to mortgage brokers and lenders – from document management to fully managed underwriting.

Quebec

Flinks provides data aggregation technologies for lenders to get a deeper understanding of customer profiles.

Number of Mortgage FinTechs by Business Model



Slightly more than half of Mortgage FinTechs in our database operate under a B2B market context. These firms provide digital mortgage solutions and related technologies to other businesses, not consumers – providing a core part of the technology stack in banks, credit unions, and other lenders. Based on our review of the industry, we believe that technology firms (e.g., B2B Mortgage FinTechs) are more likely to appear in Canada as they do not have to wrest control away from incumbent lenders. In fact, we observe that B2B-oriented Mortgage FinTechs often engage in collaborative partnerships with incumbents (refer to page 36 of this document for more information).

Notably, B2B Mortgage FinTechs represented the following proportions of Mortgage FinTechs by province: Ontario (51%), British Columbia (59%), Quebec (75%).

Selected examples of Mortgage FinTechs by business model include:

B2B Business Model

Doorr designs and develops broker management platforms for the mortgage industry

B2C Business Model

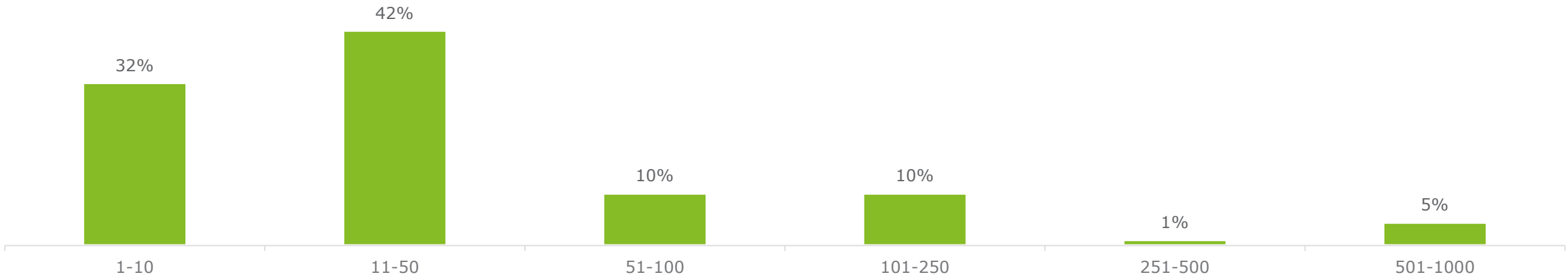
Mogo is a digital challenger to banks, empowering consumers with simple solutions to manage and control their finances.

1. InvestInOntario, *Where Information Technology Lives*, 2020.
2. Katie Rankin, "There 3 Provinces Are Driving Canadian FinTech Investment", Hockeystick, October 30, 2018.

Key Observations from Domestic Database (continued)

Majority of FinTech firms in Canada's mortgage industry employ 100 employees or less, indicating that the mortgage FinTech space is heavily concentrated with smaller-sized firms

Distribution of Mortgage FinTechs by Firm Size (based on number of employees)[1]



The largest proportion of Mortgage FinTechs are concentrated in the 11-50 employees range, with the second and third largest proportions employing between 1-10 people and 51-100 people, respectively. Together, about 85% of Mortgage FinTechs in Canada employ 100 people or less.

Nationally, about 70% of all private sector firms employ between 1 and 100 people[2] – a proportion slightly lower than what we observe for Mortgage FinTechs. This supports the general consensus that Canada's FinTech sector is still in nascent stages of development – an observation that reverberated in the literature and our stakeholder consultations.

Selected examples of Mortgage FinTechs by number of employees include:

1-10

Manzil offers halal financing and investments solutions to Canadians, including affordable, shariah-compliant home financing

51-100

HES FinTech develops end-to-end lending software that automates the loan management process from origination to repayment

501-1000

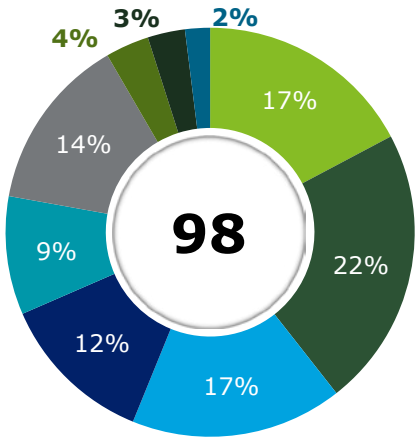
Real Matters provides technology and network management solutions to the mortgage lending and insurance industries in Canada and the United States

1. Due to data limitations, our domestic database has less than a 100% completion for employment numbers (as shown on page 69 of this document). As such, this graph does not represent the entire population of firms in our primary dataset – only firms that had employment numbers available were reflected herein.
2. Innovation, Science and Economic Development Canada, *Key Small Business Statistics*, January 2019.

Key Observations from Domestic Database (continued)

Majority of FinTech firms are concentrated in earlier phases of the mortgage process, executing functions such as mortgage search and loan origination

Distribution of FinTech Firms by Mortgage Function (all firm sizes)

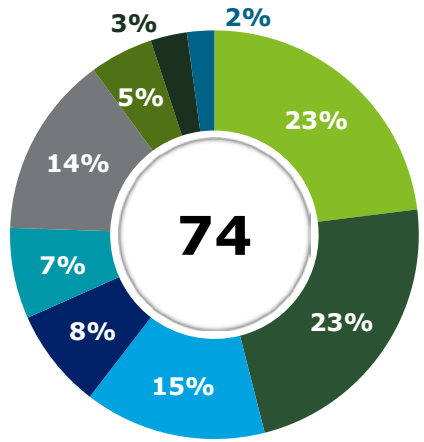


Mortgage search | Loan origination | Loan processing
Loan underwriting | Mortgage servicing | Insurance
Investment management | Securitization | Fundraising

The top two categories of mortgage functions associated with FinTech firms in Canada are mortgage search and loan origination. This indicates that FinTech activity is concentrated in the earlier stages of mortgage processes, an observation validated through our stakeholder consultations.

Other major functions associated with FinTech firms are loan processing and insurance. There is least activity within the securitization, fundraising, and investment management functions – together accounting for less than 10% of mortgage functions associated with FinTech firms. This observation is consistent with our findings from the literature and stakeholders consultations, which inform a lack of technological innovation within the securitization process in Canada.

Distribution of FinTech Firms by Mortgage Function (firms with 100 employees or less)[1]



Mortgage search | Loan origination | Loan processing
Loan underwriting | Mortgage servicing | Insurance
Investment management | Securitization | Fundraising

We find some key differences in the distribution of firms by mortgage function when we isolate smaller-sized firms (100 employees or less):

- We find that smaller-sized firms exhibit a greater concentration of FinTech activity in earlier stages of the mortgage process. This indicates that mortgage search and loan origination functions may have lower barriers to entry relative to other functions, an observation supported by our stakeholder consultations.
- We find that smaller-sized firms are more frequently associated with the insurance function. This is an intuitive finding since companies with rate comparison platforms include both homebuyer's insurance rates and mortgage rates.
- We also find that smaller-sized firms are less frequently associated with the underwriting function. This is likely due to the requirement of sizable investments in underwriting technology, as informed by our stakeholder consultations.

Note: Please refer to pages 22-23 of this document for selected examples of FinTech firms by mortgage function.

1. Due to data limitations, our domestic database has less than a 100% completion for employment numbers (as shown on page 69 of this document). As such, this graph does not represent the entire population of firms in our primary dataset – only firms that had employment numbers available were reflected herein.

Mortgage Technologies of Canadian Financial Institutions

Several Canadian financial institutions have developed fully end-to-end digital mortgage platforms by investing in technology and/or partnering with FinTech firms

Canadian financial institutions have been dedicating significant resources towards developing mortgage technologies over the past few years, from developing in-house solutions to enacting partnering with FinTechs. Illustratively, the number of partnerships between Canadian financial institutions and FinTech firms is significantly higher than the global average. Approximately 62% of financial institutions in Canada have partnered with FinTech firms, which is 9% higher than the US, and 15% higher than the global average.[1] The mortgage technologies adopted by existing financial institutions are outlined below, along with commentary on the extent of automation exhibited in these platforms.

FINANCIAL INSTITUTION	DESCRIPTION OF MORTGAGE OFFERING	LEVEL OF AUTOMATION
Scotiabank eHOME	eHOME is a fully digital experience that allows for Canadians to apply for a mortgage, track the application through real-time updates, and complete the closing without requiring an in-person appointment. Documents are easily uploaded and the user can contact a dedicated team of specialists by phone. Through eHome, customers receive conditional approvals in less than 24 hours, compared to multiple days in the traditional process. Since its launch, over 50,000 Canadians have engaged with the application.	Fully end-to-end digital mortgage
TD Digital mortgage application	TD's digital mortgage application is an integrated, digital solution that provides 24/7 access, save and resume, status tracking, and document upload. Mortgage specialists are also available to assist consumers throughout the process. In addition, TD offers digital mortgage pre-approval and the TD Mortgage Affordability Calculator. In consultations, it was noted that TD customers have the option to have a fully end-to-end experience or, to access in-person assistance at any phase of the mortgage process.	Fully end-to-end digital mortgage
Meridian Motusbank	Motusbank is an online-only and full-service bank that is owned and backed by Meridian. The bank's digital mortgage platform allows customers to apply for and receive mortgages, all online. Due to the banks digital presence, Motusbank is able to offer highly competitive rates and increased transaction speeds.	Fully end-to-end digital mortgage
Alterna Bank Digital Mortgage Engine	Alterna partners with Lendful Financial, a Vancouver-based lending startup, to offer an end-to-end digital mortgage platform. The entire process, including document verification is online, offering customers a more flexible, convenient, and automated mortgage platform.	Fully end-to-end digital mortgage

1. Charlotte Watson and Alex LaPlante, *An Overview of Fintech in Canada,* 2018.

Mortgage Technologies of Canadian Financial Institutions (continued)

Other Canadian financial institutions have automated some elements of the mortgage process, but have yet to develop a fully end-to-end digital mortgage experience for consumers

FINANCIAL INSTITUTION	DESCRIPTION OF MORTGAGE OFFERING	LEVEL OF AUTOMATION
Royal Bank of Canada RBC Online Mortgage Facility	Royal Bank of Canada ("RBC") offers a pre-approval mortgage facility that helps an individual know online exactly how much he/she can afford and what the interest rate will be. After completing the online pre-approval form, an RBC mortgage specialist contacts the customer within 24 hours to help complete the mortgage pre-approval. However, RBC's online mortgage facility allows customers to pre-qualify in as early as 60 seconds.	Partial – digital pre-qualification only
Bank of Montreal BMO Mortgage & Loan Application / Blend Partnership	Bank of Montreal ("BMO") offers an convenient online application to apply for a mortgage, loan or line of credit. The application takes around 20 minutes to complete and the applicant receives an update within 2 business days regarding the mortgage/loan application. While the application can be completed online, the customer is required to visit a branch in order to finalize the loan. In addition, BMO is working with Blend to deliver digital mortgage and home equity experiences to customers in the US and Canada.	Partial – digital application only
National Bank of Canada Online Mortgage Pre-approval Solution	Customers can apply for a mortgage pre-approval remotely through National Bank's online pre-approval facility. Customers can save and resume and securely upload required documents to the bank's website. In addition, customers will receive a decision on their loan application within two business days. Previously, clients were required to meet face-to-face with a mortgage specialist to complete the pre-approval.	Partial – digital application only

Secondary Population of Firms

During our analysis, we found firms that did not meet our definitional criteria but could be viewed as related to the mortgage industry by other stakeholders

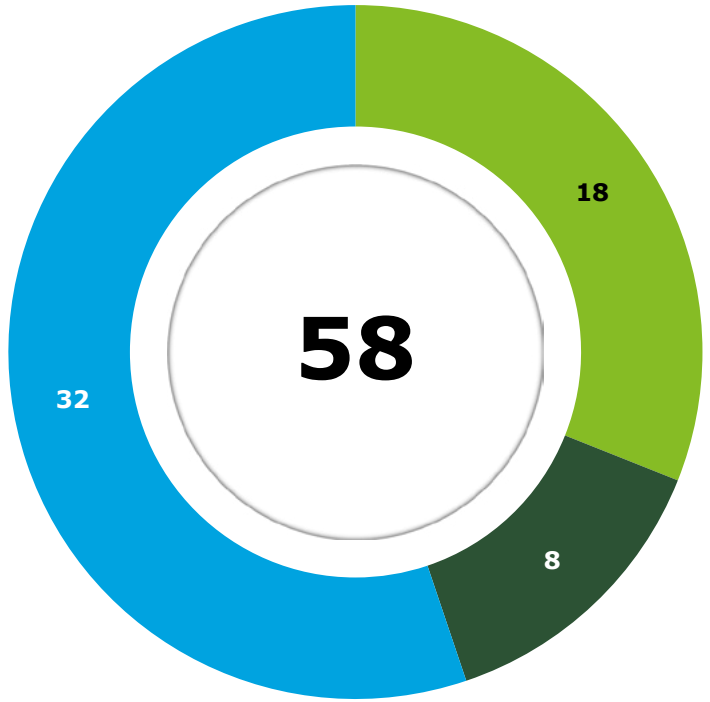
During our analysis, we began to notice similarities in the firms that were excluding for lack of alignment to our definitional criteria. Specifically, we identified a secondary set of **58** firms that could not be determined to have the level of relevance required for inclusion in the primary dataset (herein referred to as "secondary firms"). Although these secondary firms may not align with the mortgage functions and mortgage technologies to the same extent as firms in the primary dataset, they may self-report to be relevant to the mortgage industry or be characterized by others as 'FinTech firms'. Thus, these firms may be useful for CMHC to track and be aware of.

These secondary firms were included in the secondary dataset (and excluded from the main dataset) as they did not align to mortgage related activities tightly. Below we subcategorize these firms into three populations:

- **Enablers:** This category includes firms that are not directly involved in the mortgage process but may perform broadly accompanying functions, acting as potential enablers to the mortgage industry. Examples of their products and services include: general service platform providers for insurance brokers, real estate portals and listings, platforms for buying and selling properties, and rental platforms for landlords and tenants.
- **Broadly applicable technology firms:** This category includes secondary firms (mostly B2B) that could not be determined to provide services directly relevant to the mortgage industry, but exhibited technologies that broadly overlap with those applicable to mortgage functions – e.g., general software solutions for retail banking services.
- **Private lenders with point solutions:** This category includes private lenders that were determined not to exhibit significant technological innovations, but were characterized by external database sources as "FinTech", likely due to their use of online application forms. Deloitte does not view these firms as FinTech based on our understanding of the firms' technological capabilities.

The dataset of secondary firms was not included in our key observations presented in this section.

Number of Firms in Secondary Dataset by Category



9. Overview of Deloitte's International FinTech Database

Overview of International Mortgage FinTech Database

We focused on the US, UK, and Australian markets when searching for FinTech firms that may look to Canada for expansion

FinTech firms that do not currently operate in Canada are more likely to look to Canada for expansion if they operate in comparable market environments. Accordingly, FinTech firms in comparator jurisdictions (i.e., the US and UK) are more likely to expand to Canada compared to jurisdictions with a lower degree of market comparability (e.g., Singapore).[1] We began our search in the US and UK markets for FinTech firms that may look to expand into Canada's mortgage industry.

Our consultations with stakeholders and subject matter experts highlighted another potential jurisdiction from which FinTech firms may look to expand into Canada's mortgage industry – Australia. Australia's property market has experienced a downturn in recent years, leading to a credit squeeze which has put downward pressure on residential mortgage lending.[2] In light of this downturn, FinTech firms in Australia may look to expand into relatively less saturated property markets (e.g., Canada). As such, we also looked to the Australian market for FinTech firms that may look to expand into Canada's mortgage industry.

Selection criteria

We focused on four selection criteria to identify firms which may look to expand to Canada – based on estimated revenues, total funding received, acquisition activity, and brand prominence. These selection criteria indicate potential expansion into Canada's mortgage industry on the basis that a firm looking to expand would have already met the following targets.

- Achieved sufficient scale or size (in terms of revenues), indicating that the firm may have captured an adequate share of the market in their home jurisdiction.
    - Accordingly, we set a threshold that a firm must have generated revenues in line with the top 20% of all firms to meet this requirement. This resulted in a revenue threshold of US$50 million or greater, which can be considered conservative as many of the largest FinTech firms in the US mortgage industry (generating annual revenue significantly higher than US$50 million) have not currently expanded operations into Canada.
- Firms that have obtained sufficient capital from investors, indicating that the firm has adequate capital for expansion and that the investment community sees potential in the firm's vision.
    - Accordingly, we set a threshold that a firm must have received total funding in line with the top 60% of all firms to meet this requirement. This percentile was significantly higher than our percentile because not all capital investments are publicly disclosed, potentially leading to underreported funding amounts received by firms. This resulted in a funding threshold of US$5 million or greater.
- Engaged in acquisition activity, indicating that the firm may expand by merging or acquiring businesses in the target country.
- Achieved sufficient coverage in secondary literature, indicating that the public sphere sees strong technological innovation capability within the firm.

To be considered for inclusion in our database, the firms would need to have met one or more of the aforementioned selection criteria. The combination of the four selection criteria also limit the risk that a firm falls out of scope due to data limitations – e.g., if estimated revenue data were not available for a firm, it could potentially fall within the other three selection criteria and still be considered for inclusion in our database.

1. Please refer to page 51 of this document for more information on our selection of comparator jurisdictions.
2. Deloitte LLP, *Australian Mortgage Report – Looking Ahead: 2020 A New Decade*, 2020.

Overview of International Mortgage FinTech Database (continued)

We reviewed 244 firms to identify a dataset of 72 FinTech firms[1] based in the mortgage markets of comparator jurisdictions through a rigorous data review approach

We searched for FinTech firms that (i) were based in the US, UK, or Australia, (ii) were associated with a range of sectors, including consumer finance, retail banking services, enterprise software, real estate, and mortgages, and (iii) met one or more of the previously described selection criteria. The table below presents the number of potentially relevant firms by selection criteria achieved.

Selection Criteria	Threshold/Requirement	Potentially Relevant Firms
Estimated Revenues	More than US$50 million	58
Total Funding Received	More than US$5 million	81
Acquisition Activity	Has acquired at least one firm	74
Brand Prominence	Has been referenced in prominent academic and business lists	31

This initial search identified more **244** potentially relevant firms that may look to expand into Canada's mortgage industry in future periods (refer to Appendix 1 for more information on the data sources employed). Next, we reviewed the business information of these firms and applied the following criteria to narrow the list of firms. Firms were excluded if they:

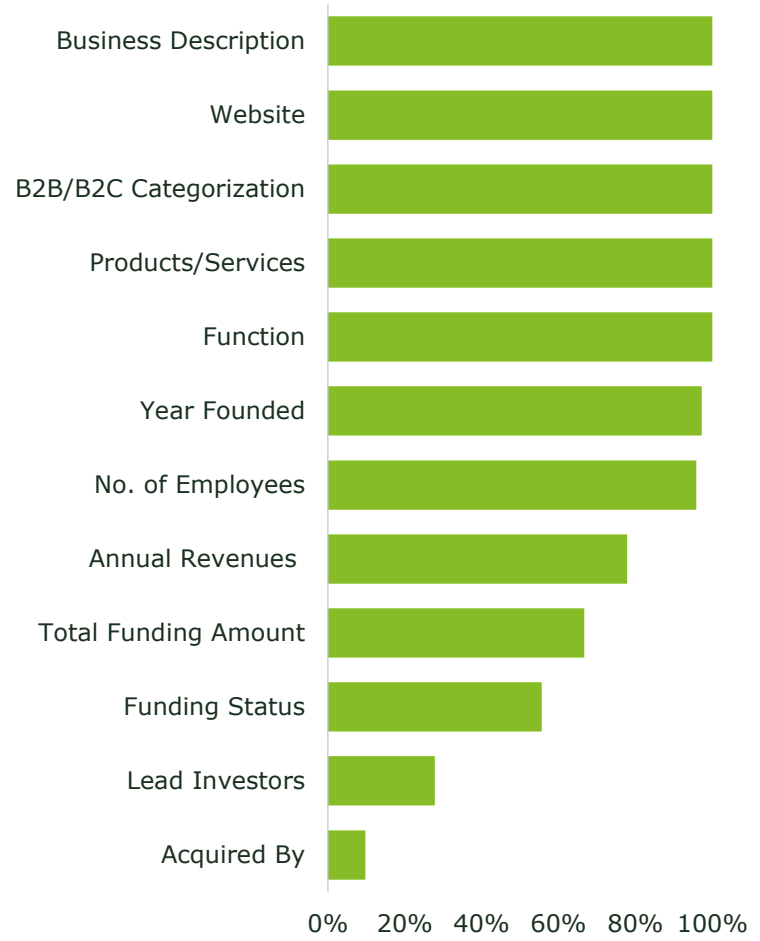
- could not be determined to perform or associate with any of the mortgage functions outlined in page 21 of this document upon review of business description;
- could not be determined to employ mortgage technologies outlined in pages 22-23 of this document;
- were not currently operational due to acquisition, bankruptcy, or another event that halted operations;
- did not have any known operations within Canada;
- did not have a functional website; or
- were a duplicate observation of another firm.

This was a highly manual process. We individually reviewed the business descriptions, websites, products and services, and related external information of these potentially relevant firms to determine inclusion or exclusion.

We identified **72** FinTech firms (herein referred to as "Mortgage FinTechs") based in the US, UK, and Australia that were relevant to the mortgage space and indicated potential entry into Canada based on our selection criteria. The table below presents the number of Mortgage FinTechs by country.

Country	Mortgage FinTechs
United States	50
United Kingdom	14
Australia	8

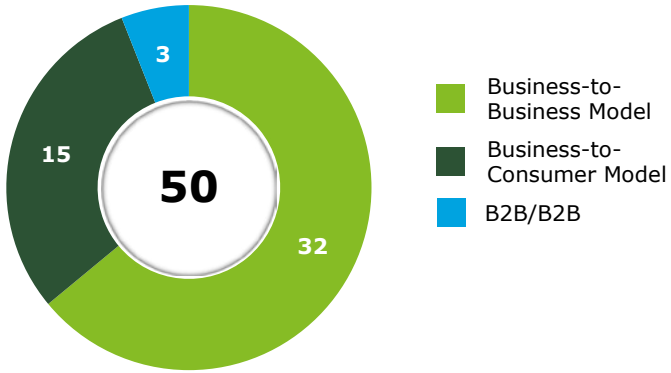
Data Dimension Percentage Completion



Key Observations from International Database: United States

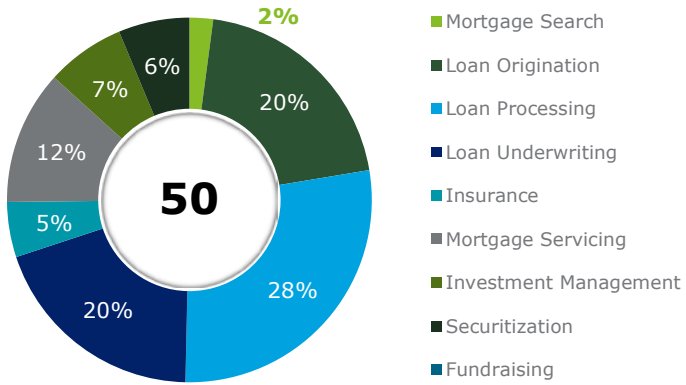
We identified a population of 50 FinTech firms in the US mortgage market that met our selection criteria to indicate potential entry into Canada in future periods

Number of Mortgage FinTechs in the US by Business Model



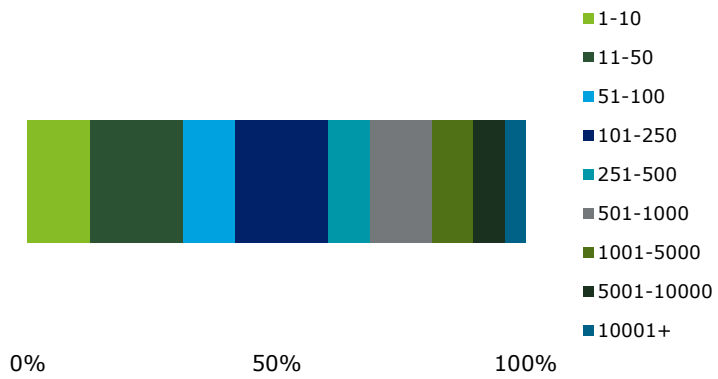
- 70% of Mortgage FinTechs in the US which met our selection criteria operate under a B2B market context.
- As it relates to foreign direct investment, we may see B2B firms as the most common form of US firms looking to expand into Canada's mortgage industry. This might especially relate to the expansion of US firms into domains such where there is limited capacity in the Canadian mortgage industry at present (e.g., underwriting, investment management, securitization).
- This is an intuitive observation given that the B2B market may be more accessible to new market entrants in light of oligopolistic structure of Canada's financial services industry.

Distribution of FinTech Firms in the US by Mortgage Function



- Most US firms in our database are associated with the loan processing functions, followed by the loan origination and underwriting functions.
- The prevalence of loan origination is similar to our observations on Canada's mortgage industry, in which we find that FinTech activity is largely concentrated in the earlier stages of the mortgage process.
- However, we find US firms which fall within our criteria for potential entry into Canada are more often associated with loan processing and underwriting – both functions which represent a greater degree of technological innovation in automation amongst US firms.
- Additionally, investment management and securitization functions are associated with a relatively large share of US firms (compared to our domestic database) – suggesting potential growth for these functions in Canada through cross-border expansion of US firms.

Distribution of Mortgage FinTech Firms in the US by Firm Size (based on employees)



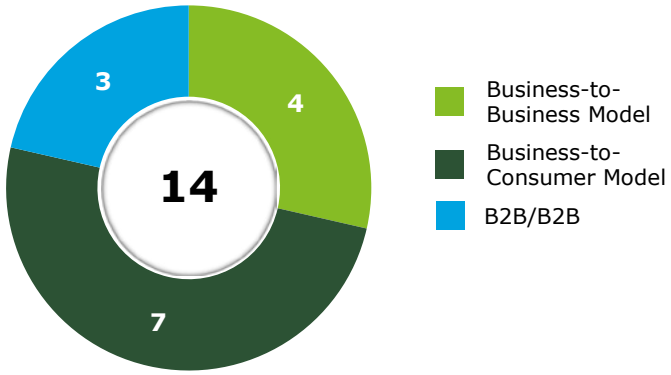
- Based on our selection criteria, we find that Mortgage FinTechs in the US are evenly distributed in terms of employment levels – with roughly equal representation of firms with more than 250 employees and less than 250 employees.
- This suggests that US firms which may look to expand into Canada are likely to come in all sizes (in terms of employment levels).

Note: Recall that our selection criteria filtered for firms that met certain thresholds for annual revenues, total funding received, and acquisition activity. Accordingly, it is reasonable to assume that the outcomes of our search are skewed towards larger FinTech firms (in terms of employment levels). As such, we have not commented on the comparison of firm employments levels between the international database and domestic database.

Key Observations from International Database: United Kingdom

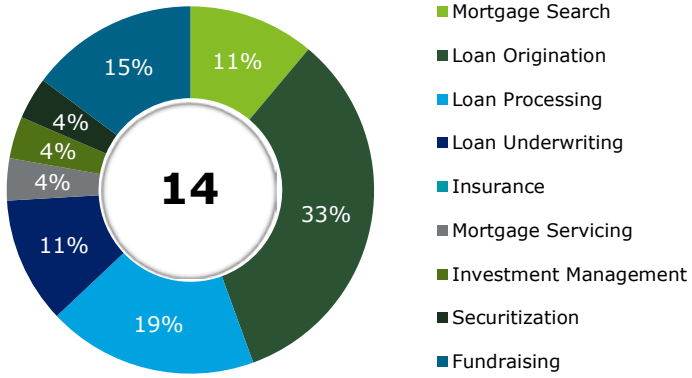
We identified a population of 14 FinTech firms in the UK mortgage market that met our selection criteria to indicate potential entry into Canada in future periods

Number of Mortgage FinTechs in the UK by Business Model



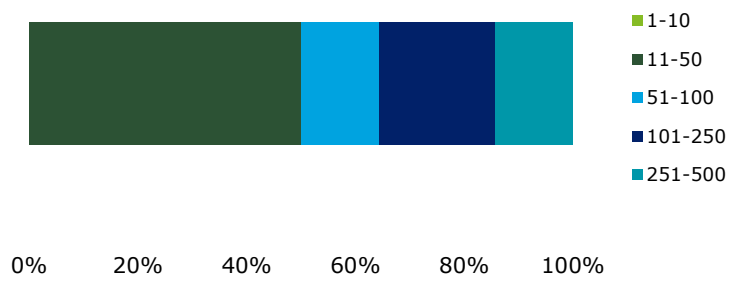
- Over 60% of Mortgage FinTechs in the UK which met our selection criteria operate under a B2C market context.
- As it relates to foreign direct investment, we may see B2C firms as the most common form of UK firms looking to expand into Canada's mortgage industry. This might especially relate to the expansion of UK firms into domains such where there is limited capacity in the Canadian mortgage industry at present (e.g., fundraising).

Distribution of FinTech Firms in the UK by Mortgage Function



- Most UK firms in our database are associated with the loan origination function, followed by the loan processing and fundraising functions
- The prevalence of loan origination and loan processing is similar to our observations on Canada's mortgage industry, in which we find that FinTech activity is concentrated in the earlier phases of the mortgage process.
- However, we find UK firms which fall within our criteria for potential entry into Canada are significantly more associated with fundraising (e.g., P2P lending). This speaks to the UK's high degree of maturity in alternative lending practices, an area in which Canada has the least amount of FinTech activity.

Distribution of Mortgage FinTech Firms in the UK by Firm Size (based on employees)



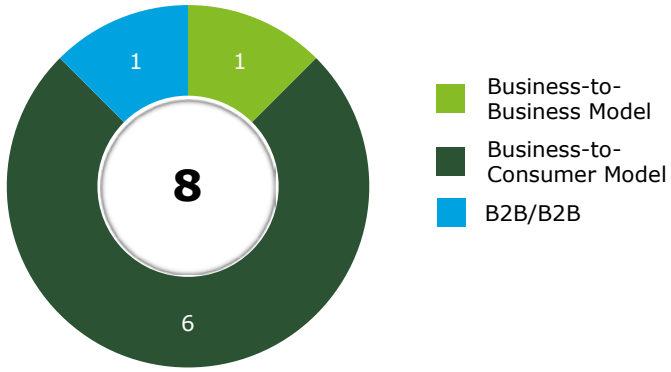
- Based on our selection criteria, we find that UK firms in our database are largely concentrated around lower levels of employment – over 60% have 100 employees or less.
- This suggests that UK firms which may look to expand into Canada are likely to be smaller-sized firms (in terms of employment levels).

Note: Recall that our selection criteria filtered for firms that met certain thresholds for annual revenues, total funding received, and acquisition activity. Accordingly, it is reasonable to assume that the outcomes of our search are skewed towards larger FinTech firms (in terms of employment levels). As such, we have not commented on the comparison of firm employments levels between the international database and domestic database.

Key Observations from International Database: Australia

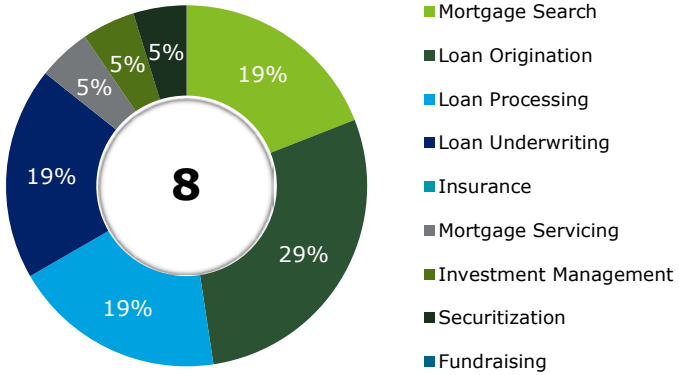
We identified a population of 8 FinTech firms in the Australian mortgage market that met our selection criteria to indicate potential entry into Canada in future periods

Number of Mortgage FinTechs in Australia by Business Model



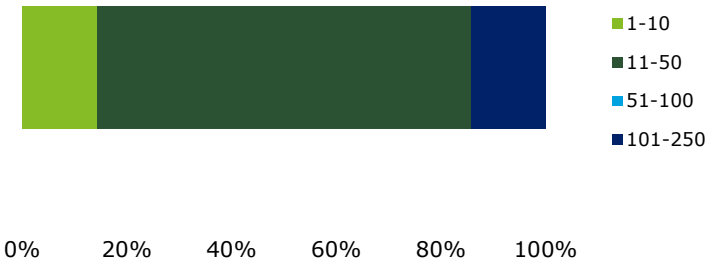
- Most Mortgage FinTechs in Australia which met our selection criteria operate under a B2C market context.
- Similar to the UK, we may see B2C firms as the most common form of Australian firms looking to expand into Canada's mortgage industry (as it relates to foreign direct investment).

Distribution of FinTech Firms in Australia by Mortgage Function



- Most Australian firms in our database are associated with functions relevant to mortgage broker and lending activities (i.e., mortgage search, loan origination, loan processing and underwriting).
- This suggests that majority of Australian firms are either offer mortgage rate comparisons or are digital mortgage lenders – the latter of which we find see less activity for in Canada.

Distribution of Mortgage FinTech Firms in Australia by Firm Size (based on employees)



- Based on our selection criteria, we find Australian firms in our database are almost exclusively concentrated around lower levels of employment – 6 out of 7 firms (one firm did not have employment data) employ less than 50 people.
- This suggests that Australian firms which may look to expand into Canada are likely to be smaller-sized firms (in terms of employment levels).

Note: Recall that our selection criteria filtered for firms that met certain thresholds for annual revenues, total funding received, and acquisition activity. Accordingly, it is reasonable to assume that the outcomes of our search are skewed towards larger FinTech firms (in terms of employment levels). As such, we have not commented on the comparison of firm employments levels between the international database and domestic database.

Appendix 1

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Database Sources

Source	Description
Quid	Quid is a platform that searches, analyzes and visualizes text-based data.
CapitalIQ	CapitalIQ is a market intelligence platform that collects and analyzes more than 135 billion data points in order to provide financial services research.
Crunchbase	A platform for finding business information about private and public companies, including business and operational information on companies and start-ups in the FinTech space.
Deloitte's proprietary lists of FinTech firms	Deloitte has access to several business registries and databases to identify FinTech companies. Additionally, Deloitte maintains internal lists of key FinTech companies in North America.
Publicly available firm and business lists	We reviewed certain publicly available firm and business lists in the development of this database (e.g., Canadian Fintech Ecosystem Map, CB Insights, Forbes, Fintech Ecosystem Report, Directory of Australian FinTech Companies, etc.).
Individual firm websites	Individual firm websites were used to obtain information on firm selection and related parameters (e.g., description of products/services, associated mortgage functions, business models, etc.).

Appendix 2

List of External Stakeholder Consultations

List of External Stakeholder Consultations

Organization	Stakeholder Name(s)
Mortgage Brokers Association	Wes Sudsbury – President of the Board of Directors
Financial Innovation & Technology Association of Canada	Ellis Odynn – VP Operations & Spokesperson
Digital Finance Institute	Ellis Odynn – Executive Director & Chief AI Officer at Digital Finance Institute
Finance Canada	Julien Brazeau – Director General at Financial Sector Policy Branch (2019-2020) Saskia Tolsma – Acting Director at Financial Sector Policy Branch Read Guersnay – Economist at Financial Sector Policy Branch
Canadian Credit Union Association	Michael Hatch – Vice President, Government Relations Patrick Barr – Financial & Digital Policy Advisor
Toronto-Dominion Bank	Roy D'Souza – Associate VP of Transformation
IntelliMortgage Inc.	Robert McLister – Co-Founder of IntelliMortgage
RateSpy.com	Robert McLister – Co-Founder of RateSpy.com
ExemptEdge	Stephen Preston – Vice President

Appendix 3

Descriptions of Cross-Cutting Technologies

Descriptions of Cross-Cutting Technologies

FinTech products and firms employ several innovative technologies, including artificial intelligence, robotic process automation, application programming interface, and blockchain

Artificial Intelligence

Artificial intelligence refers to the ability of a machine or system to perform tasks that normally require human intelligence, such as risk assessment and customer service.

Relevance to FinTech: AI is being adopted in a number of FinTech firms to reduce human error and automate resource intensive activities related to financial transactions, management of financial products, and/or financial reporting. This can improve operational efficiency. Further, machine learning ("ML") – a subset of AI – is gaining traction by FinTechs to enable the analysis of large quantities of data, allowing the financial services industry to better and more efficiently interact with customers.

Relevance to Mortgage Industry: AI and ML have the potential to help lenders, borrowers, and other stakeholders (e.g., insurance companies) detect anomalies/fraud, assess risk, analyze large amounts of data to forecast loan performance, and enhance customer service at several points of the mortgage process. In fact, Fannie Mae (a government sponsored agency in the United States that backs mortgages) predicts that by 2021, 58% of mortgage lenders in the US will have adopted AI/ML technologies in some capacity.[1] For instance, ML can assist in connecting or 'matching' lenders and borrowers by analyzing input data to effectively identify suggested pairings based on a set of criteria.

Robotic Process Automation

Robotic process automation is a technology that allows individuals to configure a software or 'robot' to emulate mundane tasks within existing applications.

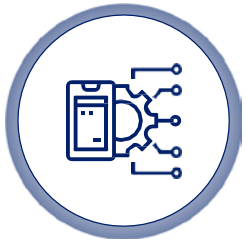
Relevance to FinTech: RPA technologies can enable firms to automate routine processes that can improve the accuracy of critical due diligence and analysis tasks. Collectively, RPA technologies can provide firms with data and insights that can help to develop new services or products related to mortgages or to continually manage and review mortgage portfolios. RPA processes can be configured with relative ease and speed, allowing FinTechs to automate activities. This is a desirable feature of RPA technologies as once applied, firms can easily reap efficiency, cost saving, and speed related benefits from the technology immediately.

Relevance to Mortgage Industry: Through digitization and automation, RPA technologies have the potential to solve the complex operational, regulatory, and financially challenges faced by firms in the mortgage industry. The key benefits of RPA include, amongst others: reduction of operational risks in transaction processing, automation of compliance and review processes, and validating and integrating information that originates from disjointed systems and databases.

1. Fannie Mae, *Mortgage Lender Sentiment Survey: Providing Insights Into Current Lending Activities and Market Expectations*, 2019.

Descriptions of Cross-Cutting Technologies (continued)

FinTech products and firms employ several innovative technologies, including artificial intelligence, robotic process automation, application programming interface, and blockchain



Application Programming Interface

Application program interface is a software intermediary that facilitates a seamless exchange of information across different applications, systems, and databases.

Relevance to FinTech: APIs are critical to facilitating open banking, which refers to the provision of limited open access to consumers' financial transaction data through digital channels.[1] By giving third-party financial service providers access to consumers bank data via secure online channels, customers can achieve access to more holistic services regarding the management and planning of their financial affairs. Open banking provides opportunities for FinTechs to collaborate with banks, scale and grow their businesses, and create targeted, innovative products and services that leverage existing infrastructure.

Relevance to Mortgage Industry: Open banking, via APIs, has the potential to improve the efficiency of the mortgage industry by supporting the mortgage matching process. For example, lenders could gain insights into a client's financial status through digital channels as opposed to the lengthy process of collecting paperwork from numerous sources. This technology can provide users with several benefits, including: greater access to information regarding mortgage rates, greater ability to switch to alternative lenders, money management, etc.

Blockchain

Blockchain is a digital, decentralized ledger that records, verifies and stores transactions. The information stored on the blockchain is immutable, meaning it cannot be altered or manipulated.

Relevance to FinTech: Blockchain is used across the FinTech landscape to increase the transparency, efficiency, and security of the financial industry. From transforming digital payments to innovations in securitization, blockchain brings radical changes to traditional business models and operating processes by creating an indisputable 'record' of transactions and financial activity, thereby potentially significantly de-risking transactions.

Relevance to Mortgage Industry: Blockchain has the potential to reduce costs, streamline, and provide more secure and accurate mortgage lending processes. For instance, it is estimated that blockchain could result in annual cost savings of $840 million to $1.7 billion in the US mortgage industry.[2] Blockchain decentralizes the storage of information, improving the transparency and audibility of mortgage lenders. This can eliminate the myriad of paper documents that are required in the mortgage process, and instead allow for all required material to be stored on a secure distributed network that is easily accessible and updateable.

1. For more information on open banking, please refer to Appendix 3 to this document.
2. Moody's Investors Service, *Housing-Related Industries Lay Foundation for 21st Century Technology*, 2019.

Appendix 4

Research on Open Banking in Canada

Research on Open Banking Platform

Open banking refers to the provision of limited open access to consumers financial transaction data through digital channels

Open banking has the potential to increase the competitiveness of the financial sector by facilitating the development of bespoke products and services via increased access to financial data. This is realized through APIs, a software intermediary tool that enables applications to interact and exchange data.

OPEN BANKING, FINTECHS, AND THE MORTGAGE INDUSTRY

- Open banking provides opportunities for FinTechs to collaborate with banks, scale and grow their businesses, and create targeted, innovative products and services that leverage existing infrastructure. These opportunities are created from increased access to banks data and processes and the reduction of interoperability of different systems.
- By giving third-party financial service providers access to consumers bank data, using secure online channels, customers will gain access to more holistic services regarding the management and planning of their financial affairs. This has the potential to improve the efficiency of the mortgage industry, where lenders could gain insights into a client's financial status through digital channels as opposed to the lengthy process of collecting paperwork from numerous sources. In addition, consumers can benefit from greater access to information regarding mortgage rates, the benefits of switching providers, money management etc.
- Open banking is becoming increasingly relevant in the mortgage industry. The Financial Stability Board estimates that lowering processing costs in the origination process could result in consumer savings of $480 to $960 per loan and cost savings of $3 billion to $11 billion annually for banks (in US and European markets).[1] Despite this potential, open banking is still in its early stages and therefore its effect on FinTech and the mortgage industry has not fully come into force.

OPEN BANKING IN CANADA

- In Canada, regulation surrounding open banking is still in its nascent stages. Open banking became part of the 2018 federal budget, and the Ministry of Finance appointed an advisory committee in September 2018. A consultation paper was released in 2019 that reviews the merits and potential risks of open baking. Despite the consultation paper, no recommendations have been developed with respect to open banking and therefore there have not been significant advancements in the government-led initiative.
- Canada's inaction to date regarding open banking could significantly affect the competitiveness of its banking and FinTech industries. In fact, the Senate committee on banking, trade and commerce published a study that concluded that Canada risks falling behind other countries if it does not 'create a regulatory environment conducive to open banking.'[2] According to the Department of Finance, access to financial data through open banking is crucial to the ability of FinTechs to scale and grow both in Canada and internationally. Further, open banking presents an important opportunity to increase competition in Canada's financial sector and bring benefits to consumers. To illustrate, the Competition Bureau of Canada found that 71% of Canadians have been with the same bank for the past 10 years. This indicates that Canadian customers do not, on average, take advantage of different products and services offered in the financial sector and therefore could benefit greatly from an open banking framework.[3]
- Despite the significant merits of open banking in Canada, there exist several barriers to its adoption that have impeded progress to-date. For one, the financial landscape in Canada is dominated by five large, trusted banks that held 93% of bank assets over the past decade.[4] These incumbents have emphasized the potential risks associated with open banking, demonstrating a reluctance of the industry to implement an open banking framework. In addition, there exists some degree of consumer complacency or lack of awareness with regards to open banking. A study by Accenture shows that three-quarters of Canadians are not currently interested in open banking, where 90% of Canadians cite concerns over financial data privacy as the source of their apprehension.[5]

1. Financial Stability Board, *Financial Stability Implications for FinTech: Supervisory and Regulatory Issues that Merit Authorities' Attention,* 2017.
2. The Standing Senate Committee on Banking, Trade and Commerce, *Open Banking: What is Means for You,* 2019.
3. Ibid.
4. Domenico Lombardi, James W. Hinton, & Joanna Wajda, *Issues in Bringing Canadian Fintech to the International Stage,* 2017.
5. Accenture Consulting, *Open Banking in Canada: Opportunity Knocks,* 2019.

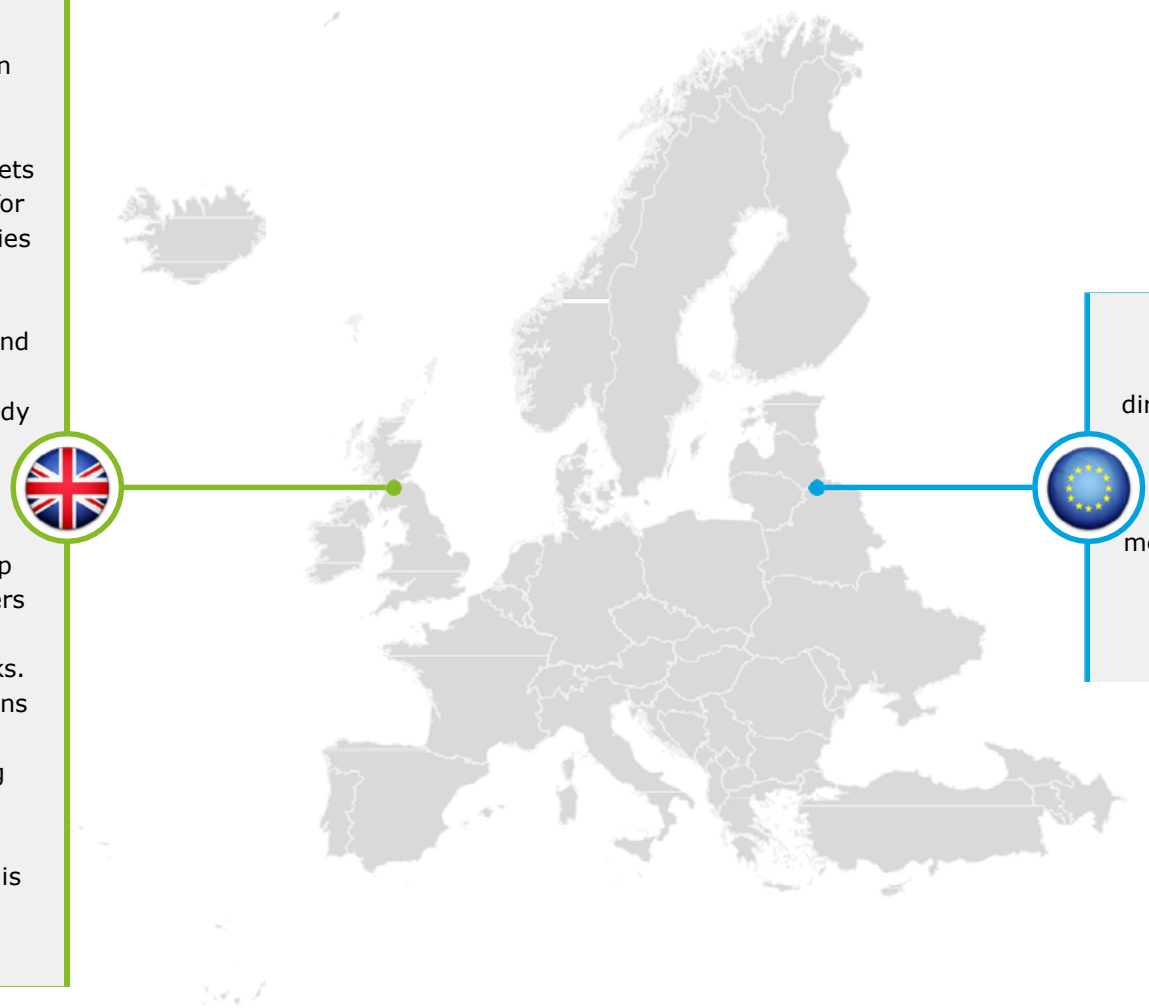
Research on Open Banking Platform – International Adoption

While Canada is lagging in the implementation of open banking regulation, the European Union and the United Kingdom have made important strides in 'opening' the banking industry

Open Banking in the United Kingdom

Open banking was introduced in January, 2018 in the UK through a roll-out process that firstly required banks to share data for chequing accounts. In addition, the Competition and Markets Authority requires mandated standardized APIs for nine of the largest banks for approved third parties in the UK. While still in the early stages, PwC estimates that open banking represents a £7.2 billion revenue opportunity by 2022 in the UK, and that 71% of SMEs and 64% of adults will adopt open banking by 2022.[1] In fact, there have already been several financial innovations that are taking advantage of the merits of open banking.

For example, HSBC has developed a new iOS app called Connected Money, which enables customers to see all their bank account balances, including mortgage accounts, from up to 21 different banks. In addition, Oracle Banking Enterprise Originations is a new solution that uses open banking to improve the mortgage origination process. Using an open architecture approach, Oracle enables lenders to process mortgage applications with increased efficiency. To illustrate, one bank that is implementing the technology has seen a 25% reduction in the cost of origination.[2]



Open Banking in the European Union

The EU introduced the second payment services directive ("PSD2") in 2015, which requires financial institutions to allow authorized third-party providers access to payments data. The PSD2 came into effect in 2018 across all member states and is reinforced by the EU General Data Protection Regulations, which regulate how companies manage and protect the data of EU citizens.

1. Global Consulting Company 2019.
2. Oracle, *UK Banks and Building Societies Can Accelerate Digital Mortgage Origination with Oracle,* 2019.

Appendix 5

Summary of Fintech Growth Syndicate's Classification System

Summary of Fintech Growth Syndicate's Classification System

Fintech Growth Syndicate (FGS) is an information technology and research company specialized in the FinTech sector. FGS is considered to be leading source for research and statistics on FinTech, illustrated by their provision of research services to the Government of Canada. As described in page 29 of this document, we have relied on an analysis performed by FGS to provide estimates on the size of the Canadian FinTech landscape, as well as the proportions of Canadian FinTech firms by subcategory.

Below we summarize the categorization system employed by FGS, which encompasses a set of ten subcategories (an extension of the key subcategories we described in page 19 of this document). To develop these subcategories, FGS collected data on FinTech in Canada extensively over the past three years and identified subcategories most relevant to the predominant product offerings of FinTech firms. For more information, refer to the report: Fintech Growth Syndicate, *Fintech: Executive Summary*, 2019.

Artificial intelligence

A sector that consists of companies primarily offering Machine Learning and AI capabilities as their core service in financial services.

Cryptocurrency & Blockchain

New forms of currency and records of all cryptocurrency transactions are recorded on a distributed network of computers that has no central ledger.

LendTech

Companies that are designed to improve or reimagine the current lending life cycle stages of origination, underwriting, settlement, closing and discharge or loans provided by existing financial institutions.

Wealthtech & PFM

A primary sector which includes companies that either provide alternative wealth management products and business models, or are technologies that focus on enhancing the current wealth management and the retail investment process.

Capital markets and investments

A sector that is primarily raising capital by dealing in shares, bonds, and other long-term investments, and in the process of ensuring that a company's tangible and intangible assets are maintained, accounted for, and put to their highest and best use.

FI Tech and Enterprise Software

A sector that consists of companies that are leveraging new methods, leading and new technology, or automation and AI to add to or improve the technology currently used by financial institutions.

RegTech

A primary sector which includes companies that utilize information technology to enhance regulatory processes.

Crowdfunding

A sector of FinTech companies that enable the practice of funding a project or venture by raising many small amounts of money from a large number of people.

InsurTech

Companies with new business model products designed to replace or augment those offered by insurance companies today, or new technology designed to squeeze out savings and efficiency from the current insurance industry model.

PayTech

Companies that use technology to enable the electronic transfer of value.

Appendix 6

Comparability of Singapore’s Housing Market

Comparability of Singapore's Housing Market

Several features of Singapore's housing market resulted in it's exclusion in our analysis

We have reviewed the comparability of Singapore's housing market (as a proxy for Asian housing markets) to Canada's housing market. The following characteristics provide a basis for opening up a discussion on the comparability of the Canadian mortgage industry to Asian countries (e.g., Singapore), and focusing instead on the US and UK.

- **Political structure:** Singapore is a city-state, meaning it does not have to contend with the same municipal, or provincial regulations seen in Canada/the United States (e.g., state level rules that may apply to the mortgage industry). Similarly, China has access to a different set of political levers than Canada that could limit the applicability of tactics in the market to Canada.
- **High rates of homeownership:** Singapore has one of the world's highest rates of homeownership which is owed to a comprehensive public-housing program that allows residents to purchase homes that are subsidized by the government.[1] To illustrate, Singapore's homeownership rate is 91%,[2] compared to Canada's rate of 67.8%.[3]
- **Public ownership of land and housing:** Around 90% of land in Singapore is owned by the state.[4] In addition, more than 80% of Singapore's population lives in Housing & Development Board flats (publicly governed and developed housing), which are sold on a 99-year lease agreement.[5] Only 15-20% of Singapore's housing stock is private.

1. NYTimes, *House Hunting in Singapore,* 2019.
2. Department of Statistics Singapore, *Statistics on resident households,* 2018.
3. Statistics Canada, *2016 Census of Population,* 2017.
4. World Bank, *"But what about Singapore?" Lessons from the Best Public Housing Program in the World,* 2018.
5. NYTimes, *House Hunting in Singapore,* 2019.

Appendix 7

Potential Topics for Future Research

Potential Topics for Future Research

We identified certain topics for which there were research limitations – neither our literature review nor stakeholder consultations provided sufficient information on these subject areas. Accordingly, the subject areas outlined below may be addressed through future CMHC research initiatives.

- **Predatory lending.** FinTech firms may use algorithms in social media platforms to identify vulnerable populations and offer alternative lending solutions. We could not find information on the prevalence and/or existence of predatory lending in Canada.

- **Private label securities.** This report presents our findings on the role of FinTechs in the securitization market (e.g., examples of mortgage technologies and associated FinTech firms). However, we could not find sufficient information on whether technology can enable net new securitization products or allow firms to issue residential mortgage-backed securities without government backing.

- **Real growth of FinTech sector**. This report summarizes estimations of the size of the Canadian FinTech landscape using data from various third-parties. However, we could not find sufficient information on the real growth of the Canadian FinTech landscape over a time series (keeping methodology consistent). to

- **Financial volumes intermediated by FinTech**. We could not find information on financial volumes intermediated by FinTech in Canada's mortgage industry (even on an aggregated basis). This lack of information is likely due to a number of reasons, as outlined below.
    - Canada's "mortgage tech" sector is considered to be very nascent compared to other countries. As such, it is possible that data on financial flows does not exist simply because the sector has not yet matured.
    - The provision of digital end-to-end mortgages to Canadian consumers is dominated by the largest banks and credit unions (e.g., Scotiabank, TD Bank, Alterna, Meridian), all of which have made digital mortgage services available within the last 1-2 years. These institutions have not segmented mortgage originations between digital and non-digital platforms, and as such, there is little information on financial flows intermediated by FinTech mortgage lenders.
    - Similarly, we found no indication that lenders who use digital lending platforms developed by B2B firms (e.g., Savvyy, Lendesk) publish information on how many mortgages they have originated through such platforms.

Deloitte.

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