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Singapore: The Leading Hub of Asia's FinTech Industry

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ABSTRACT

Fintech has been receiving great attention worldwide. While it is well-known that overall adoption rates are at their highest in Asia, they have risen particularly fast in Singapore – the continent's now leading fintech hub. This thesis aims to identify the unique advantages that promote Singapore's international success in fintech based on a study of industry-level competitiveness. Factors of success are investigated through the design and application of a theoretical framework which combines elements of national competitiveness, fintech ecosystems, innovation systems, as well as institutions.

To investigate the theoretical underpinnings of Singapore's success in the fintech industry, this thesis combined the strategy of a single case study with a descripto-explanatory approach to research. First, a broad selection of qualitative and quantitative secondary sources was reviewed to provide detailed information on the local political and economic environment of the industry, its development, as well as on the specific matters of collaboration, capital availability, talent, and research. Second, results were triangulated with primary data collected through two semi-structured interviews of one hour each. Interviewees included one representative of Singaporean fintech firm Validus and the Singapore FinTech Association, respectively.

The developed theoretical framework was able to sufficiently identify distinct factors of success. Findings indicate that Singapore's competitive advantage in fintech can be primarily ascribed to the actions of the local government. Especially the financial authority's pursuit of innovation as part of Singapore's national strategy for technological transformation has led to heavy investments in infrastructure, talent, and research. In addition, this has been amplified by the effective development of a conducive fintech ecosystem as well as the strategic creation of international linkages and an entrepreneurship culture. Looking ahead, the work of this thesis presents a valuable addition for complementary research studying industrial competitiveness on the level of individual fintech firms.

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LIST OF ABBREVIATIONS

AIDF	Asian Institute of Digital Finance
AIF	Academy of Internet Finance
API	Application Programming Interface
APIX	API Exchange
ASEAN	Association of Southeast Asian Nations
B2B	Business-to-Business
B2C	Business-to-Customer
BSB	Business sans Borders
DLT	Distributed Ledger Technology
DOS	Department of Statistics
ECSIP	European Competitiveness and Sustainable Industrial Policy Consortium
EDB	Economic Development Board
FDI	Foreign Direct Investment
FI	Financial Institution
FSTI	Financial Sector Technology and Innovation
FTIG	Financial Technology and Innovation Group
GIA	Global Innovation Alliance
IBF	Institute of Banking and Finance
ICAEW	Institute of Chartered Accountants in England and Wales
IMDA	Infocomm Media Development Authority
InfoComm	Information and Communication
IPOS	Intellectual Property Office of Singapore
ISCA	Institute of Singapore Chartered Accountants

ITAP	International Technology Advisory Panel
MAS	Monetary Authority of Singapore
MNC	Multinational Company
MOE	Ministry of Education
MOM	Ministry of Manpower
MTI	Ministry of Trade and Industry
NTUC	National Trade Union Congress
NUS	National University of Singapore
PE	Private Equity
PoC	Proof of Concept
R&D	Research and Development
SEA	Southeast Asia
SFA	Singapore FinTech Association
SFF	Singapore FinTech Festival
SFYC	Singapore FinTech Youth Chapter
SME	Small and Medium-sized Enterprise
SWITCH	Singapore Week of Innovation and Technology
UNDP	United Nations Development Programme
VC	Venture Capital / Venture Capitalist
WEF	World Economic Forum

1 INTRODUCTION

Financial technology, or *fintech*, is considered one of the world's fastest-growing technological industries (Founders Guide, 2020) with a global investment value of US$105.3B in 2020 (KPMG, 2021). By utilising specialised software and algorithms to automate the delivery of financial services, users are given the freedom of independently handling their financial matters (Kagan, 2020). As such solutions hence offer private and commercial customers alike a greater degree of efficiency and accessibility than what has traditionally been possible, fintech either disrupts the services of established institutions or complements them with services that previously did not exist (EY, 2019).

Fintech presents companies with low barriers to entry, which is reflected in an industry landscape that is broad in its combination of players with different backgrounds and levels of establishment (PwC, 2019a). Besides startups and financial institutions (FIs), this particularly concerns technology companies with a non-financial core business, firms providing financial transaction technology, as well as different government bodies (Ketabchi, 2019). PwC (2019a) observed a theme of coopetition and collision among the various players resulting from a shared goal set of improved operational efficiency, enhanced customer experience, and reduced costs. Traditional banking, for example, is being disrupted by startups shaping customer expectations in Europe, whilst startups and technology companies have both been able to gain strong positions in sparsely regulated sectors in the United States. At the same time, technology companies commonly share their technologies and customer relationship data to in turn receive expertise on products, markets, or regulatory affairs from FIs. In a competition for customer loyalty, however, the objective of fintech employment varies from the facilitation and quickening of services to their personalisation and integration (PwC, 2019a).

A significant increase from just 16% in 2015, the latest global fintech adoption rate of 64% presents companies with promising opportunities for the international expansion of their activities (EY, 2019). Asia, with the markets of China, India, Hong Kong, Singapore, and South Korea all exhibiting above-average adoption rates, has taken the world's top position as its fintech industry benefits from a feedback loop of adoption and innovation, a strong regulatory support for innovation, the emergence of virtual banks, and a growing Application Programming Interface (API) ecosystem (Lloyd, 2020). Singapore, interestingly, is Asia's dominating fintech hub on a comparative scale of both cities and countries (Findexable, 2019). The city-state's success can largely be ascribed to the support of its government and regulators, who for example have recently been pursuing further growth by issuing a limited number of digital banking licenses (Palma, 2019). With a conducive regulatory environment

and an open attitude towards novel technologies, the government's promotion of diverse innovation opportunities will also continue to contribute to Singapore's sustained attractiveness (Menon, as quoted in Palma, 2019).

EY (2019) considers Singapore to be an excellent case study for the maturation and globalisation of the fintech industry based on the considerable growth of its adoption rate from 15% in 2015 to 67% in 2019. Since internationalisation has become a major topic of interest for companies located in countries such as Hong Kong, Australia, or the United Kingdom (EY, 2019), this consequently leads to the assumption that Singapore is likely to be regarded as a top destination choice for reason of its prominent position. However, the question arises how the city-state has created a seemingly instrumental environment for fintech businesses and which factors have enabled the industry to thrive.

1.1 Research Question

The purpose of this thesis is to analyse the fintech industry in Singapore and to uncover the unique advantages that promote its international success. A detailed description of the industry and its local environment will be provided, in addition to the study of industry-level competitiveness based on a combined framework of four theoretical concepts. In this context, success will first be evaluated regarding the interplay of the city-state, the financial industry, and locally residing customers for the creation of a fundamental competitive advantage. This will then be aided by the analysis of the fintech ecosystem's contribution to industry growth, whereby special consideration will be given to the institutional setting and overall incentives for foreign entrants. The investigation of knowledge and technology flows within the fintech industry will provide an explanation for its innovative capability before finally directing attention to Singapore's international connections and the government's assistance for such related activities. The following main research question and its three sub-questions will be answered:

What are the success factors behind Singapore's position as the leading fintech hub in Asia?

- How does the interplay between the city-state, the financial industry, and locally residing customers contribute to Singapore's competitive advantage in fintech?
- How does the fintech ecosystem enable industry growth and which incentives are provided to foreign entrants?
- How do knowledge and technology flows contribute to Singapore's innovative capability in fintech and what assistance is provided for internationalisation activities?

1.2 Structure

The remainder of this thesis will be structured as follows. The methodology section will outline the research process in terms of approach, design, and methods in addition to providing a short discussion of delimitations. Following this, a broad theoretical framework will be established through consideration of multiple firm- and industry-level theories in relation to industrial competitiveness. Beginning with the resource-based view, competitive forces, and the value net model, the eclectic paradigm will then serve as a transitional theory from the level of individual firms to the overall industry. Regarding this, attention will be given to the diamond model, national innovation systems, actor-network theory, institutional theory, and fintech ecosystems. The subsequent delimitation of the introduced theories in the fourth section will enable the construction of a precise and purposeful framework, which will see the explicit combination of the diamond model, national innovation systems, institutional theory, and the fintech ecosystem. Thereafter, the descriptive section will present the necessary information for the application of the delimited theoretical framework. Specifically, this will concern different aspects of the fintech industry's environment in Singapore as well as a thorough description of the happenings within. The analytical section will then be divided into three parts, respectively dedicated to providing an answer to each of the research sub-questions. At last, a final conclusion will be drawn and an outlook for future perspectives will be given.

2 METHODOLOGY

The following section will explain the methodological choices and considerations of the conducted study on the success factors of Singapore's fintech industry in view of the main research question and the three sub-questions it is composed of. After a clarification of the approach to research, the research design will be outlined in terms of purpose, strategy, as well as validity and reliability. Following this, the undertaken methods of data collection will be specified. A description will be given regarding the process of data analysis before this section will conclude with a review of delimitations.

2.1 Research Approach

Reichertz (2014) describes abduction, deduction, and induction to constitute distinct means of research that allow for logical inferences to be attained. The research approach adopted for this thesis was of the abductive kind. While Ketokivi and Mantere (2010) state that abductive reasoning begins with the observation of a 'surprising fact', Saunders et al. (2019) elucidate that this fact represents a conclusion for which it is sought to find a feasible explanation. Thereby, generalisability commonly results from the interaction of theory and specific observations (Saunders et al., 2019). The surprising fact which motivated this study was Singapore's status as the leading fintech hub in Asia. Hence, a literature review of established theories served to identify pertinent factors that have previously been found to enable the achievement of superior industrial competitiveness and thus international success. A theoretical framework was built on the basis thereof, such that the finding embodied in the initial fact was subsequently supported by the framework's application to a set of both primary and secondary data.

2.2 Research Design

This section will outline the study of the research question by illuminating design decisions in relation to research purpose and strategy. Additionally, the validity and reliability of the conducted research will be discussed.

2.2.1 Research Purpose and Strategy

To uncover the success factors of Singapore's fintech industry, three research sub-questions were investigated to analyse and determine specific causes for the city-state's competitive advantage at the industry level as well as their concurrent effects on industry growth and innovative capability. Besides seeking to find an explanation for the city-state's international success, however, the same research sub-questions also exhibited descriptive qualities seeing as it was necessary to first establish a sufficient basis for analysis. This included, for example, a detailed depiction of the political

and economic environment, governmental involvement, or the local availability of capital and fintech talent. Since descriptive research can generally be combined with its explanatory counterpart by preceding the latter and providing a truthful report on the matter under examination (Saunders et al., 2019), the purpose of the performed research was thus to answer the main research question in a descripto-explanatory manner.

To complement the choice of an abductive research approach and congenial to a research purpose of both an explanatory and descriptive character, the selected strategy of research was that of a single case study. Whilst case studies exhibit a flexible design and aim to generate a detailed understanding of a given situation, the investigation of such a study is inextricably linked to the context in which it occurs and typically reliant on the multi-method collection of predominantly qualitative data (Robson & McCartan, 2016). With respect to the conducted research, the study of Singapore's fintech industry from a perspective of industrial competitiveness naturally saw the case embedded in its international context as well as in the context of its local political and economic influences.

2.2.2 Validity and Reliability

Accurate findings are ensured by designing research to be both valid and reliable. Whereas validity pertains to the production of results that are accurate in what they attempt to explain, reliability refers to methods of data collection and analysis that guarantee the consistency of results (Saunders et al., 2019). Since the study of Singapore's fintech industry followed a flexible case strategy primarily concerned with the use of qualitative data, standard means of reaching valid and reliable results as commonly utilised for quantitative data could not be employed. Robson and McCartan (2016), however, outline three particular threats to the validity of qualitative research that relate to the description and interpretation of data as well as to the data's fit with theory. These threats were counteracted by accurately describing primary and secondary data, continuously reviewing the applicability of the theoretical framework with the data at hand, and keeping the limits of the employed theory in mind (see Robson & McCartan, 2016). Although the theoretical framework's guidance of the analysis naturally shaped the nature of reached conclusions, validity was furthermore ensured through the triangulation of data collection methods (see Saunders et al., 2019). The combination of interviews and secondary data allowed for the enquiry of researched topics with individuals that had direct experience with Singapore's fintech industry. Consequently, this provided a means to evaluate one's own interpretations with interviewee perceptions.

The reliability of results stemming from qualitative data is achieved by thoroughly investigating the research question as well as by doing so in a careful and honest manner (Robson & McCartan, 2016). In accordance with this, the conducted research involved the careful selection of relevant data from a multitude of sources so that an honest picture of Singapore and its fintech industry could be created. Data was collected from credible sources such as official government websites or reputable organisations. Interviews were conducted in quiet surroundings to limit outside distractions and transcribed in their entirety using transcription software, reducing human error.

2.3 Research Methods

This section will present the employed methods of primary and secondary data collection, with special consideration to the sources of utilised data. Also, the two-stage process of data analysis will be described.

2.3.1 Data Collection

Whilst research was carried out by using a mixed method of qualitative and quantitative data, the predominant use of the former finds its justification in the descripto-explanatory purpose of this research as well as in the flexible design of a case study. Later complemented by primary data generated through two semi-structured interviews, the initial data collection exclusively concerned secondary sources. According to Saunders et al. (2019), secondary data can be split into three categories: documentary data, multiple source data, and survey data. Specifically, the documentary data collected for the study of Singapore's fintech industry concerned information available on the websites of government agencies and industry bodies as well as in academic journals, books, newspaper, and magazine articles. In addition to reports from non-governmental organisations, information was further obtained from speech and interview transcripts, press releases, podcast episodes, Facebook posts, and official infographics. Multiple source data was represented in the industry reports of established consulting firms, governmental databases for economic, demographic and labour statistics, as well as economic and political index data. Lastly, survey data from industry surveys of locally based fintech firms was also considered.

Guided by an emic perspective, qualitative interview data was collected by asking open-ended questions in order to obtain accurate insights into the interviewees' understanding of the fintech industry (see Fetterman, 2008). Based on a guide of distinct themes that the interview enquired about, main questions were formulated rather broadly before being complemented by more detailed follow-up questions. This method allowed for the interviewees to elaborate their viewpoint on specific topics without compromising reliability by subconsciously exerting influence on the given answers. Interviews of one hour each were conducted with X.Y. Ng on the 17th of February 2021 and Teck

San Lim on the 12th of March 2021. Ng, after joining as Vice President of Marketing in 2018, acts as the current Group Head of Brand and Digital at Validus (*X.Y. Ng*, 2021) – Singapore's leading platform for small and medium-sized enterprise (SME) financing from individual and institutional lenders, which has notably received multiple awards since its formation in 2015 (Validus, 2020). On the other hand, Lim has joined the Singapore FinTech Association (SFA) as Senior Operations Officer before ascending to Head of Partnerships both in the last year (*Teck San Lim*, 2021). The relevancy of interviewing Ng and Lim presents itself in view of their direct yet differing experiences with the fintech industry in Singapore, respectively representing the perspective of an actively involved company as well as of a coordinator with strong connections and broad industry knowledge. Non-verbatim transcriptions can be found in Appendix A and Appendix B.

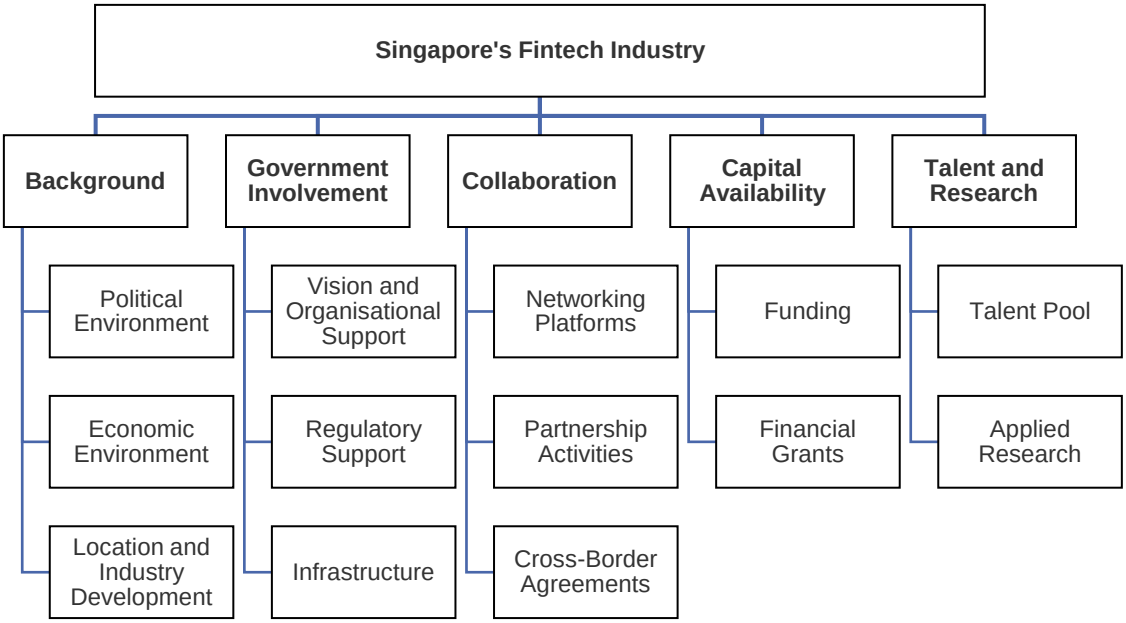
2.3.2 Research Process and Data Analysis

As a guiding structure for the analysis of gathered data, an extensive review of literature was conducted to gain insights into aspects of industrial competitiveness and to subsequently build a comprehensive theoretical framework for the same. In this context, literature was researched with further regard to the supportive and/or closely related topics of industry growth and development as well as of internationalisation, networks, and institutions. This resulted in a selection of eight distinct theories, which could then be divided into theories on the firm and industry level by considering the two-dimensionality of industrial competitiveness in its use as an indicator for overall success. At last, the theoretical framework was delimited to only include those theories that exhibited the greatest applicability for the investigation of the main research question and its sub-questions.

For the descriptive part of this research, a template analysis was conducted. This choice of analytical tool is especially appropriate for an abductive approach to research due to being a standalone method of analysis (Saunders et al., 2019), while also presenting the ability to flexibly adapt to the requirements of undertaken research (King & Brooks, 2017). Initially, data was gathered by looking up the terms 'fintech' and 'Singapore' through Google Search. Relevant sources were collected, and after a familiarisation with the resulting set of secondary data, key paragraphs were sorted and coded to identify a group of initial themes to which they related. The codes 'Sandbox' and 'Payment Services Act', for example, were assigned to the theme 'Regulation'. These themes were then combined with an additional list of a priori themes (see King & Brooks, 2017), which considered more general aspects to the topic necessary for answering the given research question (e.g., 'Economic Environment'). In this way, a hierarchical template was produced and iteratively adjusted with the addition of new material. The final template is illustrated in Figure 1.

Figure 1

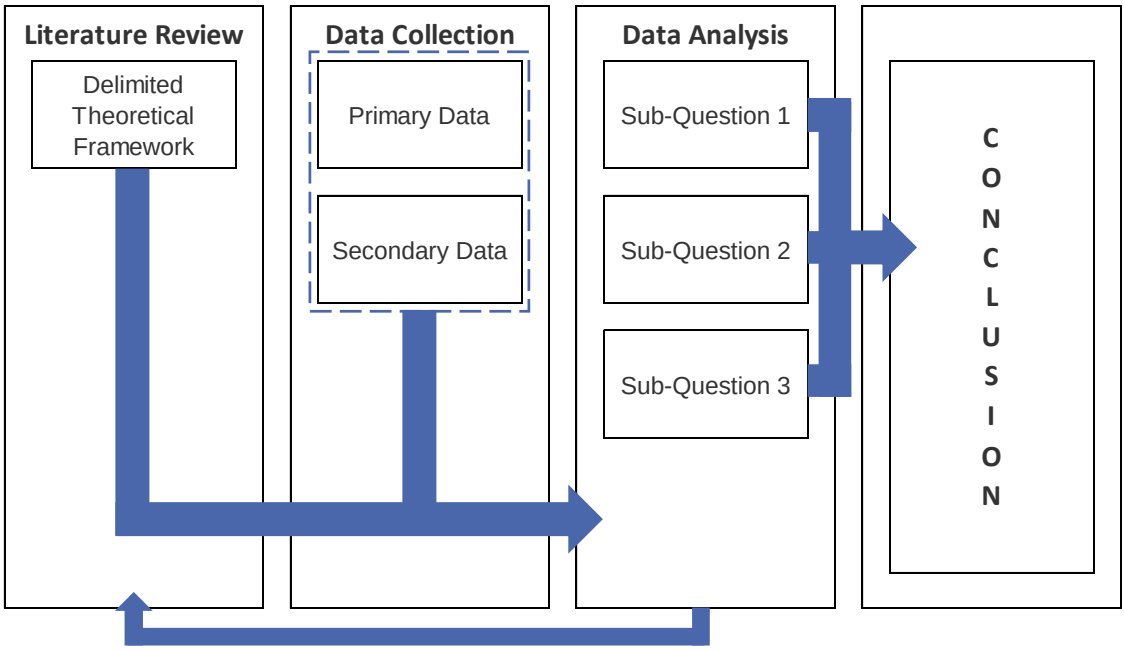
Hierarchical Template for Data Description and Analysis



For the explanatory part of this research, triangulation was employed as an analytical tool. At first, the theoretical framework was disassembled into its individual components (i.e., diamond model, innovation system, ecosystem, and institutions) so that each research sub-question could be individually addressed. The data collected through the previously conducted template analysis was respectively assigned to the theory it displayed the most relevance to, and afterwards complemented by thematically matching key parts of the transcribed interview data. In this way, the incorporation of first-hand insights with the matter under investigation produced a direct comparison with secondary data points that was able to reveal new topical aspects and provide supplemental information. Additional material was then integrated where necessary to support and strengthen the line of argumentation. It should be noted that during this part of the analysis modifications were made to the theoretical framework according to where data indicated novel or different areas of inquiry. Institutional theory, for example, was given stronger emphasis as well as relocated within the framework based on its increasingly emerging relevance in the context of the fintech ecosystem. The conclusions made in the analysis of the three research sub-questions were combined through the eventual re-assemblance of the theoretical framework before an overall conclusion for the main research question was drawn on the basis thereof. The complete process of data analysis is illustrated in Figure 2.

Figure 2

Process of Data Analysis



2.4 Delimitations

For the research of this thesis, five broad delimitations lent themselves to either the nature of the research question or the practical constraints of this study:

1. The strategy of a single case study led to a geographic delimitation, meaning that findings are applicable only to the fintech industry in Singapore. Generalisability was sacrificed as an identical level of success cannot be claimed to be reproducible in other settings.
2. Data collection was time delimited by only considering industry events that took place after 2015. With this being the beginning of Singapore's 'fintech journey' (see Menon, 2016), the following years were most relevant to identify factors of success.
3. The reliability of primary data may be compromised due to the small number of interviews, which was owed to difficulties in finding interested individuals who could have contributed more insights to data analysis.
4. The reliability of primary data may also be compromised due to the choice of a non-verbatim transcription method. Since one of the interviewees was not a native speaker of English, this was necessary to improve readability and comprehensibility.
5. The study of the research question could have been approached differently, for example by measuring success in quantitative terms or making one or more businesses the subject of the case study.

3 THEORETICAL FRAMEWORK

To investigate the underlying success factors of Singapore's position as the leading fintech hub in Asia, the following section will establish a comprehensive framework of related theories and hence provide a coherent foundation for the viable analysis of collected data.

Success is commonly defined as the achievement of desired results (*Success*, 2021); however, this must be understood in relative terms considering that any leading position can only be attained through direct comparison with competing entities. The European Competitiveness and Sustainable Industrial Policy Consortium [ECSIP] (2013) defines industrial competitiveness to consist of a vertical dimension, concerning internal dynamics such as strategies and business models, and a horizontal dimension, concerning the general business environment. It is hence relevant and in the scope of this thesis to investigate success from a perspective of international competitiveness both in terms of Singapore's fintech industry and the individual firms it is composed of.

3.1 Firm-Level Theories

Two distinct perspectives present themselves for the assessment of firm-level competitiveness. On the one hand, an introspective view directs attention to a firm's resources and capabilities. On the other hand, an extrospective view considers any competitive position to be a result of the external environment a firm is operating in. To provide a holistic picture, this section will consider both approaches through the works of Barney (1991, 1995), Porter (1979), as well as Brandenburger and Nalebuff (1995). Additionally, Dunning's (1980) eclectic paradigm will find brief consideration.

3.1.1 Resource-Based View

Barney (1991) introduced the framework of a resource-based view in his article on "Firm Resources and Sustained Competitive Advantage" in the *Journal of Management*. Building on the assumption of a heterogenous distribution of immobile resources among firms, the author suggests that any firm can achieve a sustained competitive advantage through an access to resources that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). Barney (1995) later refined his framework by incorporating non-substitutability into inimitability, combining both into a single attribute and adding the question of a firm's internal organisation as a requirement for resource exploitation. Referencing Daft (1983), Barney (1991) characterises resources as all assets, capabilities, processes, attributes, information, and knowledge controlled by a firm. In the case of fintech, for example, crucial resources may thus be found in unique technologies or collaboration activities across firms.

Barney's resource-based view has been applied in Legowo et al.'s (2020) study on the influence of fintech on the sustainable development of the Indonesian financial and banking industry, which concluded that fintech has had a positive impact on the aforementioned due to resources and capabilities found in technology, organisations, and money flows. Bömer and Schwienbacher (2018), moreover, studied the determinants of venture capital (VC) investments in fintech startups with the conclusion that resource-based advantages are found in their proximity to large FIs and software technology companies.

3.1.2 Competitive Forces and Value Net Model

Whilst the resource-based view regards a firm's internal characteristics as the source for a competitive advantage, a complementary idea is found in the consideration of environmental influences such that competitiveness is best determined through the examination of both. Porter (1979), focussing on externalities outside the boundaries of a firm, proposes that firm performance is a direct result of the competitive forces within an industry. Specifically, the author recognises that there are five forces that shape competition and business strategy: existing competitors, new entrants, potential substitutes, customers, and suppliers (Porter, 1979). The theory presents a general approach for an industry's nature of competition as demonstrated by Werth et al.'s (2020) paper on the influencing factors for the fintech-driven digital transformation of the financial services sector or Aaron et al.'s (2017) research study on the risks and opportunities of the fintech industry from the perspective of central banks. Adopting a game-theoretic position centred around value-creation, Brandenburger & Nalebuff (1995) elaborate on Porter's theory by arguing that actors not only compete with one another but also gain advantages through cooperation. In fact, a reference can be made to the concept of coopetition, which is formally defined as "the dyadic and paradoxical relationship that emerges when two firms cooperate in some activities, such as in a strategic alliance, and at the same time compete with each other in other activities" (Bengtsson & Kock, 2000, p. 412). Herbert and Christoph (2003) notably describe coopetition as a distinct business model.

Brandenburger and Nalebuff 's (1995) value net model portrays an industry's firms to be surrounded by four groups of players, a notation which is owed to the authors' applied game-theoretic approach and thus synonymous to the actors in Porter's five forces. The players are split along a vertical dimension, consisting of transactions with customers and suppliers, and a horizontal dimension, consisting of interactions with substitutors and complementors. Each dimension represents a mixture of competitive and cooperative relationships; however, it is the latter which creates value and elevates firm performance. In addition to all players being interdependent, any player can assume multiple roles simultaneously and benefits may ultimately be found in the collaborative efforts with

rivalling firms (Brandenburger & Nalebuff, 1995). The model's underlying idea of value creation is mirrored in a general definition provided by Borys and Jemison (1989, p. 241): "The process by which the capabilities of the partners are combined so that the competitive advantage of either the hybrid or one or more of the partners is improved."

The relevance of the value net model presents itself in light of PwC's (2019a) finding that collaboration and coopetition have become major drivers of the global fintech industry. Especially traditional financial services firms and technology companies are working together, for example by jointly applying for digital banking licenses or by selectively sharing innovative technology and market expertise, in order to be able to compete in increasingly converging fintech ecosystems (PwC, 2019a). The value net model hence adequately indicates real-life circumstances and, in this way, directs attention to such unique competitive advantages within the industry.

3.1.3 Eclectic Paradigm

Supplemental to the aforementioned theories, Dunning's (1980) eclectic paradigm provides a framework that can be used to look both inside and outside of a specific firm. The author, seeking to explain international production activities, suggests that internationalisation strategies are reliant on a company's ownership advantages as well as on the location-specific advantages of the target country. The former, to be more precise, refers to unique assets such as technology or organisational skills that cannot be accessed by international competitors (Dunning, 1980). As established by Barney (1995), organisational skills relate to internal firm capabilities that are vital for the successful utilisation of resources and thus help to achieve a sustained competitive advantage.

A major benefit of the eclectic paradigm lies in the shifted focus from a domestic to an international market. Considering that governments worldwide are directing growing efforts towards the attraction of foreign fintechs (EY, 2016), this becomes highly relevant seeing as the competitive advantages of foreign entrants and their impact on domestic competition cannot be neglected. Yet besides its use in assessing the individual strengths of companies, Dunning's paradigm also underlines the simultaneous assessment of more general location characteristics. Thus, the question arises which advantages particularly contribute to the attractiveness of Singapore's fintech industry.

3.2 Industry-Level Theories

This section will consider multiple theories for the assessment of industry-level competitiveness. In keeping with Dunning's (1980) notion of location-specific advantages in an international context, Porter's (1990a) diamond model will be introduced and subsequently extended by use of national innovation systems. Following this, actor-network theory will be outlined. Networks will be elaborated upon by means of institutional theory, after which this section will conclude with ecosystem theory in special regard to the fintech industry.

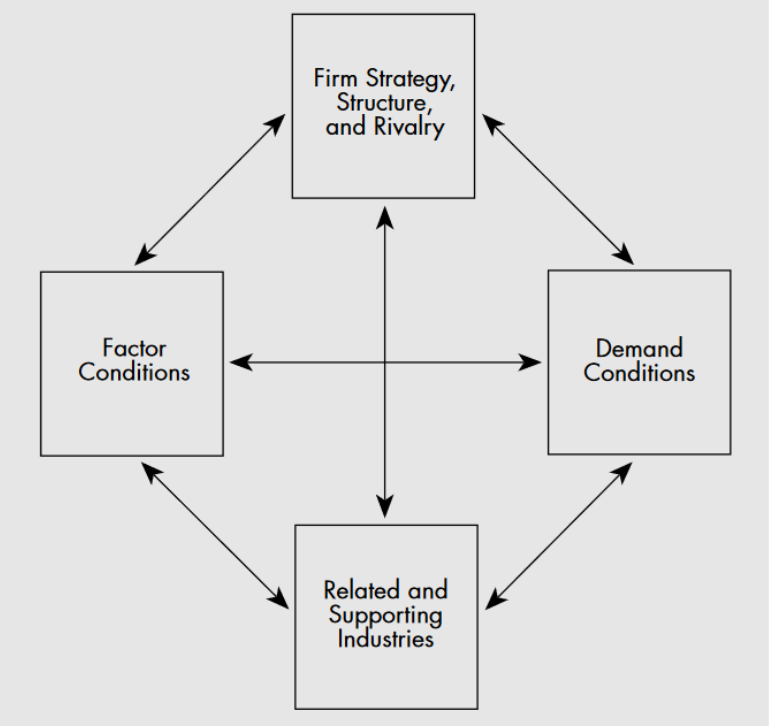
3.2.1 Diamond Model

Porter's (1990a) diamond model presents a framework for the determinants of national competitiveness, which is built on the assumption that prosperity is self-created. The author maintains that the competitive advantage of a nation is subject to a highly localised process, and success in particular industries is achieved by being forward-looking and dynamic. An industry, and thus the companies which it is composed of, must therefore possess a fundamental capability to continuously innovate and upgrade. To thrive, a challenging environment is required in which the two concepts of innovation and change necessitate one another (Porter, 1990a).

Porter (1990a; Figure 3) identifies four interconnected attributes that contribute to the creation of a competitive environment: factor conditions, demand conditions, related and supporting industries, as well as firm strategy, structure, and rivalry. While factor conditions also refer to common resources such as capital or infrastructure, the author stresses the importance of specially created factors that are aligned to an industry’s needs through constant upgrading. This requires a characteristic home-demand of sophisticated buyers, who clearly signal their consumer needs and thereby stimulate companies to innovate. Innovation and upgrading are further encouraged by internationally competitive related and supporting industries due to a facilitated flow of information and technical interchange. Lastly, the national context conditions the creation, organisation, and management of companies and competitiveness is achieved when the latter two converge with the industry’s sources of competitive advantage. By fostering intense, localized rivalry, companies are compelled to not only innovate and upgrade, but the development of specialised factors is enabled as well. The author concludes by saying that the specified conditions promote the creation of linked and mutually supporting industry clusters (Porter, 1990a). However, two outside forces further influence a nation’s competitiveness: governments ought to create a challenging environment for companies to evolve in (Porter, 1990a) and chance events may either positively or negatively reshape the structure of an industry (Porter, 1990b).

Figure 3

Diamond Model



Source: Porter (1990a)

Attempting to explain the underlying reasons of varying degrees of industry success in different countries (Smit, 2010), the diamond model finds its strength in a multidimensional analysis that connects firms, industries, and nations (Grant, 1991; Peng, 2009). The interdependency of the four specified conditions implies that it is necessary for each of them to be strong in order for an industry to advance and be internationally competitive (Porter, 1990a; Smit, 2010). This, for instance, is illustrated by Laidroo and Avarmaa's (2020) study on the role of location factors for the intensity of fintech formation, based on which the authors suggest that that the attractiveness for doing business in a given location can be increased through the elimination of weaknesses indicated by the model. In Grant's (1991) assessment of Porter's proposed theory, however, two particular points of criticism emerge and shall be highlighted. Firstly, the existence of a direct relationship between industry performance and national prosperity is critiqued due to the presumption of an unseen force connecting the two. Secondly, the model's central concept of upgrading is said to lack a sufficient definition despite competition being regarded as a process of dynamic change. Still, these deficiencies remain of little relevance considering that "Porter's theory of how national factors influence competitive advantage within individual industries extends well beyond current theories of competitive advantage based upon resource endowments […]" (Grant, 1991, p. 547).

3.2.2 National Innovation Systems

Following Porter's (1990a) theory of innovation as one of the driving forces behind competitiveness and international success, deeper insights into the development of an industry's competitive environment can be gained by applying the theory of national innovation systems (Munshi et al., 2019). In relation therewith, the tendency of cluster formation as mentioned in the diamond model is explicitly addressed by a cluster approach dedicated to the identification of unique industry interactions. A definition of industrial clusters is given by Bortoluzzi et al. (2015):

> A geographic concentration of interconnected firms, suppliers, and institutions in a particular field. It has the potential to affect competition by increasing the productivity of the companies in the clusters, driving innovation, and stimulating new businesses in the specific field. (p. 568)

National innovation systems can be traced back to the works of Nelson, Freeman, Lundvall, and Pelikan (1988). Based on the OECD (1997), the theory posits that a process of innovation is enabled by technology and information flows between individuals, companies, and institutions. Distinct flows of knowledge are specifically found in networks of connected actors, involving the respective interactions of companies, universities, and public research institutes. While knowledge is also subject to general diffusion and transfer by the movement of workers, such flows are ultimately able to increase firms' innovative capacities in terms of productivity, products, and patent claims. Aside from their consideration on a national level, innovation systems may also be evaluated sub-regionally, pan-regionally, or internationally. Cluster analysis, moreover, is specifically concerned with the distinct nature of technology and networking within industry sectors, in which interactions take place due to the utilisation of equivalent technologies, the presence of shared knowledge or skills, or the relationships between producers and suppliers (OECD, 1997). Niosi et al. (1993, p. 212) clarify that "interaction […] may be technical, commercial, legal, social, and financial, inasmuch as the goal of the interaction is the development, protection, financing, or regulation of new science and technology."

The evaluation of national innovation systems can enhance industrial competitiveness through the introduction of targeted government policies (OECD, 1997). Wonglimpiyarat's (2018) study on fintech crowdfunding in Thailand, for instance, found that ineffective policies within the financial industry hinder technological growth and that coherence is needed for the promotion of startup activity. The system-based view of innovation suggests that failures as reflected in low innovation performance are attributable to a lack of coordination between involved actors (Soete et al., 2009). As a countermeasure, governments can provide sufficient incentives and exert influence on all groups of actors as well as their relations and interactions (Samara et al., 2012). Instead of

encouraging individual innovation activities, policy activities should focus on the system's missing components, boundaries, and connections to facilitate knowledge flows and in this way advance innovation (Metcalfe, 2005). The OECD (1997, p. 7) concludes that "policies which seek to improve networking among the actors and institutions in the system and which aim at enhancing the innovative capacity of firms, particularly their ability to identify and absorb technologies, are most valuable in this context."

3.2.3 Actor-Network Theory

Innovation, as previously established, drives competition and hence affects an industry's growth and success. With further regard to the importance of networking within an innovation system, a social network is formally defined as "a finite set or sets of actors and the relation or relations defined on them" (Wasserman & Faust, 1994, p. 20). By placing a focus on technological innovation processes, actor-network theory is especially appropriate for the analysis of technology-driven industries (Shim & Shin, 2016). Apart from Shim and Shin's (2016) study on the development of the Chinese fintech industry, this is also evidenced by its successful application in academic work within the field of information and communication (InfoComm) technology (e.g., H. Lee et al., 2015; McBride, 2003).

Positing a dynamic process of network formation, actor-network theory seeks to explain the linkages amongst a group of heterogeneous network elements (Shim & Shin, 2016). With the distinct idea that actors are not constrained to human individuals but may also assume non-human or non-individual characteristics (Latour, 1996), such networks connect for example people, text, or organisational groups (Uden, 2012). Human actors, all having their own objectives, exhibit different motivations for the support or opposition of a specific technology and must thus align their interests for the establishment of associated non-human actors (Uden, 2012). Bringing special attention to the political, social, and economic factors behind new technologies, Shim and Shin (2016) hence specify that an actor-network comprises all those elements that have had an impact on their respective development.

For the application of actor-network theory, Callon (1984, p. 203) introduced "a general process called translation, during which the identity of actors, the possibility of interaction and the margins of manoeuvre are negotiated and delimited." Based on this, the author developed a framework of four moments: problematisation, interessement, enrolment, and mobilisation. In the first moment, a set of actors determines itself and builds their individual identities as an obligatory passage point for future network relationships. The second moment then describes an actor's actions intended to impose and stabilise the identity of others. Following this, enrolment determines specific strategies that result in the successful definition and attribution of interrelated roles. Lastly, the moment of mobilisation combines methods for the actors' proper representation (Callon, 1984).

While the theory of actor-networks appears rather abstract, it presents a unique perspective on the development of technological innovations. By either following the actors or alternatively inspecting written evidence of their interests (Carroll, 2014), the growth of industries can be mapped and contributing factors identified. In general terms, however, innovations are enabled through the collective actions of diverse network elements in the form of research, technologies, and financial resources, as well as institutions and regulation (Shim & Shin, 2016).

3.2.4 Institutional Theory

Considering that institutions exert influence on an industry's innovative capability as a distinct network element (see Shim & Shin, 2016), short consideration shall be given to institutional theory. A prominent definition is provided by North (1991), who regards institutions as formal and informal constraints designed by humans for the creation of order and reduction of uncertainty. Evolving incrementally, North (1991) asserts that institutions give structure to political, economic, and social interaction while providing necessary incentives for economic growth, stagnation, or decline. Scott (2013, p. 56), in contrast, maintains that "institutions comprise regulative, normative, and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life." Whereas regulatory processes are described to include the setting of rules as well as the monitoring and sanctioning of activities, the author relates the normative aspect to the values and norms of social life. The remaining element lastly refers to common beliefs and shared conceptions which are internalised by individuals (Scott, 2013).

Especially informal institutions, or alternatively the normative and cultural-cognitive aspects of institutions, characterise networks in the sense that their elements are subject to the norms and cultural customs of their physical location. In other words, they shape the nature of relationships as well as people's understanding of their own selves. When values and norms are then moreover restricted to particular social positions, the emergence of roles affects the definition of associated goals (Scott, 2013). Regarding actor-network theory, these goals would be critical in determining whether high-ranking individuals such as policy makers or regulators have an agenda in favour or opposition of certain technologies and may thus either positively or negatively influence their development. In any case, however, informal institutions affect the formation of actors' identities as well as those assigned to others, thereby impacting technological innovation to an extent in accordance with their ascribed role in the network. But apart from this, an industry's institutional setting can naturally also be considered in more general terms. It's different aspects, for instance, can be incorporated into the evaluation of governments and national contexts as described by Porter's (1990a) diamond model.

3.2.5 Fintech Ecosystems

Auschra et al. (2019) state that institutions may affect entrepreneurial activity and interactions by acting as either an enabler or deterrent. More specifically, both formal and informal institutions determine the nature of interactions and hence provide a necessary context for the assessment of relationships and outcomes. With further consideration of innovation systems and networks, this brings attention to the theory of entrepreneurial ecosystems. Defined as “combinations of social, political, economic, and cultural elements within a region”, the interactions in such ecosystems support innovation, entrepreneurial activity, and consequently strengthen competitiveness (Spigel, 2017, p. 50). In terms of fintech, I. Lee and Shin (2018) underline that a symbiotic ecosystem that effectively enables innovation through the presence of both competitive and collaborative forces is of substantial importance for the industry’s growth.

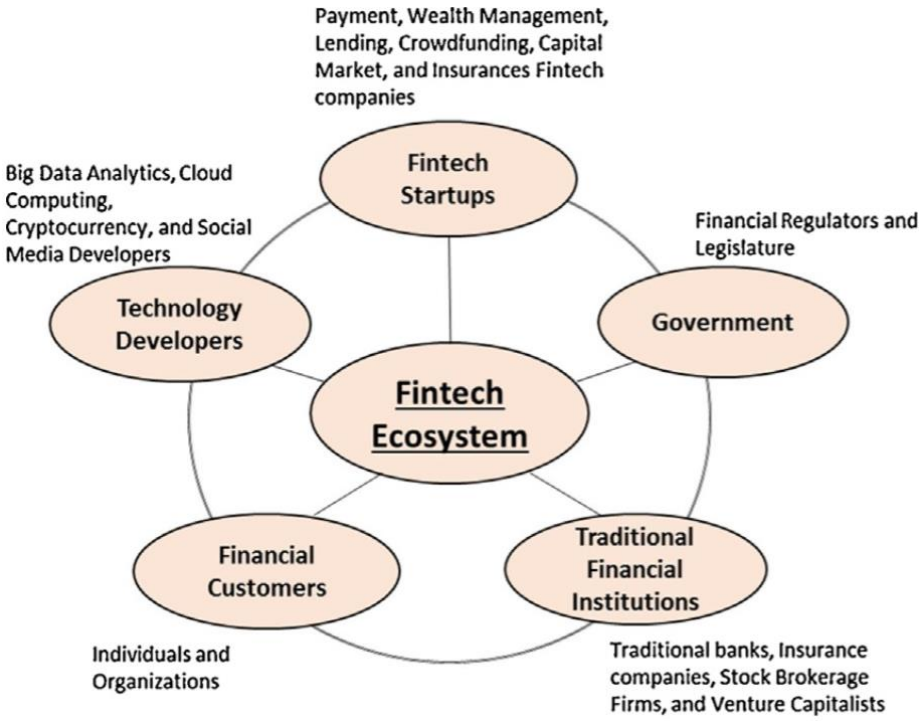
Diemers et al. (2015) identified three key participants of fintech ecosystems, each of whom they assign distinctive roles. Whereas governments are responsible for policy enforcement and the creation of a conducive regulatory environment, a diverse set of FIs provide market expertise and other relevant knowledge while entrepreneurs are the source of innovative or even disruptive technologies (Diemers et al., 2015). On the basis of this, I. Lee and Shin (2018; Figure 4) suggest a refined definition including startups, technology developers, governments, financial customers, and traditional FIs. Startups enable crucial innovations and, by unbundling financial services, have great influence on fintech industry growth. Their work is facilitated by technology developers, who supply essential infrastructure for example in the form of cloud computing, artificial intelligence, or mobile services. Innovation is stimulated by governmental regulation, which facilitates competitiveness also on a global scale through policies pertaining to licensing, capital requirements, or tax incentives. Revenue then stems from different groups of customers, particularly from individuals and SMEs more so than from larger organisations. Finally, traditional FIs benefit from the collaboration with startups. In doing so, as well as by adapting their business models and strategies, industry growth is further promoted (I. Lee & Shin, 2018).

Diemers et al. (2015) specify that the development of such an ecosystem requires several supporting factors. Besides regulatory support from governments, the business environment must present a general cost advantage relative to other location choices along with high quality infrastructure. Also, technology clusters contribute to the enhanced integration of activities, the emergence of synergies, and the availability of specialist knowledge. Capital must be easily accessible and should be provided not only by governments and banks, but also by VC funds and private equity (PE) shops as well as incubators and accelerators, respectively. Experts providing financial know-how are vital in their

assumption of a supporting role for entrepreneurs and startups; however, they may also influence the government in favour of individual actors or the ecosystem as a whole. The sufficient fulfilment of these conditions ultimately promotes growth and contributes to the formation of successful fintech hubs (Diemers et al., 2015).

Figure 4

Fintech Ecosystem



Source: I. Lee & Shin (2018)

4 THEORETICAL DELIMITATION

Based on the theoretical framework provided in the previous section, this section will determine a smaller selection of the introduced theories to subsequently guide the analysis of collected data. To allow for a thorough investigation of the research question as well as conclusive findings regarding the success factors of Singapore's fintech industry, the chosen theories will be used in conjunction to one another and in this way create a precise and purposeful delimited theoretical framework in accordance with the scope of this thesis.

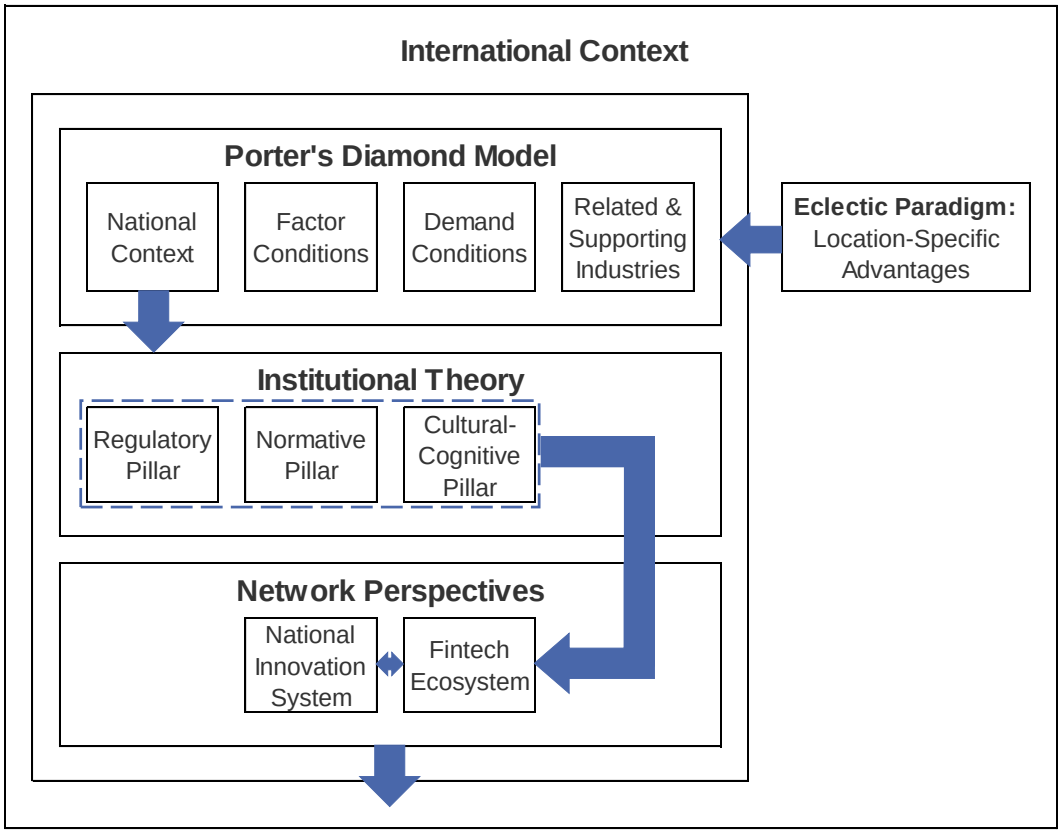
As formerly established, the two distinct dimensions of industrial competitiveness relate to the strategic decisions made by individual firms as well as to the general business environment in which they operate (ECSIP, 2013). Intending to provide an assessment of the latter rather than a micro analysis of individual firm-level advantages, however, this thesis will direct its focus towards theories on the level of the overall fintech industry. Therefore, neither the resource-based view nor any alternative between Porter's five forces and the value net model will be given further consideration. The same reasoning also applies to the general objective of the eclectic paradigm, seeing as it is not sought to study the underlying reasons of a particular company's mode of internationalisation. Yet, the fintech industry is global in scope and Singapore can increasingly expect to see the entrance of foreign businesses. The paradigm, which creates a connection between theories on the firm- and industry-level, will consequently find indirect application in relation to the city-state's location advantages and their ability to promote incoming internationalisation activities.

A delimited theoretical framework is constructed by combination of the diamond model, institutional theory, fintech ecosystems, and national innovation systems, all of which are furthermore embedded in the international context of Singapore's fintech industry (Figure 5). Whereas institutional theory serves to create more depth for the industry's assessment, the remaining three theories complement each other in their attempt to explain how different actors, companies, or institutions contribute to an industry's potential and capacity for innovation while simultaneously providing differing perspectives on the exact achievement of industrial competitiveness. To begin with, the diamond model creates a broad foundation for the explanation of Singapore's success in fintech through the consideration of a diverse set of contributing conditions that, if fulfilled, can be said to particularly encourage activities of inward internationalisation. Specifically, the fintech industry would achieve its full strength by satisfying factor and demand conditions, benefitting from already competitive related and/or supporting industries, and being situated in a national context conducive to the continuous upgrading of innovative technologies (Porter, 1990a). Although this consequently generates a holistic picture of location-specific advantages as referred to in Dunning's (1980) eclectic paradigm, a critical

shortcoming of the diamond model lies in its strict focus on competitive interfirm relationships as the main rational for innovation and upgrading. Porter's theory largely disregards aspects of cooperation and collaboration other than in the context of related and supporting industries; however, it is reasonable to assume that such behaviour is taking place not only among the participants of Singapore's fintech industry but also with players from industries outside national borders.

Figure 5

Delimited Theoretical Framework



Rather than being mutually exclusive, competition and collaboration within a business environment represent two ends of a spectrum with the respective ability to promote industrial success. As such, the utilisation of ecosystem theory as described by I. Lee and Shin (2018) merges the idea of firm competition with that of collaborative dynamics as equal drivers for innovation and growth. Whereas the diamond model is primarily concerned with the framing factors of an industry as well as its international competitiveness based on their contribution to a national advantage, the model of a fintech ecosystem zooms deeper into the industry itself by examining different players, their purpose, and relations to one another. Supplemental to this, the investigation of the national innovation system gives emphasis to the particular interactions of companies, academic, and public institutions (OECD, 1997). As the sharing of knowledge and its resulting influence on technological innovation is thereby

specifically underlined, both theories sufficiently extend the diamond model by forming a joint network perspective that directs attention to the collective efforts of a diverse group of relevant actors. All three theories are especially applicable for the investigation of industry clusters, and it should thus be reiterated that Singapore's fintech industry cannot be regarded in isolation. Besides facing international competition in terms of other hubs presenting a similarly attractive environment for fintech activity, the industry also benefits from the entrance of foreign firms as well as the outward expansion of its domestic companies. Therefore, the international connections of the fintech industry must find explicit consideration in the analysis of Singapore's success.

Political institutions and their impact on the fintech industry are initially represented in the role of the government as part of the diamond model, hence establishing a first formal background for both of the following network perspectives. Yet, a country's regulatory environment along with its overall institutional setting can also be argued to constitute part of its national context, such that institutional theory can be employed to further elucidate the actions and interactions that are occurring within. Although this naturally includes both the innovation system and ecosystem, institutional theory finds explicit application in conjunction with the latter. For one, the fintech ecosystem places unambiguous emphasis on the government in its regulating function while also declaring it to be a distinct element. Second, it clearly defines a set of industry-specific actors whose behaviour may find a generalisable explanation in the effect of normative and cultural-cognitive institutions. That is to say, the aspects of these institutions may affect the establishment of companies, the nature of business relationships, or the development of specific technologies.

Whilst the delimited theoretical framework considers Singapore's fintech industry as a network of interconnected actors, it has been decided to exclude actor-network theory due to the extent of its application. Despite being tailored to technological industries, the theory principally aims to assess an industry's overall development such that it can be difficult to identify distinct factors of success. Specifically, the theory demands the tracing of developmental steps based on the accounts of key figures or written material reflecting their interests (Carroll, 2014). Besides potentially distracting from the research question at hand, especially such primary data is difficult to obtain while its absence is likely to lead to improper results given the theory's focus on role perception and role allocation. For example, the analysis of fintech as an actor-network would focus on the different motives of industry participants for introducing supportive elements such as regulation or financial grants. Ultimately, industrial success would be determined by the consolidation of individual actions and the subsequent establishment of favourable network elements that exist and work in agreement with the network's majority.

5 DESCRIPTIVE SECTION

The following section will deal with the fintech industry in Singapore, consequently constituting the necessary background for the application of the delimited theoretical framework. First, information will be provided on the industry's political and economic environment, its development, and geographic advantages. Fintech will thereafter be positioned into the government's vision of a smart financial centre, in relation to which matters of organisational and regulatory support as well as infrastructure initiatives will be portrayed. Collaboration within the industry will be outlined in terms of networking platforms, partnership activities, and cross-border agreements. Finally, the availability of capital along with talent and research will find concluding consideration.

5.1 Background

This section will provide detailed background information on the fintech industry. The political environment will be outlined, after which the economic environment will be described in terms of general indicators, the financial industry, as well as digital competitiveness. Location-specific characteristics and fintech-related industry developments will also be presented.

5.1.1 Political Environment

Singapore is a sovereign republic and parliamentary democracy with a clear separation of state powers, in which an elected president acts as the head of state and appoints a prime minister as the head of government (Prime Minister's Office, 2020). Miller et al. (2020) report that the government has been under the leadership of Lee Hsien Loong, leader of the People's Action Party, since 2004. The long-ruling party has successfully designed the world's freest economy, and although this 'may' be an achievement built on the back of personal freedoms, the city-state exhibits top performances in regulatory efficiency, the rule of law, government size, and open markets. Equal treatment is given to both domestic and foreign businesses while being furthermore accompanied by the option of complete foreign ownership in almost all sectors as well as a corporate tax rate capped at 17% (Miller et al., 2020). Startup businesses benefit from a special tax exemption scheme in their first three years of operation, with international expansion being separately incentivised through a double tax deduction for related expenses (Startup Decisions, 2019).

Singapore's legal framework presents a favourable environment for business activity (Gnirck & Visser, 2016), which is rooted in a strong rule of law in light of a wide absence of corruption, robust regulatory enforcement, and general order and security (World Justice Project, 2020). More specifically, Singapore is distinguished by the effective enforcement of (intellectual and physical) property rights and anti-corruption laws, an independent judiciary, as well as great freedoms in terms

of business, labour, and monetary matters (Miller et al., 2020). The World Justice Project (2020) awarded Singapore with the 12th rank in its latest Rule of Law Index. Although issues remain especially regarding insufficient legislative limits on government powers or lacking governmental checks, sanctions for official misconduct are in place. Along with the adequate representation of labour rights, the city-state presents a broad absence of discrimination and strong freedom of religion. Yet, other fundamental rights such as free expression, free association, or the right to privacy fall short. Civic participation in governmental affairs remains relatively restricted, on top of open government scores for complaint mechanisms as well as the right to information displaying room for future improvement (World Justice Project, 2020).

The Freedom House (2021) assigns Singapore the status of being 'partly free' based on their assessment of political rights and civil liberties. The People's Action Party enjoys unfair advantages as a result of a flawed electoral framework, large disparities in financial resources, or the restriction of the media. Government officials maintain strong connections with business leaders, such that their heavy involvement with the private sector presents the potential for associated conflicts of interest. This is further amplified by the work of public investment funds; however, a strong legal framework strengthens activities within the private sector whilst related court cases are generally resolved without bias. Trade unions are given relative freedom, though the National Trade Union Congress (NTUC) exerts great influence and expands the government's outreach over labour organisations through their open alliance. Still, the local labour force is presented with great economic opportunity (Freedom House, 2021). The positive perceptions of politicians' ethical standards, moreover, have led to the world's highest level of trust among the public (World Economic Forum [WEF], 2018).

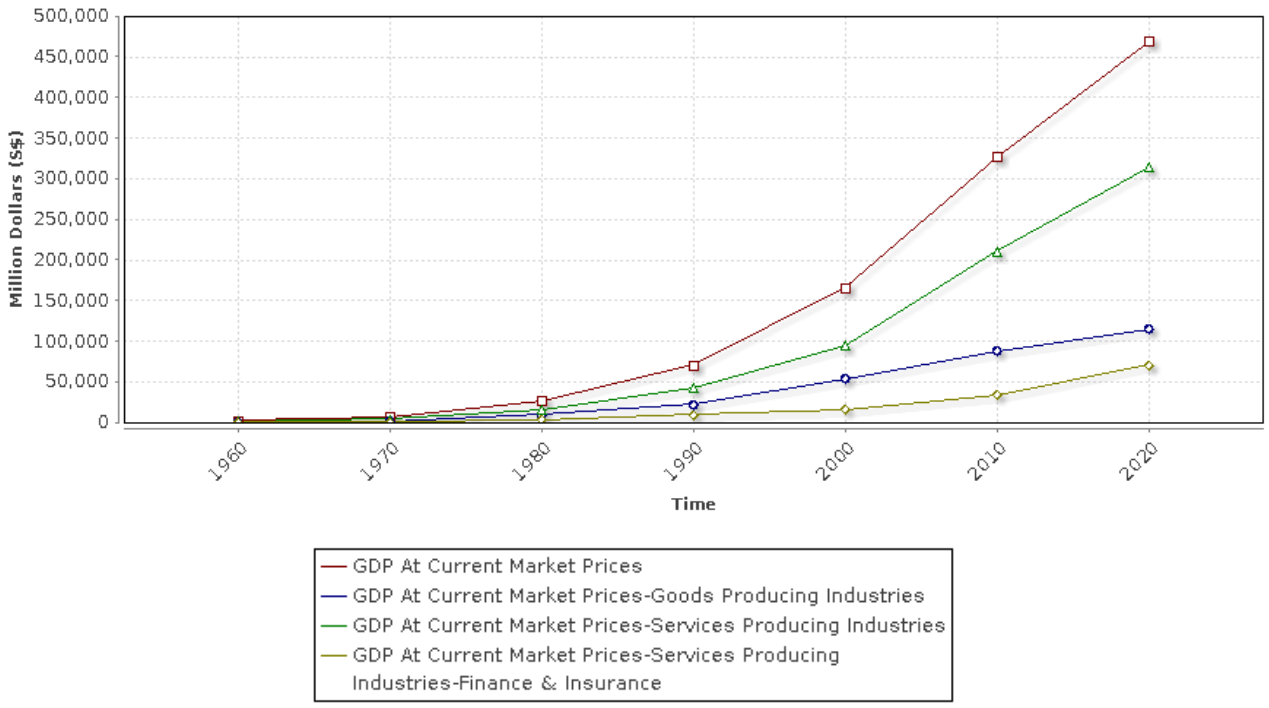
5.1.2 Economic Environment

Based on Zhou (2019), Singapore's economy has experienced rapid development in the past fifty years. On top of being generally disadvantaged due to having no natural resources, the city-state initially faced severe problems in relation to widespread unemployment, an underdeveloped infrastructure, and an insufficient water supply. Consequently, the government sought to counteract these issues through targeted industrialisation efforts that involved the strategic creation of an attractive business environment for global investments. Autocratic measures were introduced, which for example served to combat corruptive practices by threat of capital punishment or to restrict labour rights with help of the state-controlled NTUC. This resulted in stable business conditions, contributed to a rapidly growing manufacturing sector, and ultimately allowed for essential improvements in infrastructure. With the subsequent arrival of multinational companies (MNCs), Singapore was able to train its workforce in areas such as information technology and electronics and ultimately engaged with advanced industries already by the 1990s (Zhou, 2019).

In 2020, Singapore boasted S$469.1B in total GDP along with a per capita GDP of S$82,503 (Department of Statistics [DOS], 2021c). Based on the DOS (2021a; Figure 6), GDP has grown rapidly since 1980, with particularly significant increases in the past two decades. At 66.87%, this is mainly boosted by the service industry as compared to the 24.4% of value added by the goods-producing industries. Finance and insurance moreover represent 22.41% of the value generated by all service-producing industries as well as 14.99% of total GDP. Relative to 2019, however, GDP exhibited an overall decrease of -8.15% (DOS, 2021a). Singapore's Ministry of Trade and Industry [MTI] (2021) expects this trend to reverse in light of this year's 4-6% growth forecast. While COVID-19 has led to a general contraction of the service industry, the growth of the finance and insurance sector remains unaffected and is likely to see a continued expansion due to persistent enterprise demand for credit and payment processing services (MTI, 2021).

Figure 6

GDP at Current Prices, by Industry



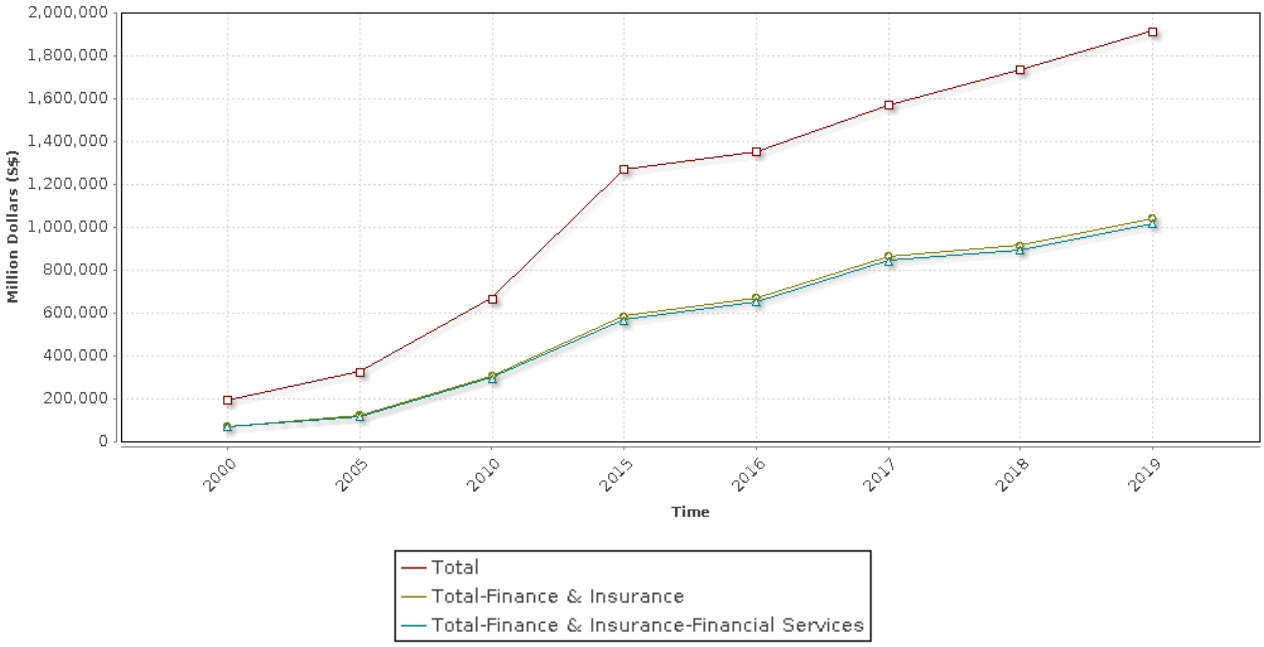
Source: DOS (2021a)

Figure 7 illustrates that Singapore's economy holds large amounts of foreign direct investment (FDI), which can be ascribed to an investment climate distinguished by a broad regulatory openness in financial services (OECD, 2021). It can be seen that between 2010 and 2019, the local stock of FDI nearly tripled as it reached a total value of S$1.9B. At S$1B, 54.43% of this amount is attributable to

investments in the finance and insurance sector – out of which financial services again contribute 97.76% (DOS, 2021b). While foreign investments are strongly promoted by Singapore's *Economic Development Board* (EDB), the government utilises the agency to maintain close relationships with such private investors (US Department of State, 2021). Nevertheless, the city-state is an attractive destination for investments considering its status as the most competitive economy worldwide – ranking first in infrastructure, health, and labour market, as well as second in institutions, product market, and financial system (WEF, 2019).

Figure 7

Stock of FDI, by Industry



Source: DOS (2021b)

Singapore finds its strength in a deep and stable financial system (WEF, 2019), as well as a strongly developed financial services sector. In a global comparison of financial centres, Morris et al. (2020) assessed the city-state to rank sixth overall after being narrowly preceded by Hong Kong or more considerably so by London and New York. As Singapore enjoys a significant reputational advantage beyond its quantitative assessment, however, prospects of becoming more relevant are highlighted for the near future. In terms of current competitiveness, the city-state is placed 6th for its business environment, 5th for human capital, 4th for both infrastructure and financial sector development, and 3rd for more general aspects such as innovation and cultural diversity (Morris et al., 2020). Although there are no restrictions on the foreign ownership of FIs, it should be noted that the government strictly ensures that the interests of their respective leaders are in line with its own national and

economic interests (US Department of State, 2021). With fintech now being the greatest strength of the financial sector (Morris et al., 2020), established institutions have been launching innovation centres and VC arms while also entering partnerships with accelerators, incubators, and individual businesses (Gnirck & Visser, 2016).

Regarding fintech, an economy's strength in technology is naturally relevant. The WEF and INSEAD (2016) measured national capabilities of becoming globally competitive by leveraging InfoComm technology in their index of networked readiness. Topping the index in 2016, Singapore is leading in the categories of business and innovation environment, skills, government usage, and social impact along with coming second in terms of its political and regulatory environment (WEF & INSEAD, 2016). Despite a lower rank in 2020, Singapore retains an overall third place due to factors such as the public promotion of emerging technology investments, regulatory quality, or the quality of education (Portulans Institute, 2020). The IMD World Competitiveness Center (2020) declares Singapore to be the second-most digitally competitive nation based on technology, knowledge, and future-readiness. The city-state excels in terms of its regulatory and technological framework and performs well regarding the support of businesses by banking and financial services or the funding of technological developments. Talent is of good quality and high-tech patents are most often granted; however, deficiencies remain in areas such as adaptive attitudes, investment in telecommunications, or public expenditure on education relative to GDP (IMD World Competitiveness Center, 2020).

5.1.3 Location and Industry Development

Singapore's economy is characterised by a large presence of SMEs, which constitute 99% of all enterprises whilst employing 72% of workers and contributing 44% of nominal value added to GDP (DOS, 2021c). Yet, the same SMEs face a collective financing gap of US$23.8M with 17% reporting access to finance as a major obstacle; many enterprises consider themselves to be either underserved (8%) or unserved (41%; SME Finance Forum, 2021). As noted by Deloitte's (2015) Mohit Mehrotra, similar numbers can be observed for other member states of the Association of Southeast Asian Nations (ASEAN), namely Indonesia, Malaysia, Thailand, and the Philippines, which is why he considers this to present a strategic opportunity for the application of fintech solutions.

Apart from its unclaimed market potential, Singapore offers an advantageous geographic location for the international expansion of fintechs within the surrounding region (see Appendix C). In fact, companies are commonly utilising the city-state's market for the experimental implementation of their technologies before subsequently moving into its bigger neighbouring countries (Institute of Singapore Chartered Accountants [ISCA] & Institute of Chartered Accountants in England and Wales

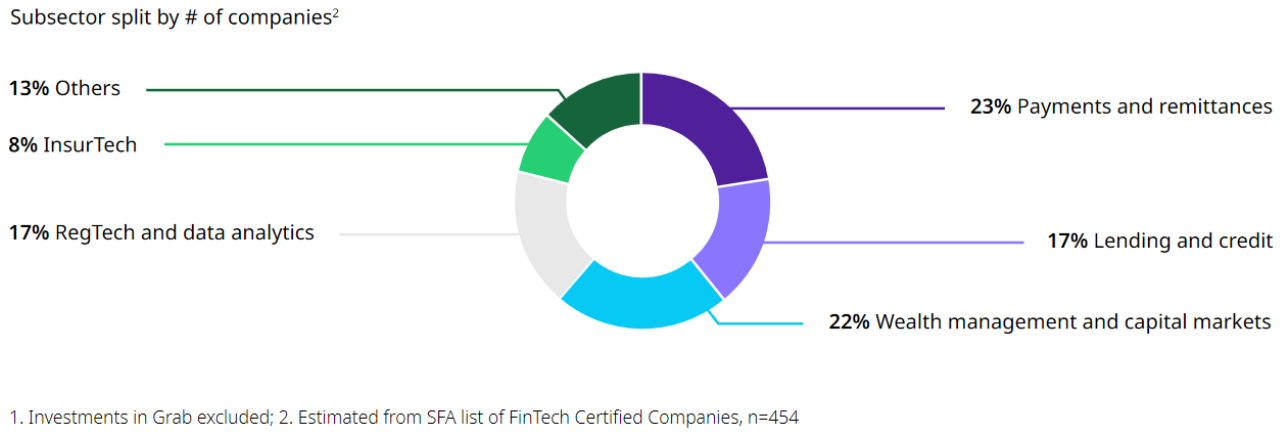
[ICAEW], 2018). According to ASEAN (2020), the region has been exhibiting a joint annual population growth of 1.1% for the last four years of assessment, resulting in a total population of 655.9M in 2019. The demographic is rather young: 50.8% are 20 to 54 years of age and an additional 24.9% are aged five to 19. Simultaneously, the density of mobile phones and the prevalence of internet services have been rapidly growing with numbers recently reaching a respective 139.1% (2010: 87.5%) and 57% (2010: 18.7%; ASEAN, 2020). Yet, the majority of individuals in Southeast Asia (SEA) remains underbanked as a mere 47% of adults have access to a bank account (CB Insights, 2019).

Singapore's fintech industry is experiencing quick expansion regarding the number of businesses and employed professionals, the diversity in activities, and the trends in business models. Whereas the city-state was home to only 50 fintechs in 2015 (Menon, 2020), Chessher (2020) states that approximately 750 entities – more than 40% of all fintechs in SEA – were estimated to be locally based as of July 2020. One month later, Menon (2020) referred to more than 1,000 companies. This is supported by Oliver Wyman and the Singapore FinTech Association [SFA] (2020), who in their December report similarly calculate over 1,000 companies to be hosted in Singapore and further specify these to collectively employ over 10,000 workers. More than a tenfold increase for both since 2015, the authors appoint this development in part to the impact of COVID-19 on the rate of digital adoption. With two thirds of fintechs reporting a heightened demand for their services, performance improvements were observed especially for businesses engaging in payments, wealth management, and insurance (Oliver Wyman & SFA, 2020).

Among the companies of Singapore's fintech landscape, Chessher (2020) describes most to concentrate on vertical service offerings for reasons of the financial sector's general strength in investments and banking. Formerly focussed on payment and lending activities to address SEA's lack of financial inclusion, fintechs have been progressively moving away from these now maturing sub-sectors (Oliver Wyman & SFA, 2020). As depicted in Figure 8, the current main sets of activities include payments and remittances (23%), wealth management and capital markets (22%), lending and credit (17%), regtech and data analytics (17%), and insurtech (8%; Oliver Wyman & SFA, 2020). With regard to the age of participating firms, the industry remains relatively young particularly when considering the previously mentioned growth in new businesses. In 2019, however, almost a quarter of companies had been established for over five years, 42% had been founded three to five years ago, and 23.5% had been operating for only one or two years (PwC & SFA, 2019). Singapore presents a conducive environment for startup activity: achieving second place in the latest Doing Business Index, the city-state ranks first in contract enforcement, third in the protection of minority investors, and fourth in starting a business (World Bank, 2021).

Figure 8

Diversity of Fintech Activities



1. Investments in Grab excluded; 2. Estimated from SFA list of FinTech Certified Companies, n=454

Source: Oliver Wyman and SFA (2020)

Fintechs pursuing a business-to-customer (B2C) model consider Singapore in its gateway function to SEA a relevant testing ground for novel products; but, scaling is capital-intensive and competition has increased due to the region's high market potential (Oliver Wyman & SFA, 2020). Therefore, changes inside the industry have been accompanied by matching changes in business models. While businesses mainly operated within the B2C space in 2015 (Oliver Wyman & SFA, 2020), PwC and the SFA (2019) report that 40.7% have more recently been focussing on business-to-business (B2B) activities. With an additional 32.1% pursuing both models simultaneously, only a remainder of 8.6% employs a B2C model as the rest concentrates on B2B2C (PwC & SFA, 2019). This is notably encouraged by three contributing factors: the substantial base of 220,000 SMEs, the large presence of FIs, and the city-state harbouring the better part of Asia's MNCs at roughly 7,000 entities (Oliver Wyman & SFA, 2020). The majority of fintechs, furthermore, exhibit a strong focus either on regional, continental, or global expansion. Whereas nearly a third have established a presence outside of Asia, a joint 54% operate in Asia and SEA whilst another 92% of all companies are planning to further expand their business within the next two years (Oliver Wyman & SFA, 2020).

5.2 Government Involvement

This section will give an overview of the government's involvement with the fintech industry. In relation to organisational support, the vision of a smart financial centre will be introduced and subsequently provide the necessary context for public sector activity. The government's approach to regulation will be described along with guiding principles and concrete initiatives. At last, varied efforts for the development of infrastructure will be presented.

5.2.1 Vision and Organisational Support

Since 2015, Singapore's vision for fintech has been "to harness the power of technology and innovation to increase efficiency, manage risks better, create new opportunities, and improve people's lives" (Kung, 2019, para. 3). Ravi Menon (2018), managing director of the Monetary Authority of Singapore (MAS), further emphasises that the application of fintech aims to foster innovation within the economy, inclusion within society, and the inspiration of individuals. Since it is recognised that the exploitation of technology strengthens economic and national competitiveness, the MAS assumes a proactive stance towards technological disruption as exemplified by the transformation of Singapore into a *smart financial centre* (Menon, 2016).

Singapore's vision of a smart financial centre is part of its overarching strategy for a *smart nation*, which sees the government as an enabler of public and private sector innovation through the provision of conducive policies as well as the enhancement of research and co-creation (Smart Nation, 2020). Launched in 2014, the smart nation initiative therefore represents a striving for global excellence embodied in a national effort for the extensive and systematic use of technology to bring about economic and societal improvements (H. L. Lee, 2014). Mohanty (2017, p. 19) explains that the "MAS has been working closely with the financial industry, FinTech companies, institutes of higher learning, and other stakeholders towards the vision of a Smart Financial Centre." Aside from strengthening the business environment and regulation, the financial authority has been aiming to attract increased investments as well as to improve technical skills and competencies to purposefully optimise a setting in which fintechs and FIs can develop digital services, compete, and collaborate with each other (Mohanty, 2017). Menon (2017; Figure 9) summarises the strategies for the fintech-enabled transformation of Singapore as follows: the creation of a competitive and collaborative ecosystem, the implementation of an open API architecture for enhanced connectivity, the formation of international linkages to boost knowledge exchange, the development of strong talent and research capabilities, the construction of conducive regulation, and the establishment of a safe cyber environment.

Figure 9

Strategies for a Smart Financial Centre

Source: Menon (2017), own illustration

The MAS' support for fintech is reflected in the 2015 formation of the *FinTech & Innovation Group* (FTIG), a dedicated part of its organisation structure in charge of policies and strategies that assist technology, innovation, and consequently reinforce financial sector competitiveness (MAS, 2015). Interviewed by N. Lim (2019), the FTIG's chief financial officer Sopnendu Mohanty outlines three key areas of focus: the adoption of technology by FIs, successful partnerships between fintechs and FIs, and the existing talent pool's re-training, re-skilling, and re-purposing. With regard to current barriers hindering the technological transformation of FIs, Mohanty stresses that causes are found in legacy systems, an insufficient use of cloud technology, and the unavailability of public infrastructure (N. Lim, 2019). Hence, this is mirrored in the structure and duties of the FTIG's individual divisions. The MAS (2020f) outlines the responsibilities of the *Payments Development and Data Connectivity Office* as the development of the payments ecosystem and cross-border financial service connectivity, while the *FinTech Infrastructure Office* complementarily focuses on financial infrastructures such as cloud computing or big data. The *FinTech Ecosystem Office* works on the implementation of 'cutting-edge' technologies and the *AI Development Office* specifically helps the formation of an AI ecosystem in the financial industry (MAS, 2020f).

The MAS has also been committed to the establishment of additional support structures. Since 2016, the *International Technology Advisory Panel* (ITAP) has been tracing technological developments to advise on the local usage of promising technologies (MAS, 2016c). Bringing together a diverse set of industry experts and creating value through their combined perspectives, the MAS (2016c, para. 2) specifies that the panel "comprises chief innovation and science officers in major financial institutions, Fintech business leaders, venture capitalists [VCs], and thought leaders in technology and innovation." A virtual *FinTech Office*, which in addition to offering direct advice on government-related fintech matters is explicitly tasked with Singapore's marketing as a global fintech hub, was set up in the same year (MAS, 2016d). At the time of establishment, the office included members from the MAS, the EDB, and the National Research Foundation amongst others (MAS, 2016d).

Gnirck and Visser (2016) declare the MAS to be a positive force for the fintech industry, similar to the work of other agencies in favour of the local business environment. *Enterprise Singapore* (2020), for example, offers tailored support for enterprise growth in matters of upgrading and innovative capabilities, technology adoption, talent creation, and internationalisation strategies. The MTI's *EDB* (2020), in their overall goal of economic growth, similarly concentrates on innovation and talent development while also encouraging investments, promoting partnerships, and raising awareness for various incentive schemes. The *Infocomm Media Development Authority* [IMDA] (2019a) finally seeks to create a competitive InfoComm ecosystem by promoting innovation and collaboration, thereby enabling growth through research and adequate regulation.

5.2.2 Regulatory Support

To build a smart financial centre, the MAS delivers regulation that not only benefits technological innovation but simultaneously encourages the development of a safe and secure fintech environment (Menon, 2016). Already in 2018, the Global Fintech Hub Report praised Singapore as the leader in fintech regulation and policy support (Zhejiang University Academy of Internet Finance [AIF] et al., 2018). As further improvements have since then been made particularly in terms of regulatory capability, Singapore maintains its rank in 2020 as a result of the world's "most supportive and effective FinTech regulatory policies" (Zhejiang University AIF et al., 2020, p. 92). The MAS' efforts are also acknowledged by locally residing fintech companies. While 86% believe that the regulatory framework outperforms those of other countries in SEA, 54% attest to significant improvements in regulatory attitudes given the financial authority's willingness to listen to encountered problems as well as to help with their resolution for the overall benefit of customers (Oliver Wyman & SFA, 2020).

Last August, Menon (2020) described the MAS's regulatory approach as the combination of simplified rules, eased licensing criteria, technological guidance, activity-based regulation, and experimentation. In addition, Menon (2016) previously defined three guiding principles to regulatory activity: regulation not hindering innovation, a regulation's relativeness to risks, and the balancing of risks. Innovation ought to guide regulation in the sense that the need for a specific regulation is determined by continuous risk assessments such as to not inhibit technological adoption. If technologies do present material risks, a 'materiality and proportionality test' ensures that the regulatory response is comparative in its weight. Along with the reduction of risks, however, the mitigation of existing risks is not to be disincentivised (Menon, 2016). The MAS' attitude towards regulation, therefore, presents a progressive regulatory environment that is able to encourage the implementation of innovative technologies and business models within the fintech industry (Oliver Wyman & SFA, 2020).

Following the principles outlined above, a set of concrete initiatives addresses distinct fintech matters under the central goal of fostering innovation. Mohanty (2017), for example, reveals that Singapore strives to become an e-payments society – a society in which electronic payments are the norm. Thus, payments licensing has been made more efficient through a comprehensive, activity-based framework that effectively reduces the number of required licenses, modulates regulation with the type of activity carried out, and upholds principles of consumer protection (Mohanty, 2017). The 2019 *Payment Services Act* particularly "provides for regulatory certainty and consumer safeguards, while encouraging innovation and growth of payment services and FinTech" (MAS, 2020m, para. 1). Besides this, guidelines for cloud computing have been adjusted to promote the technology's employment by FIs while other regulations have been updated to expand the availability of digital services for financial advice (Menon, 2016). The MAS also advanced its objective of a secure fintech environment: Asia Pacific's first cybercrime analysis centre was established in 2017 and assisted 49 FIs from nine different countries already in its starting phase (Financial Services Information Sharing and Analysis Center, 2017).

Another regulatory initiative for increased innovation concerns the introduction of a regulatory sandbox (see Appendix D). In general, such a model "aims to help bring new products to market more quickly and cheaply, and help innovators raise funds, while ensuring appropriate protections are in place for customers" (ISCA & ICAEW, 2018, p. 15). The MAS (2016a) declares that the sandbox encourages innovation by enabling FIs and fintechs to experiment with newly developed services in their eventual production environment. The space and duration of testing phases are sharply outlined such that experiments do not threaten the financial system's safety in case of failure. The sandbox's advantage lies in the easing of regulatory requirements; however, companies must

either employ emerging technology or innovatively utilise existing technology as well as offer a service that either solves a specific problem or is otherwise advantageous for customers/the industry (MAS, 2016a). As an alternative to the regular sandbox, an express model with an application process shorter than 21 days is offered for low-risk activities related to insurance brokers and organised markets (MAS, 2020o). While the MAS received over 40 applications resulting in five candidates in 2017 (MAS, 2018a), each sandbox currently contains only one active experiment after a total of three have been concluded since October 2020 (MAS, 2021d, 2021e).

5.2.3 Infrastructure

Menon (2016) states that improvements in infrastructure target the creation of an innovation ecosystem distinguished by collaboration and knowledge exchange as well as the accelerated scaling and adoption of innovative technologies. In this context, Menon (2016, Infrastructure section, para. 2) further mentions that "w [*sic*; the MAS] want a hundred flowers of innovation to bloom but also want to ensure they make a garden." Other than creating the FTIG and the FinTech Office, the MAS has consequently made large capital investments to achieve this vision. The *Financial Sector Technology and Innovation* (FSTI) scheme was first introduced in 2015 before being renewed as the *FTIG 2.0* in 2020 (MAS, 2020d). Having supported more than 200 fintechs and FIs with a total of S$225M over the course of five years, another S$250M are now explicitly allocated to build talent, fund artificial intelligence projects, and boost technological experiments throughout the next three years (MAS, 2020d). For details of the FSTI 2.0 scheme, see Appendix E.

Menon (2016, Infrastructure section, para. 5) acknowledges that "creating the infrastructure for an innovation ecosystem is a shared responsibility and joint effort", thus outlining a wide-ranging set of initiatives for its development: encouraging partnerships through common physical spaces, facilitating electronic payments, introducing a 'know-your-customer' utility, enabling international bank payments with blockchain, and creating an open API architecture for automatic information exchanges in integrated data sets. Commonly referred to as open banking, API infrastructures are particularly beneficial for fintech firms as they allow them "to access customer data, leverage sector knowledge or infrastructure, and design new customized/ personalized products at much lower cost" (EY, 2018, p. 33). ISCA and ICAEW (2018) explain that by encouraging instead of mandating the adoption of such technology, Singapore has been able to achieve the leading position within Asia due to what is described as the strategy's appropriateness to the local market. On another note, the MAS' commitment to its infrastructure initiatives is illustrated by repeated efforts regarding the know-your-customer utility. After having been proposed for facilitated customer data verification in 2017, the project was quickly terminated only one year later before eventually being revived with help of the Bank for International Settlements in 2019 (J. Lee, 2019).

To boost collaboration, the MAS launched the innovation lab *Looking Glass* to unite startups, FIs, technology specialists, and its own representatives as well as to provide expert consultations on industry matters for startups (Menon, 2016). At the same time, the funding provisions of the FSTI scheme have successfully promoted a 'culture of innovation' as embodied in the establishment of now more than 40 innovation labs by FIs (MAS, 2020d). This number includes incubators and accelerators such as the United Overseas Bank and SGInnovate's *FinLab*, the *Deloitte Greenhouse*, or blockchain-focussed *LongHash* (MAS, 2020g; see Appendix F). Most notably, FinLab unites over 500 industry players (e.g., startups, VCs) in a dedicated co-working space called *JTC Launchpad* – Singapore's 'Silicon Valley' (SFA, 2018d). Another prominent example, the *FinTech Consortium* (2021), offers fintech advisory, corporate incubation, and venture acceleration through the provision of a networking platform, research database, and talent centre.

The MAS (2020j) recently announced the award of four digital banking licenses with the expectation that approved applicants will begin operating in early 2022. PwC (2019b, p. 3) notes that "digital banks are catalysing change across the global banking sector with their keen focus on hyper-personalisation, adoption of new technologies and the willingness to embrace new business models." Singapore separately reserved licenses for banks providing services to large retail customers as well as banks servicing SMEs and non-retail customers, presumably boosting their digital capabilities and giving rise to new business models that strengthen competition (PwC, 2019b). KPMG (2020) considers the attention given to companies that create novel ways of banking to be a critical differentiator for local digital banking, which is expected to raise investments and address unserved customer needs. Menon (as referenced in Palma, 2019) neglects the effect of digital banking on innovation and competition due to such services already being widely available within the financial sector; however, recognising the potential of digital banks and wanting to secure Singapore's status as a global financial centre by having relevant players present in the market. Interestingly, more than 80% of fintechs believe that the introduction of digital banking will lead to enhanced prospects for future collaborations (Oliver Wyman & SFA, 2020).

With further regard to digital service infrastructure benefitting SMEs, the MAS' (2020a) partnership with the IMDA led to the creation of *Business sans Borders* (BSB). BSB is an online marketplace and global meta-hub of buyers, suppliers, and fintech services providers aimed towards the improved trade opportunities of participating countries. As fintechs are thereby presented with the possibility of accessing large amounts of data, they are encouraged to develop innovative technologies that can readily be tested within the initiative's own sandbox environment. Therefore, BSB contributes to the promotion of the financial sector as well as the individual development of SMEs (MAS, 2020a).

5.3 Collaboration

This section will deal with collaboration within the fintech industry and present its local, regional, and global linkages. After outlining a collection of diverse network initiatives, an overview of partnership activities across the public and private sectors will be given. In addition, information on cross-border cooperation agreements will be provided.

5.3.1 Networking Platforms

Networking initiatives are pursued by different government and industry bodies to build connections between local, regional, and global fintech players. *LATTICE80*, Singapore's first innovation village, opened in late 2016 (Menon, 2016). After attracting nearly 100 startups and multiple government delegations from over 30 countries within its first year of operation, the collaboration, learning, and co-creation space was later rebranded as the *80RR* fintech hub – though retaining its mission of creating an ecosystem for startups, established institutions, governments, and the public to globally connect (LATTICE80, 2017). As a shared project of the MAS, the SFA, and property development firm Hong Leong Holdings Ltd, 80RR provides an affordable co-working space in Singapore's Central Business District while offering additional access to workspaces in Indonesia, Malaysia, Thailand, and the Philippines as part of a partnership with Union Space (80RR, 2020b). Networking sessions are regularly organised, and members can link up with experts or other fintech companies on pre-specified topics such as the legalities of Asian markets or trademark and patent law (80RR, 2020a).

A similar ecosystem approach is also represented by *BLOCK71*, a joint networking platform of the National University of Singapore's (NUS) entrepreneurial arm NUS Enterprise and corporate VC fund SingTel Innov8 in further collaboration with multiple corporate and public partners such as the IMDA, Enterprise Singapore, Microsoft, Google, or Maybank Kim Eng (BLOCK71, 2019). BLOCK71 seeks to catalyse the startup community; individual member experiences, academic research capabilities, and the expertise of partnering companies are combined while opportunities for global networking, mentoring, or access to talent and funding are provided (NUS Enterprise, n.d.).

Intending to promote best practices and solve issues within the industry, the SFA (2018a, para. 1) functions as a networking platform for the "facilitate[d] collaboration between all market participants and stakeholders in the FinTech ecosystem." Besides driving innovation, the non-profit organisation takes a representative role for the interests of its members and equally supports the growth of local fintechs and foreign entrants. More than 860 companies are encouraged to leverage the SFA's

global connections, with partnering associations and government agencies residing in 26 countries in Asia, 15 countries in Europe, two in both Africa and Oceania, and one in the Americas. Additionally, the SFA offers a fintech certification, a legal directory, portals for jobs, grants, and businesses, as well as information about accelerators and a collection of general fintech resources (SFA, 2018a).

Organised by the MAS, the Association of Banks in Singapore, and SingEx, the *Singapore FinTech Festival* [SFF] (2020d) acts as a global networking platform which annually joins a diverse community of fintech service providers, technopreneurs, and industry leaders along with investors, policy makers, and academics. Last December, the world's largest fintech event was held in conjunction with the *Singapore Week of Innovation and Technology* (SWITCH) – the leading festival for Asia's global innovation ecosystem. As a result, SFF x SWITCH saw 60,000 visitors from more than 160 countries within its duration of five days. While this included 1,300 exhibitioners and 2,000 speakers, it moreover led to a total of 4,400 business meetings (SFF, 2020d).

The *Global FinTech Innovation Challenge* hosted by the MAS as part of the SFF comprises the *Global FinTech Hackcelerator* and the *FinTech Awards*, the latter of which regularly presents the top three performing companies in the categories 'Singapore Founder', 'ASEAN Fintech', 'Singapore Financial Institution', and 'Global' with cash prizes ranging from S$50,000 to S$150,000 (SFF, 2020c). The Hackcelerator, in turn, addresses current needs such as COVID-19 or green finance and incentivises companies to partake with finalist benefits of S$20,000, professional mentorship, a fast-track to the FSTI's proof-of-concept (PoC) grant, the free utilisation of the APIX innovation sandbox, as well as the access to an investor and client network (SFF, 2020b).

The MAS established the *ASEAN Financial Innovation Network* (AFIN) in collaboration with the International Finance Corporation and the ASEAN Bankers Association, thereby delivering an integrated platform for facilitated partnership activities among fintechs, banks, microfinance institutions, and non-banking FIs (International Finance Corporation, 2017). The initiative works closely with the industry and regional regulators to bring about converging API standards for improved technological compatibility, and participants are subsequently encouraged to exchange information and enter foreign markets in support of financial inclusion (EY, 2018). With further regard to this, the *APIX* API Exchange offers a digital platform for the discovery, collaborative design, and eventual deployment of innovative technologies in a global marketplace and sandbox environment, of which the latter's cloud-based character allows for the immediate application of fintech solutions (APIX, 2018). The platform connects a total of 457 fintechs and 85 FIs as of this year (APIX, 2021).

The MAS is also a founding member of the *Global Financial Innovation Network* (GFIN), which aids the facilitated interaction of regulators and companies looking to internationally scale their business models (MAS, 2020h). Whilst regulatory services vary by country and may, for example, consist of legal guidance, authorisation support, engagement with technology firms that facilitate regulatory processes, or assistance for local partnership formation, they moreover extend to the sectors of trading infrastructures, securities, insurance, consumer credit, investment advice, banking, payments, investment funds, and/or crowdfunding (GFIN, n.d.; see Appendix G). Considering that the network currently connects 55 regulating bodies as well as seven observing entities from 35 countries worldwide (GFIN, 2021b; see Appendix H), it "has also created a new means of co-operation between financial services regulators to work on innovation-related topics, sharing different experiences and approaches" (GFIN, 2021a, para. 2).

5.3.2 Partnerships Activities

Partnerships take place among all players of Singapore's fintech ecosystem, also for the benefit of regulating bodies. In the context of *Project Ubin*, for instance, the MAS collaborated with the fintech industry in a multi-year effort regarding Blockchain and Distributed Ledger Technology (DLT; MAS, 2020n). Aiming to produce a prototype for blockchain-enabled interbank payments, the MAS (2020n) entered into initial partnerships with DLT firm R3, an additional technology provider, as well as a consortium of nine FIs in 2016. The assortment of partners remained flexible thereafter, as the composition and size of the consortium changed already with the project's second phase and a growing number of technology partners (e.g., Microsoft, Accenture) were onboarded according to current needs. While the publication of technological documents served to assist with the external experiments of FIs, research institutes, and academia, the private sector was particularly engaged through workshops and discussions on the payment network's business value. The final prototype built with help of J.P. Morgan and Temasek, the Government of Singapore's investment company, seeks to promote future work between the MAS in its role as a central bank, other central banks, and the industry to push the development of an enhanced international payments infrastructure (MAS, 2020n).

Beyond targeting specific technologies, the public sector also engages in strategic partnerships for more general digitalisation efforts. The MAS (2017c), for example, joined the United Nations Capital Development Fund to advance fintech solutions and thereby boost financial inclusion within the ASEAN region. The partners strive to digitise the services of banks, financial cooperatives, and microfinance institutions for the population's accelerated access to finance. At the same time, the provision of co-funding grants for innovative business models serves to address concrete social objectives as reflected in a first goal of supporting women particularly in Cambodia, Laos, Myanmar,

and Vietnam (MAS, 2017c). The MAS' partnership with the United Nations Development Programme (UNDP) Global Centre for Technology, Innovation and Sustainable Development, furthermore, provides fintechs with facilitated access to developing markets worldwide by specifically utilising the online-based platforms APIX and BSB (UNDP, 2020). Most recently, the MAS (2020k) has been working with the Bank of Ghana on the adoption of the latter.

Partnerships within the industry are encouraged through Singapore's *Global Innovation Alliance* (GIA). Launched in 2017, the alliance helps to create global linkages amongst business and entrepreneurs as well as students and other related individuals (MTI, 2018). More specifically, the EDB is partnering with Enterprise Singapore, local and global universities, incubators, accelerators, and providers of co-working spaces to expose students to innovation activities, connect businesses with international opportunities in terms of partners, talent, capital, and customers, and finally link international technology providers with local firms and government agencies (MTI, 2018). The GIA's network supports the internationalisation of local firms as well as of companies looking to enter Asia via the Singaporean market, while extending into the countries of Germany, France, China, Japan, India, Indonesia, Thailand, Vietnam, the Philippines, the United Kingdom, and the United States (Enterprise Singapore, 2021). With this year's inclusion of Singapore's *Co-Innovation Programme*, incentives for the formation of global partnerships will moreover be provided by covering up to 70% of project qualifying costs (Heng, 2021).

Oliver Wyman and SFA (2020) state that established institutions have been gradually seeking to enter more partnerships with startups and point towards the following example: payment technology company Mastercard is releasing biometric cards jointly developed with augmented identity specialist IDEMA and issued by fintech firm MatchMove (Patel, 2020). Conversely, "91% of FinTechs have partnerships with other companies or are considering doing so in the next 12-24 months with an average of 3-5 partnerships" (Oliver Wyman & SFA, 2020, p. 22). Last June, the SFA (2020) introduced the *FinTech Service Provider Compliance Readiness Framework*, a digital self-assessment tool available to fintechs for an accelerated partnership formation with FIs. The SFA's president Chia Hock Lai (as quoted in SFA, 2020) mentions that 80% of fintechs provide technology for the improved services of FIs, which is why the framework supports the formation of sustainable relationships by helping fintechs meet necessary compliance levels in order to boost the confidence of their institutional partners (SFA, 2020).

5.3.3 Cross-Border Agreements

The international character of the fintech industry in Singapore is augmented by the financial authority's emphasis on accumulating cross-border alliances; all 35 currently maintained cooperation agreements can be found in Appendix I. The MAS (2021c) is fostering the development of innovative services in mutual efforts with a global set of central banks, financial authorities, and other governmental agencies from 29 countries as well as one research institute located in China. While the MAS has entered into a single agreement with the majority of these countries, it notably signed a respective two agreements with France, Canada, and the United States, as well as three with both India and China. All agreements concern concrete arrangements regarding any or all of the themes 'information-sharing', 'referral', and 'joint projects' (MAS, 2021c).

Mohanty (2017) specifies that these cooperation agreements depict individual frameworks for the exchange of technology trends and regulatory concerns as well as for the execution of joint projects, thereby strengthening the understanding of stakeholders from corresponding markets. Concurrently, they serve as a channel for referrals that helps local fintechs to venture abroad and foreign fintechs to establish themselves in Singapore (Menon, 2017). Whereas the first agreement was signed with the United Kingdom's Financial Conduct Authority in May 2016, the two most recent alliances with Hungary's Magyar Nemzeti Bank and the People's Bank of China were both formed in December 2020 (MAS, 2021c).

5.4 Capital Availability

This section will be concerned with the availability of capital within the fintech industry. First, the developments of startup funding will be described with special regard to investment sources and deal numbers. Then, diverse schemes of financial support will be presented.

5.4.1 Funding

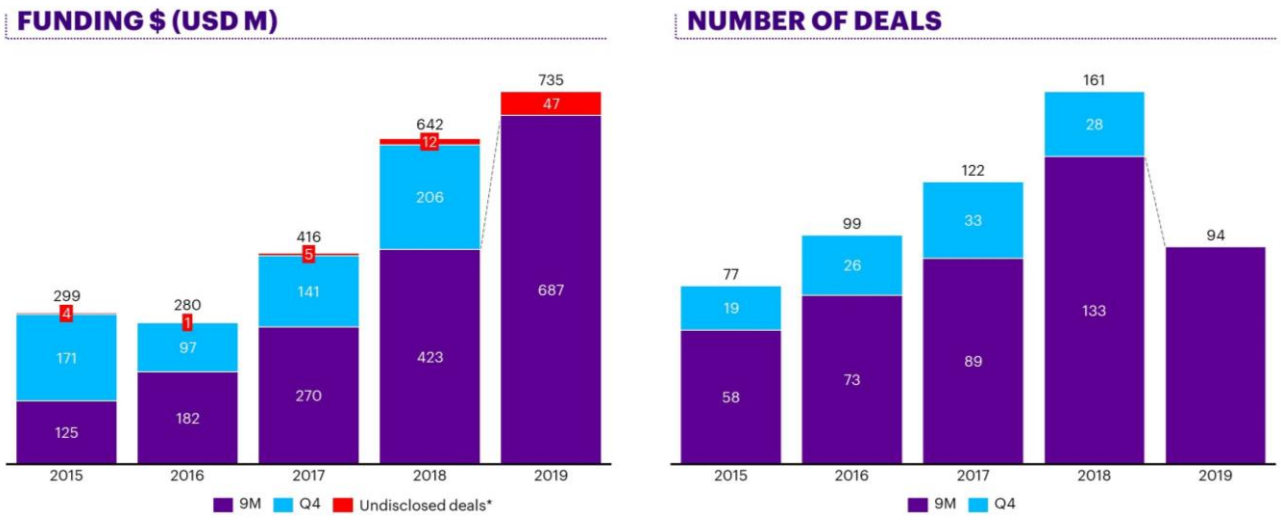
Fintechs in Singapore have access to a large variety of funding sources considering the interest of local and international angel investors and VC funds, the presence of corporate venture arms, or the activity of government-affiliated investors such as SingTel, EDB Investments, or Temasek (Mohanty, 2017). The latter of these notably distributed S$90M across four VC funds in 2015 (Chng, 2015) and was more recently expecting to dedicate further investments directly into fintech firms (Sipahimalani, as referenced in Seow, 2019). Mohanty (2017) states that the MAS acknowledges the value that is brought to startups and the industry by VC funds. Therefore, to facilitate their local activities and with further regard to "the lower risks they pose, given their business model and sophisticated investor base" (Mohanty, 2017, p. 21), a new regulatory framework for accelerated authorisation processes and a resultantly improved availability of fintech funding was introduced in October 2017 (MAS,

2017d). Investors, however, commonly encountered difficulties in obtaining necessary information for their potential investments, which is why the development of a *FinTech Research Platform* subsequently served to boost their confidence as well as to facilitate the discovery of promising ventures (MAS, 2019b). In the same year of 2019, fintech represented the largest investment category of VC in SEA mostly due to a strong growth in foreign investors (Browne, 2020).

Between 2015 and 2019, Singaporean startups attracted the majority of all fintech funding in SEA at 65% – exceeding the next biggest market of Indonesia by almost four times and US$1.8B (Oliver Wyman & SFA, 2020). For their analysis of local fundraising developments, Accenture (2019, para. 8) combined the "financing activity from venture-capital and private-equity firms, corporations and corporate venture-capital divisions, hedge funds, accelerators, and government-backed funds." Figure 10 reveals that investments from 77 deals amounted to US$299M in 2015. Despite the subsequent 28.57% increase in deal numbers, funding initially declined by US$19M before rising again by about one third as US$416M were split across 122 deals in 2017. The number of deals climbed alongside the amount of provided funds in the year after, totalling US$642M and 161 deals. At US$687M in the first three quarters of 2019, funding exhibited a considerable growth of 62.41% even with deal numbers falling by -29.32% relative to the same period in the previous year (Accenture, 2019). By the end of 2019, fintech fundraising activity achieved a record high of US$861M (Accenture, 2020). While COVID-19 led to a decline in investments in the first three months of 2020, this was overcome already in the following quarter as funding increased more than fourfold to US$278M (Oliver Wyman & SFA, 2020).

Figure 10

Fintech Funding and Number of Deals, 2015-2019



Source: Accenture (2019)

Oliver Wyman and the SFA (2020) specify that fintechs obtain capital largely from the private sector's angel investors, VCs, and PE funds. In 2019, most investments were dedicated to Angel and Seed funding rounds at 51% with another 19% each for Series A and Series B funding (Oliver Wyman & SFA, 2020). Early-stage funding, however, dropped by more than half in light of a 66% year-on-year surge of growth-focused series funding in the first three quarters of the same year (Accenture, 2019). In other words, investors were directing their focus towards the long term by making capital accessible for businesses looking to expand their operations. In general, private investments have been strongly encouraged by Singapore's financial authority. As part of the 2018 SFF, the MAS (2018b) created the *MATCH* platform to connect fintechs with global VC and PE opportunities – raising more than US$12B from 380 investors. Following the same concept, the MAS is now hosting *Deal Fridays* in connection with this year's festival to promote targeted investment deal-making based on list of pre-defined themes (e.g., 'Singapore', 'ASEAN', 'Solutions for FIs'; SFF, 2020a).

5.4.2 Financial Grants

Singapore's government drives fintech funding not only through its own investment company but also through the introduction of diverse programmes in support of innovation. A prominent example, Enterprise Singapore, specifically runs various investment schemes such as *Startup SG Equity, Startup SG Founder,* or *Startup SG Accelerator.* Supplemental to independent third-party investors, the first of the aforementioned entails co-investment opportunities for locally based startups that are capped at S$2M for general tech and S$8M for deep tech (Startup SG, 2019b). In contrast, Startup SG Founder presents startups either with grants of S$50,000 or adequate support for finding capital from outside sources (Startup SG, 2019c). Startup SG Accelerator, at last, offers funding for startup enablers to help with the provision of mentoring or programmes from which startups may learn also in terms of financing (Startup SG, 2019a).

A wide range of funding opportunities is furthermore available as part of the FSTI 2.0 scheme (see Appendix E). Based on the MAS (2020d), FIs can obtain up to S$1M for the catalysation of innovative ideas, 50% co-funding for the salaries of employed professionals in innovation centres, or up to S$3m to strengthen their capabilities in cyber security. Apart from this, FIs and other industry players can receive S$400,000 for doing a PoC of innovative solutions, between S$500,000 and S$1.5M for projects concerned with artificial intelligence and data analytics, and a maximum of 70% co-funding for the advancement of fintech infrastructure. Offering co-funding of 80%, the *Digital Acceleration Grant* additionally aids the technology adoption of smaller institutions and fintechs by covering costs of up to S$120,000 and S$100,000, respectively (MAS, 2020d).

In April 2020, the MAS (2020c) released a S$125M COVID-19 support package for the fintech industry before initiating another S$6M solidarity grant together with the SFA and financial services provider AMTD in the following month. While resources are particularly dedicated to the training, course fees, and wage support of fintech employees and recent graduates, companies are also eligible for rental support of up to six months. In addition, all startups at 80RR can apply for a temporary exemption from the entirety of their rent payments if necessary. Fintechs may access the APIX platform for six months free of charge and are explicitly incentivised to do so through PoC grants of S$40,000 and the monthly coverage of associated internship salaries at a maximum of S$1,000 per person (MAS, 2020c). The complete measures of both initiatives can be found in Appendix J and Appendix K.

5.5 Talent and Research

This section will deal with talent and research within the fintech industry. The local labour pool will be characterised, in relation to which several education and training programmes will be presented. Following this, the promotion of applied research will be outlined in terms of financial schemes, research institutes, and patent programmes.

5.5.1 Talent Pool

With an unemployment rate of 3.2% in the last quarter of 2020, Singapore's labour force comprised a total of 2.35M resident workers and 1.37M foreign workers (Ministry of Manpower [MOM], 2021a). A closer look at the former reveals that the majority of the local workforce is highly skilled, seeing as 39.1% of residents hold a university degree while an additional 19.8% either have a diploma or professional qualification (MOM, 2021b). Such high numbers are promoted by Singapore's focus on higher education; the government funds six autonomous universities, including the NUS or the Singapore Institute of Technology (Ministry of Education [MOE], 2018). With further consideration of the National Institute of Education and local polytechnics, the overall expenditure on tertiary education has been raised considerably since 2005 and recently exceeded S$4.1B in 2019 (MOE, 2021). Along with displaying fluency in English due to its status as a working language, Singaporean workers are educated in Mandarin, Malay, and/or Tamil (Mathews et al., 2020).

There is conflicting information regarding the availability of labour within the local fintech industry. While PwC and the SFA (2019) report no significant shortage of talent based on a survey of 394 companies, 94% of recruiting firm Michael Page's (2019) respondents describe a general need for qualified workers. In support of the former, Oliver Wyman and the SFA (2020, p. 25) underline that "Singapore has a deep talent pool for both business and tech talent, particularly compared to the rest of Southeast Asia." Singapore is developing its talent pool through the strategic implementation

of diverse programs aimed at students and workers alike. Together with the industry and academic institutions, the MAS is taking a holistic approach towards the development of associated skills and competencies through dedicated curricula, work placement programmes, learning, and re-training opportunities (Mohanty, 2017).

In 2016, the MAS and Singapore's five polytechnics agreed to adjust their curricula towards fintech needs, targeting 2,500 students a year and facilitating project and internship opportunities with industry players (MAS, 2016b). As part of *PolyFinTech 100* (2021), companies have since then been able to register their interest in this or in providing general mentorship to these students on a centralised website, thus helping to build a community of fintech experts for the same. The *Singapore FinTech Youth Chapter* (SFYC), which is now being launched together with the SFA, aims to further intensify the collaboration between the polytechnics and the industry by leveraging the association's network, connecting young adults with the local and international fintech community, and ultimately creating a deep pool of fintech talent (SFA, 2021). Apart from this, mid-career technology education is being offered by the Financial IT Academy or the Institute of Banking and Finance (IBF) on top of the funding support for individuals from the MAS' *Financial Training Scheme* and the *IBF Standards Training Scheme* (Mohanty, 2017).

Other industry- and union-related initiatives similarly target the promotion of fintech talent. MOM's *SkillsFuture*, for one, aims to build on local capabilities through technical education and training in order to respond to current industry needs and ultimately promote a culture of 'lifelong learning' (MOM, 2021c). SkillsFuture's *TechSkills Accelerator FinTech Collective* sees the collaboration of public authorities, financial associations, and universities to purposefully strengthen the skills and employability of students and professional talent (MAS, 2017a). The EDB's (2021b) *Tech@SG* programme with Enterprise Singapore aids the growth of technology companies by facilitating their access to foreign talent – an effort that is especially relevant seeing as the vast majority of fintechs are looking to employ both local and foreign workers (PwC & SFA, 2019). Given the consistent growth in trade union memberships of financial services employees (MOM, 2020), the Banking and Financial Services Union (n.d.) is joined by the SFA in helping professionals upgrade their technical skills and build networks. Through a partnership with the NTUC, the SFA is moreover able to provide its members with corresponding benefits such as a reduced rate for educational courses (SFA, 2018e). Together with Singapore Polytechnic, both parties also offer a three-month *FinTech Talent Programme* for the re-education of 'future-ready' fintech leaders (SFA, 2018c).

5.5.2 Applied Research

The importance of applied research within the fintech industry is demonstrated by a diverse set of financial, collaborative, and legal efforts for the development of related capabilities. The FSTI's *Artificial Intelligence and Data Analytics Grant* of initially S$27M has been allocated for FIs to strengthen their research and development (R&D) capabilities as well as to upskill employees for the subsequent adoption of such technology (Menon, 2017, 2018). Together with the Massachusetts Institute of Technology's (MIT) Media Lab and with a special focus on blockchain technology, the MAS (2017b) is moreover presenting industry players and researchers alike with the opportunity to participate in varied experiments on digital services and to receive academic feedback conducive to innovation. Recently, the MAS (2020l, para. 1) partnered with the NUS and the National Research Foundation to establish the *Asian Institute of Digital Finance* (AIDF), which "provide[s] thought leadership and strengthen[s] synergies between education, research and entrepreneurship in the thriving area of digital finance." Besides offering its own master's programme and post-doctoral training at the NUS, the institute carries out a varied array of projects relating to industry concerns such as digital infrastructure, sustainable financial services, cyber security, or fraud. The additional introduction of the AIDF's *Fincubator* serves to stimulate entrepreneurship by assisting with applied research, technology incubation, industry collaboration, and investor linkages (MAS, 2020l).

Singapore's emphasis on the quick development of innovative technologies is reflected in the introduction and subsequent renewal of tailored patent schemes. In 2018, the Intellectual Property Office of Singapore (IPOS) introduced the *FinTech Fast Track* initiative so that patents could be granted within half a year from the date of application – one fourth of the standard two years (Menon, 2018). Two years later, the initiative was combined with the Accelerated Initiatives for Artificial Intelligence to form the *SG Patent Fast Track Programme* before being further expanded to include trademarks and registered designs under the modified *SG IP Fast Track*, which now extends into all areas of technology and remains valid until Spring 2022 (IPOS, 2020a, 2020b). On another note, fintechs benefit from the city-state's extensive network of regional and global intellectual property offices. The *ASEAN Patent Examination Co-operation*, for example, accelerates patent issuance in Laos, Brunei, Cambodia, Malaysia, Thailand, Vietnam, Indonesia, and the Philippines by offering an application process free of extra charges or the need for translation (IPOS, 2021). Also, the *Global Patent Prosecution Highway* expediates patent grants by allowing examination results to be shared across 27 countries (IPOS, 2021). For a list of participating offices, see Appendix L.

6 ANALYSIS

The following section will analyse the success of Singapore's fintech industry based on the delimited theoretical framework, the previously presented descriptive section, and two interviews conducted with industry professionals. Following the structure of the main research question, the analysis will be divided into three parts to individually answer each of its sub-questions.

6.1 National Competitive Advantage

This section will analyse the interrelation of Singapore, the financial industry, and locally residing customers by use of Porter's (1990a) Diamond Model. The application of this theory will allow for an assessment of the city-state's competitive advantage through consideration of factor and demand conditions, the influence of the traditional financial industry, and national circumstances. The role of the government and the recent effects of COVID-19 will likewise be examined.

6.1.1 Factor Conditions

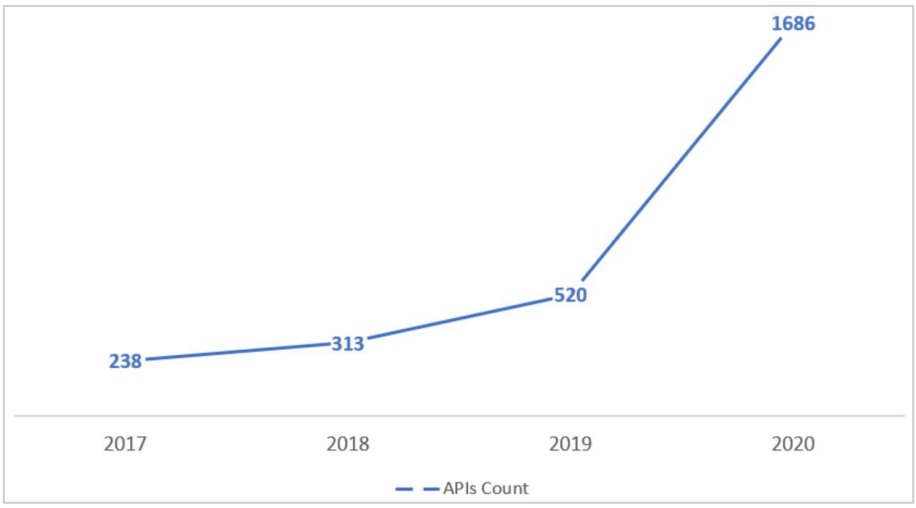
Singapore's drive to develop an industry such as fintech lends itself to the fact of being historically disadvantaged in terms of natural resources, while the added strength of governmental involvement in the aim of creating a smart nation has led to the purposeful improvement of associated business conditions. Porter (1990a) states that, for an industry to become competitive, a nation must efficiently create and continuously upgrade factors of high specialisation. Since 2015, Singapore has managed to successfully advance its local fintech infrastructure through targeted investments as part of both FSTI schemes as well as the partial responsibility that is being intentionally placed on contributions from the private sector. The MAS' (2021a; Figure 11) *Financial Industry API Register* shows that informative and transactional data from 13 FIs is currently shared through a total of 1,686 Open APIs – a stark contrast to the 238 in 2017. The utilisation of cloud computing within the finance and insurance industry similarly rose from 22% in 2018 to 31% in 2019 (IMDA, 2018, 2019b), suggesting a parallel increase in their availability such as to facilitate the outsourcing of fintech solutions (see International Monetary Fund, 2019). Apart from this, the simultaneous commitment of the financial authority to develop extensive networking infrastructure ensures that the needs of the industry's collaborative nature are being adequately met (see 6.3.1 Technical Collaboration).

Deloitte (2017) clarifies that the provision of early and later-stage funding for startups is equally as important for the stimulation of fintech activity as investments in collaboration initiatives. The wide attainability of capital is generally illustrated by financial services claiming about half of Singapore's FDI stock, and more specifically reflected in the fast growth of annual fintech funding with recently rather balanced funding rounds. While the government offers supportive grants and invests in

startups either directly or through dedicated funds, the MAS's efforts to attract higher amounts of foreign VC in combination with an expediated process of patent application contribute to an improved access to funding for novel digital solutions. Overall, Singapore takes top global positions regarding the availability of both VC and capital for technological development (IMD World Competitiveness Center, 2020).

Figure 11

Number of APIs, by Year



Source: MAS (2021a)

Porter (1990a) highlights the importance of skilled human resources, with Deloitte (2017) further mentioning that a mix of local and foreign talent produces a culture of innovation in which fintech hubs can find their unique strengths. Lim (Appendix B) reports a lack of talent as one of the current main issues for fintech businesses; however, Singapore has acknowledged this concern by introducing an extensive set of education and training programmes for the familiarisation of students and professionals with the fintech industry and related technologies. Assistance is also offered to companies looking for foreign talent; Ng (Appendix A) describes Validus' 'glocal' strategy in talent acquisition given the expected value in accumulating a mix of global and regional experience on top of the more essential local perspectives. At the same time, Lim (Appendix B) recognises the large presence of foreign founders in Singapore and discloses the hope for the SFYC to build a more localised talent pool for the industry's future.

6.1.2 Demand Conditions

Porter (1990a) emphasises the composition and character of home demand, whilst stressing the local visibility of an industry in comparison with other economies. Singapore exhibits a small domestic market, though the high number of SMEs encountering obstacles in the financing of their operations presents a measurable opportunity for fintechs to address a customer segment that FIs have failed to sufficiently serve. Ng (Appendix A) mentions that Validus actively targets these businesses through complementary offerings in terms of either supplying capital to effectively extend credit limits or delivering entire services that could otherwise not be accessed. As Singapore had furthermore boasted a sizable financial sector already before the emergence of fintech, it can be assumed that specialised knowledge is broadly available and that collaboration opportunities for startups are plentiful. The large presence of FIs invites fintech activity; Lim (Appendix B) refers to banks as the early adopters and first customers of fintech. Particularly considering the city-state's consciously intensified reliance on technology in both economy and society, this provides a strong indication for the fintech industry to be the epitome of an evident local development.

Whereas FIs can be argued to constitute a sophisticated customer segment able to signal its needs, the same does not apply to the demand character of SMEs. Yet, fintechs have realised the importance of an educated customer base: Ng (Appendix A) recounts the interest of Validus in holding workshops and webinars for improved financial literacy before underlining the power of heightened expectations to push the quality of fintech services. Even though room for improvement subsequently remains, the weak character of the proportionally bigger share of home demand may hence not necessarily hinder innovation with companies proactively seeking to tackle the issue. Ng (Appendix A), for example, reports Validus to have come first at last year's Singapore FinTech Awards for an innovative *Credit and Customer Monitoring System* that helps to purvey financial solutions even before the manifestation of particular needs.

6.1.3 Related and Supporting Industries

Singapore benefits from its position as a leading financial centre as present conditions in relation to infrastructure, human capital, or the general business environment are making the industry strongly competitive (Morris et al., 2020). Ng (Appendix A) explicitly compliments the robustness of existing infrastructure whilst further emphasising that the strength and stability of the industry's regulatory framework had been a major factor in Validus' decision to set up in Singapore. A firmly established financial industry, according to Deloitte (2017), is generally linked to a potent fintech market due to the increased product readiness and awareness of local customers. Statistics on the quantity of FIs can be found in Appendix M.

Porter (1990a) specifies that close working relationships with internationally competitive related or supporting industries are invaluable for an industry's success due to facilitated communication and information sharing. Lim's (Appendix B) observation that it is common for startups to be founded by former professionals of the financial industry accordingly implies an accelerated exchange of knowledge and/or commencement of collaborative activities as a result of presumably maintained connections. Apart from Lim's (Appendix B) report of banks being the main partners of fintech firms, their close relationships are instantiated by innovation labs either being launched by FIs or otherwise functioning as a networking space for both. But although communication is taking place, obstacles remain on the subject of diverging compliance requirements. Lim (Appendix B) explains that the recent introduction of the Compliance Readiness Framework seeks to counteract this complication by helping startups to better meet required regulations as well as to showcase their suitability for collaboration; however, being unable to comment on whether this has led to a positive effect on the relationship and trust between partners.

6.1.4 National Context

In the context of national circumstances shaping both businesses and domestic competition (Porter, 1990a), Lee Hsien Loong (2012, para. 2) emphasises that "we [Singapore] have to stay open and business-friendly, so companies and entrepreneurs from Singapore and the world over can startup and grow here and eventually contribute to Singapore." The weight placed on entrepreneurism (see also 6.2.6 Supporting Factors) aids the fintech industry, considering that the flexibility of startups allows such companies to adapt to the dynamism of technology more easily than established FIs. Validus, as portrayed by Ng (Appendix A), manages its businesses as a startup with flat hierarchy, autonomy, enthusiasm, and drive – an operational mode that fits to an industry equally as young as the company itself.

Porter (1990a) asserts that the goals of institutions directly impact a nation's competitiveness. The MAS's goal of building a smart financial centre and the support by which this is accompanied elevate the role of fintech as substantial organisational, regulatory, and financial efforts are put into the financial industry's technological transformation while prestige is attached to top performers through their formal recognition. On the one hand, this fosters competition on the back of a growing number of startups that concurrently drive innovation; Ng (Appendix A) remarks that competition gives rise to superior financial services and therefore benefits private and commercial customers alike. On the other hand, it leads to additional opportunities for collaboration that conceivably have the same outcome.

6.1.5 The Role of the Government

Porter (1990a) posits the role of the government to be that of a catalyst and challenger such as to create a suitable environment for businesses to gain a competitive advantage. Indeed, Singapore's government concentrates heavily on factor creation and has been doing so since the beginning of its fintech journey; the introduced initiatives in relation to infrastructure, talent, or capital create a broad foundation for fintech activity and ongoing innovation. The institutional setting aids the success of individual businesses in the sense of constituting a safe environment in which they can operate, as startups and other players can rely on a supportive legal framework and efficient regulation that is competently enforced without corruptive tendencies (see 5.1.1 Political Environment). Moreover, the industry benefits from the government's heavy economic involvement and its close relationships especially with established institutions. Regarding open banking, for example, the utilisation of APIs was made easier for fintechs because the government had "gathered all the key players [FIs] in one room and made them reach a single standard" (Mittal, as quoted in Macovei, 2021, Your Book section, para. 6). Based on this, as well as fintech being a principal component of the smart nation initiative, it can hence be argued that the public influence on business elites is able to promote those technologies that are vital for the industry's advancement.

The MAS' catalysation of the industry is best demonstrated by their achievement of global leadership in conducive fintech regulation and policies (Zhejiang University AIF et al., 2020). According to Lim (Appendix B), the financial authority seeks to create trust between fintechs and their customers, which is why it works closely together with startups by listening to their feedback and concerns about new regulations. Ng (Appendix A) additionally expresses that the clarity of the current framework drives industry growth in a responsible and sustainable way. On another note, Porter (1990a) maintains that direct cooperation of industry rivals should be limited; however, this does not appear to apply in fintech seeing as collaboration presents itself as a key driver for the development of innovative services. The government itself acts as a collaborator in favour of R&D: the MAS has previously worked alongside FIs and technology provides for example in the context of Project Ubin.

6.1.6 Chance Events

Singapore's fintech industry has been faced with the economic effects of COVID-19 – the relevance of such a chance event lies in its power to either positively or negatively reshape the structure of an industry (Porter, 1990b). Through a substantial financial support package as well as an extra solidarity grant, the city-state has not only been able to deal with this newfound challenge but also to evolve with the arising opportunities. The success of governmental action is partially mirrored in the unaffected growth of fintech's overarching finance and insurance sector, which also accounts for the increased number of startups as caused by heightened demand. Lim (Appendix B) points out

that the SFA has gained more than 600 members over the course of the pandemic. Comparing this to the prior sum of 300, Lim (Appendix B) emphasises that the heavy jump in membership numbers largely concerns startups less than 12 months of age and that it can be attributed to the realised importance of digitalisation by local FIs. Lim's observation, notably, is supported by the continuing enterprise demand for payment processing services – the main activity that Singapore's fintechs currently specialise in.

The pandemic has positively contributed to the deepening and expansion of the fintech talent pool. Despite acknowledging the general risk of future economic fallout, Ng (Appendix A) reveals that Validus has been able to grow in ways that it normally could not due to a facilitated access to highly skilled talent as well as expanded re-skilling and training opportunities. Although Lim (Appendix B) discloses that certain grants in relation to COVID-19 are only accessible via the SFA's fintech certification, this is an easily attainable prerequisite and furthermore free of charge for SFA members (SFA, 2018b; see Appendix N for terms and conditions). Other than that, Lim remarks that the growing pervasiveness of remote working has led to fintechs starting to only locate their senior management in Singapore while outsourcing all other talent (Appendix B).

6.1.7 Sub-Conclusion

The interrelation of Singapore, the financial industry, and locally residing customers is well represented by the Diamond Model, which reveals that the city-state exhibits considerable strengths in each of the four determinants concomitant to propitious conditions in both supporting factors. Porter (1990a) describes the points of the diamond to be self-reinforcing; the government's determination to build a smart financial centre, for example, has resulted in their heavy yet advantageous economic involvement for improved business conditions and increased entrepreneurial activity. As this fosters technological innovation and consequently strengthens competition in digital financial services, it moreover stimulates the effective upgrading of necessary factors such as infrastructure and capital. In addition, the efforts of fintechs to educate their customers intend to shape the character of home demand not least for their own benefit regarding business growth. The forces within the diamond work in all directions (Porter, 1990a), which is perhaps best illustrated by the following three observations: the financial industry's influence on the emergence of fintech, the significance of FIs as a distinct customer segment, and the entrance of financial professionals to the startup scene.

Room for future improvement remains particularly in connection with the local labour pool, the financial literacy of SMEs, or the confidence in work relationships between startups and FIs. Porter (1990a) proclaims that such weaknesses reduce the potential for an industry's advancement; however, Singapore displays awareness of its current shortcomings such that they are addressed

by both the public and private sectors through the introduction of matching initiatives, workshops, and digital solutions. Especially the facilitation of partnership formation shows great potential for industry growth in light of the preferential collaboration of fintechs with FIs and Porter's (1990a) suggestion that such industry-spanning connections generally bring attention to new methods of competition. Overall, the discussed circumstances in combination with the government's committed pursuit of the nation's technological transformation create a considerable competitive advantage for Singapore as fintech perfectly combines the city-state's present of traditional finance with the future of digitalisation. At the same time, COVID-19 has allowed the industry to find and leverage new ways of growth.

6.2 Fintech Ecosystem and Incentives

This section will examine the characteristics of Singapore's fintech ecosystem along with its contribution to industry growth. Following I. Lee and Shin's (2018) ecosystem model, this will concern startups, FIs, technology developers, financial customers, and the government. Supporting factors to technology and entrepreneurship will be investigated before incentives to foreign entrants will be highlighted.

6.2.1 Startups

With their ability to unbundle traditional financial services, startups are not only at the very centre of any fintech ecosystem but correspondingly also represent the industry's major drivers of growth (I. Lee & Shin, 2018). Despite inconsistencies in the reported number of fintechs, the collected data shows a significant increase in their incidence since the beginning of Singapore's strategically conceived fintech journey. As this has been further accompanied by steady increases in obtainable funding and a recently growing investor interest in business maturation, the industry benefits from an overall expansion of innovative potential as well as the added competitiveness of local service providers. The now almost equal shares of activities as identified by Oliver Wyman and the SFA (2020) attest to the fact that fintech is becoming ever more varied; a development which can be attributed to vast opportunities with commercial customers. The industry, in other words, has broadened in sub-sectors such that there are now fourteen distinct areas of startup specialisation as shown by Figure 12 (Fintechnews Singapore, 2021). Being mostly entrepreneurial (I. Lee & Shin, 2018), their agglomeration strengthens the ecosystem through the consequent presence of mentor, advisor, and investor networks (Spigel, 2017).

Investment capital is a catalyst for startup growth (Spigel, 2017), with PE and VC funds particularly contributing to their creation (I. Lee & Shin, 2018). Whilst Singaporean fintechs principally gain from the general interest of VCs in SEA, the ecosystem's specific advantage lies in what Bruton et al. (2002) describe as the local VC industry's greater technological orientation and stronger preference for early-stage ventures as compared to the surrounding countries. Moreover, the MAS has supported VC participation through the efficient combination of conducive regulation and publicised startup-related investment information. Bruton et al. (2002) suggest that local cultural-cognitive institutions tend to hinder quick access to funding due to high value being placed on client relationships; however, specifying that this does not apply to technology businesses in view of the global orientation of associated VCs. Consistent therewith, Ng (Appendix A) refers to Validus' partnerships with the globally active Vertex Growth, Vertex Ventures, and FMO in the context of their provided help with networking, mentoring, and business growth.

Figure 12

Map of Fintech Startups

Source: Fintechnews Singapore (2021)

6.2.2 Financial Institutions

FIs and fintechs in Singapore maintain mostly collaborative relationships, though competition as a result of in-house inventions can also be observed and both forces result in a positive contribution to the local ecosystem (Menon, 2020). FIs drive ecosystem growth through their embrace of innovation and the provision of startup funding (I. Lee & Shin, 2018), particularly by establishing VC arms. While the latter is generally motivated by profits from rising fintech valuations and the ability to utilise respective technology for the improvement of own services (EY & SFA, 2018), incentives to actively engage in the development of digital solutions or to establish innovation labs for stronger collaboration in support of the same are given as part of the FSTI 2.0 scheme. Last August, Menon (2020) praised the scheme's overall success with regard to nearly 500 projects of now 40 innovation labs, which he compared to there being hardly any before. As "it is imperative that government-led initiatives are supported by industry participants in order to ensure a thriving FinTech ecosystem" (EY & SFA, 2018, p. 13), the successful interaction of the MAS and local FIs presents a vital element in the industry's advancement.

Singapore aims to digitally transform its FIs with the goal of boosting innovation and international competitiveness (Menon, 2020). With regard to Mohanty's observation that incumbents often face difficulties in fintech adoption due to their inhibiting legacy structure or insufficient implementation of needed infrastructure (N. Lim, 2019), it can be said that the government has been instrumental in the timely addressing of these issues given the early formation of the FTIG and the subsequent support provided for FIs. Remaining a critical task, however, especially the technological enablement of partnerships between FIs and fintech is becoming ever more relevant; the majority of fintechs nowadays do seek such a connection under the motive of gaining access to valuable resources for business growth (Oliver Wyman & SFA, 2020).

6.2.3 Technology Developers

"Technology developers provide digital platforms for social media, big data analytics, cloud computing, artificial intelligence, smart phones, and mobile services" (I. Lee and Shin, 2018, p. 37), making them responsible for the infrastructure on which fintech solutions are built. Singapore systematically leverages technology for more efficiency in financial services, such that developers have benefitted from the availability of financial assistance for infrastructure-related projects under the FSTI schemes. Cloud computing, for example, has become increasingly important in relation to the fintech adoption of FIs. As it also serves as a low-cost solution for the development of web-based

services by startups (I. Lee & Shin, 2018), Singapore now boasts a considerable 262 cloud service providers alone (The Grid, 2021). The importance of these companies as well as of technological expertise, furthermore, is illustrated by the attention given to current and emerging technologies through the FinTech Infrastructure Office or the inclusion of thought leaders in the ITAP.

Developers frequently work together with other ecosystem players. While this is most prominently demonstrated by the inclusion of technology companies in Project Ubin, the collaborations of Mastercard and MatchMove or Validus and Really Singapore (see Ng, Appendix A) show that partnerships are also taking place on a smaller scale. The GIA, supplemental to such local activity, is helping companies and public agencies to connect with technology providers outside the city-state. This offers added opportunities for improvements in service quality and subsequently raises competitiveness in support of industry growth; however, the local startup community is also backed by technology MNCs contributing to the provision of networking platforms as demonstrated by the involvement of Microsoft and Google with BLOCK71. Opportunities for collaboration can be expected to expand with the upcoming business model of digital banking, for which technological infrastructure constitutes the most crucial component.

6.2.4 Financial Customers

With their purpose being the generation of revenue, main sets of customers for digital financial services are found in individuals and SMEs (I. Lee & Shin, 2018). Singapore, therefore, presents a fertile ground for the stimulation of fintech activity: its substantial base of SMEs is of high economic significance and accompanied by a wealthy population that is becoming increasingly acquainted with digital services in light of the city-state's progressing smart transformation. Likewise, the ecosystem benefits from the availability of strong FIs and from Singapore being the favoured location for MNCs in Asia. But even though "the availability of strong local markets is a key part of providing opportunities within entrepreneurial ecosystems" (Spigel, 2017, p. 55), Lim (Appendix B) recognises that Singapore's small market size limits the growth of businesses and thus necessitates their international expansion. That customers not only originate from within the city-state is further indicated by its function as a gateway to the surrounding region as well as by initiatives aiming to deliver services to consumers outside national borders. Hence, it can be said that the industry's growth is fuelled by Singapore's proximity to neighbouring markets.

There is considerable potential for fintech adoption across the ASEAN countries. The advantage in their wealth of relatively young but underbanked individuals is mirrored in Lim's (Appendix B) observation that the top destinations for venturing abroad are Indonesia, given its severely underserved population, and Vietnam, given its sizable youth market. Lim, interestingly, also deems Malaysia to be a desirable choice for international expansion due to its strong cultural similarities

(Appendix B). Since many of the region's SMEs consider themselves insufficiently served, fintechs can utilise Singapore as a stepping stone for outgoing activities that address the current financing gap. This strategic opportunity is also reflected in Ng's (Appendix A) statement that "our [Validus'] key focus is ASEAN countries, the developing countries in SEA specifically, and the mission is to drive financial inclusion for SMEs in this part of the world." So far, the company has successively entered Indonesia, Vietnam, and Thailand (Appendix A).

6.2.5 The Government

I. Lee and Shin (2018) view the government as a regulating body able to stimulate innovation and strengthen international competitiveness. The MAS' cautious approach to regulation, as exemplified by their attention to risk mitigation or the creation of a safe digital environment, has been highly successful considering its received recognition in terms of regional superiority and global excellence. The MAS is characterised by their ambition for quality: the Payment Services Act, for instance, was preceded by the thorough study of previously introduced "payments regulation in the UK, Canada, Hong Kong and Australia in an effort to craft an all-encompassing piece of legislation" (Palma, 2019, para. 4). Positive effects for the ecosystem are also achieved through the regulatory sandbox. Goo and Heo (2020) found that Singapore, being among the first countries to employ such a model, shows a significant increase in both the total and average amount of venture investment since its introduction. While this indicates that the sandbox is an effective 'deregulation device' able to remove any associated uncertainty experienced by startups (Goo & Heo, 2020), it additionally presents the industry with increased opportunities for innovation and growth. Interestingly, the small number of hosted experiments attests to a successful regulatory framework: "Every time a sandbox is organised it means that a suitable law was not previously designed, or it wasn't good enough to handle something. In an ideal world, Singapore would shut down the sandbox" (Mittal, as quoted in Macovei, 2021, Regulation section, para. 4).

Lim (Appendix B) perceives the government in its goal of giving confidence through regulation to equally support all actors within the ecosystem. Indeed, current regulation does not appear to be an attempt of wanting to shape or inhibit certain groups of fintech players especially when considering Singapore's prime concern of creating unwarranted obstacles to technological progress: "We believe regulation must not front-run innovation" (Menon, 2016, Regulation section, para. 2). Unlike other jurisdictions, the MAS accordingly refrains from banning or even prohibiting individual fintech activities – though compliance to existing regulations is strongly enforced (C. K. Lim & Gaw, 2020). The financial authority's open approach to fintech and its welcoming attitude towards a diverse service landscape, in other words, is met with a desire "to give the consumers a peace of mind that fintech companies setting up here are regulated and it's not a 'Wild Wild West'" (Lim, Appendix B).

Ng (Appendix A) applauds the regulatory framework along with the government's ability of 'putting their foot down' regarding the set guidelines and criteria. In fact, Ng asserts that the breadth of the local framework has enabled Validus to also meet the regulatory requirements of the other countries it has entered (Appendix A).

6.2.6 Supporting Factors

Singapore's institutional environment presents a crucial factor for ecosystem growth (see also 6.1.5 The Role of the Government). The creation of technology, on the one hand, is encouraged by favourable circumstances in areas such as economic stability, an openness to foreign investments, or the protection of intellectual property (Koh, 2006). Hence, businesses looking to engage in fintech encounter an attractive setting in Singapore: macroeconomic stability and intellecutal property protection are at levels close to best (WEF, 2019) while FDI restrictiveness in financial services is the lowest in all SEA (OECD, 2021). Entrepreneurship, on the other hand, is nurtured in a context of "reducing legal barriers to firm formation; developing effective tax regimes; or providing public funds to run entrepreneurship support, networking, or incubation programs" (Spigel, 2017, p. 55). Global comparison shows that the process of starting a local business is remarkably fast and inexpensive (WEF, 2019), with overall conditions for doing business being the second most favourable worldwide (World Bank, 2021). While tax schemes are designed to encourage business formation and promote internationalsisation activities for added growth, public networking initatives aid the collaboration of ecosystem players, offer mentoring opportunities, or an access to expert knowledge. Simultaneously, central locations such as that of 80RR allow startups to work in the vicinity of current, or potentially future, partners and customers (80RR, 2020b). Startup enablers are generally eligible for financial assistance; however, Ng (Appendix A) directs particular attention to the individual business grants that have allowed for the low-cost adoption of technology and Validus' pace of growth to exceed what is possible in other countries.

With startups being the main players in fintech, it applies that the ecosystem is affected by the local history of entrepreneurship and cultural attitudes towards the same (Spigel, 2017). Singapore, which had previously sought to appeal to big corporations, began with the allocation of public means towards the creation of an *entrepreneurial society* in 2001 (Pereira, 2007). With the subsequent portrayal of this idea being key to innovation and economic renewal, the years between 2004 and 2014 experienced a near doubling in the number of knowledge-intensive startups (French Chamber Singapore, 2016). Furthermore, the flourishing of the technology startup landscape was supported by what Pereira (2007) describes as a cultural transition towards norms, values, as well as beliefs in favour of entrepreneurship that ensued from a change in generations. Specifically, the congruent aspirations of the government and Singapore's educated youth led to the adoption of the officially

desired mindset by the latter as well as their agreement to the normative necessity of the same (Pereira, 2007). This has more recently been amplified by another cultural aspect advocated for by the government: an open attitude towards failure. In a 2019 talk with university students, Prime Minister Lee emphasised that “I think that kind of startup and possibly unsuccessful startup, I don’t think there’s any stigma, any shame attached to it, even in Singapore” (as quoted in Mokhtar, 2019, Excerpts section, para. 3). The propagation of entrepreneurship remains ongoing, whilst its societal importance is underpinned by the clarity and strengh of governmental support. Chan Chun Sing (2021, para. 19), Minister of Trade and Industry, announced: “Our commitment to our companies is this - as long as they have the ambition, aptitude and attitude to pursue growth, we will find the necessary resources to support them.”

Lim (Appendix B) believes Singapore to be a desirable brand for fintech due to the strength of its international reputation in influencing fintechs to start up locally. That this is a calculated effort of the government (Lim, Appendix B) is perhaps best illustrated by the duties of the FinTech Office, and the correlated entrance of foreign firms consequently drives the industry’s growth. While Diemers et al. (2015) specify that clusters of likeminded entrepreneurs aid the ecosystem’s advancement, Ng (Appendix A) confirms their positive local impact before underlining their additional contribution to SEA’s economic growth. Lim (Appendix B) clarifies that the MAS aims for foreign entrants to grow and anchor in Singapore:

> MAS will not give you money to help you set up an office here. But if you are doing a PoC with a company here in Singapore, MAS can provide certain grants to help you offset some of the costs for the PoC.

6.2.7 Sub-Conclusion

The fintech ecosystem model investigates different players, their setting, and connections, while ultimately demonstrating that industry growth results not only from individual but rather from joint actions. I. Lee and Shin (2018) explain that this requires stable and symbiotic relationships, meaning that elements of the ecosystem must support and mutually benefit one another. Certainly, fintech in Singapore presents itself as an efficient system with well attuned components: an environment conducive to young businesses and technology invites entrepreneurial activity, regulatory efforts promote the availability of VC, financial incentives to and the self-interests of FIs and technology developers provide support for innovation, and customers are available and ready to adopt digital services. Menon (2017, Ecosystem section, para. 1) remarks that “we [Singapore] want to create an ecosystem for innovation, where established financial institutions and FinTech start-ups compete as well as collaborate.” The industry’s potential, however, particularly lies in its space for financial services to prosper in collaboration (Mittal, 2020).

The MAS has made significant contributions to industry growth, with Lim (Appendix B) explicitly emphasising its forward-looking approach to regulation and ecosystem development. In this context, two things shall be reiterated: first, receptive yet resolute regulatory involvement. Menon himself regards the financial authority's work to be that of a 'no-nonsense regulator', though in a way that is welcomed by the industry and conducive to financial development (as quoted in Y. Lee et al., 2018). Second, moulded normative perceptions. The government has successfully conveyed the importance of entrepreneurism onto individuals and expressly communicates its acceptance of business failures such as to encourage and make personal drive a societal norm. Accordingly, Mittal (2020, Challenges section, para. 3) states that "the [fintech] market has been cultivated well, […] resulting in the ecosystem flourishing."

Singapore and the fintech ecosystem present various incentives to foreign entrants. Most prominently, companies can gain from a geographic positioning that allows for an easy access to markets with still untapped potential. Ng (Appendix A) mentions that the city-state offers "a good environment for cultures to come together and build a business", with Lim (Appendix B) further highlighting that the ecosystem's wide mix of nationalities results in their advantageous exposition to different views and ideas. Whilst this is bolstered by a strong standard of openness and sharing among industry players (Mittal, 2020), other incentives include: a favourable economic setting, good business conditions and tax incentives, strong VC participation, public support for business growth, networking opportunities for collaboration, as well as an attractive international reputation.

6.3 National Innovation System and Internationalisation

This section will investigate the knowledge and technology flows within Singapore's fintech industry using the theory of national innovation systems as described by the OECD (1997). With an overall focus on their contribution to innovative capability, consideration will be given to collaboration, networking, and technology adoption. Additionally, the government's international linkages and their relevance for foreign ventures will be examined.

6.3.1 Technical Collaboration

The OECD (1997) specifies that innovation is a result of complex relationships among the actors in a system, and that governmental support for improved networking aids the flow of technology and information. Innovation, furthermore, plays a crucial role for the competitive advantages of firms and therefore for overall competition within an industry. This is best illustrated by Ng's (Appendix A) belief that two of the differentiating factors for fintechs are found in the pace and the impact of innovation. Realising the need for collaboration and partnerships for the creation of a competitive industry early on, the MAS has been heavily involved in the creation of both physical and digital networking

platforms either by itself or with assistance of private sector entities. For instance, knowledge sharing is encouraged through the innovation lab Looking Glass, the co-working space JTC Launchpad, the startup hub BLOCK71, the annually held SFF, or the online-based AFIN. It can be argued that collaboration is a fundamental aspect of fintech, such that advancements in technology are naturally accompanied by the sharing of relevant know-how. Regarding this, Lim (Appendix B) mentions that fintech services are inherently complementary to one another and that they can thus always be combined. Moreover highlighting the SFA's function as a bridge between its members, Lim adds that startups commonly partner not only among themselves but also with banks and insurance companies (Appendix B). The overall prevalence of technical collaboration is reflected in the fact that only 9% of fintechs are currently neither engaged in nor planning to take up any partnership activities (Oliver Wyman & SFA, 2020).

Regarding informal firm linkages, the OECD (1997, Knowledge Flows section, p. 7) underlines "the role of competitors as both a source for and stimulus to innovation." In Singapore, specially organised events encourage the active formation of formal and informal relationships among industry participants. While this is exemplified by the thematically organised networking events of 80RR, Lim (Appendix B) further states that the SFA similarly hosts networking sessions, invites professionals to join webinars, and assists in individual matchmaking. Ng (Appendix A) acknowledges these opportunities before expressly emphasising the SFA's importance for Validus: "With the SFA, that's given us a lot of support in terms of at least having a network."

6.3.2 Public-Private Interaction

Innovation is encouraged by joint R&D activities of the public and private sectors as well as the industry-wide availability of newfound knowledge (OECD, 1997). The government has included strong research capabilities as a vital pillar of their smart financial centre, making it a goal that is specifically pursued through the provision of associated support. Financial grants for innovation labs, for instance, require FIs to "actively engage local stakeholders", which "could take the form of collaborations with Singapore-based research institutions […]" (MAS, 2020e, Innovation Centre section, Assessment Criteria, para. 6). Whilst the individual strengths of both parties are hence recognised to mutually contribute to advancements in fintech, the National Research Foundation has moreover shown a multi-year involvement with the industry. Their recent contribution to the AIDF's establishment displays great potential for an increasing interaction with industry players as part of the Fincubator programme and simultaneously stresses the importance of an international research orientation for the benefit of improved innovation in fintech. This is further underpinned by the general possibility for companies to engage with foreign academics through the MIT's Media Lab, which ultimately allows to obtain insights into experimental technologies as well as to get valuable outside

perspectives on own digital solutions and their development (MAS, 2017b). The prominence of research within the industry becomes especially apparent by example of the following: the NUS' presentation of its own capabilities in relation to BLOCK71 (regarding collaboration), the release of technological documents in the context of Project Ubin (regarding publication), and the incorporation of databases with innovation labs such as the FinTech Consortium (regarding availability).

The OECD (1997) asserts that, besides generating knowledge, universities create valuable skills for an industry. Aiming to strengthen its local human capital and in line with the fintech industry's specific needs, Singapore has taken future-oriented actions by working on the creation of a symbiotic relationship between professionals and the polytechnics. In connection with PolyFinTech100, for example, "more than 5,000 students had participated in local and global FinTech internships, […] API hackathons, innovation lab crawls, workshops and sharing sessions at Singapore FinTech Festival" (SFA, 2021, para. 4). Likewise, the intensified efforts of the SFYC will now involve "the recruitment of 10,000 youths over the next 5 years" (SFA, 2021, para. 7). The early exposure of students with practical industry knowledge and real-life experiences in conjunction with the technological skills acquired throughout their curricula helps to promote fintech activity as well as to produce highly educated and well-connected upcoming talent. In addition, the FinTech Collective entails the provision of tailored training programmes at all of Singapore's six universities also to the benefit of polytechnic graduates (MAS, 2017a).

6.3.3 Technology Diffusion and Labour Movement

Technological knowledge can generally be attained through the adoption of external innovation, though this is less relevant for industries with an inherently innovative nature (OECD, 1997). While COVID-19 has led to an increased outsourcing of digital services by FIs (see 6.1.6 Chance Events), the government has assumed responsibility for enabling digitalisation already with the establishment of the FTIG by assisting in technology adoption and recognising the concomitant necessity of re-training employees for usage optimisation. Seeing as a lack of both financing and expertise rank among the main causes for failure (OECD, 1997), the significance of the FSTI's digital acceleration grant being specifically allocated to smaller institutions and fintech firms becomes magnified. Technology diffusion is also backed by other initatives: the APIX architecture, for example, allows participating companies to easily embed offered fintech services. The Hackcelerator, similar to the benefits of the COVID-19 support package, further promotes the distribution of innovative solutions by providing free access to APIX, driving their experimental implementation, and following adoption.

The OECD (1997) underlines that a crucial element for enabling innovation is the transfer of tacit knowledge as carried by moving personnel. Although there are no figures for the movement of local fintech labour, Singapore evidently embraces the inflow of foreign professionals. Lim (Appendix B) specifically mentions the *Tech.Pass* when talking about the government's hope of attracting highly qualified talent with strong technical skills. That the tacit expertise held by such individuals can be leveraged for the benefit of the fintech industry is demonstrated by the freedoms it grants, which include: the operation of multiple companies, the simultaneous employment with multiple companies, the change of employers or move to entrepreneurship, mentoring and consultancy activities as well as being a lecturer, director, or investor (EDB, 2021a). Accordingly, Lim (Appendix B) declares that "we [Singapore] wouldn't welcome all foreigners, but we only welcome foreigners who are able to contribute to the Singapore economy." Mohanty adds: "The only thing we respect is what you bring in. […] the diversity in our talent really makes this country a remarkable place to do new things" (Barefoot, 2018, 32:26).

6.3.4 Internationalisation

Although "the national level remains the most important for conceptualising innovation systems due to the importance of country-specific interactions in creating a climate for innovation" (OECD, 1997, p. 29), Singapore's multiple international connections present invaluable inflows of knowledge for the fintech industry. That the fintech-related system of innovation extends well outside national borders is most prominently demonstrated by the fact that the cooperation agreements maintained by the MAS pertain to now nearly 30 countries of six continents (see Appendix I). Especially the partnership with the Asia-Pacific Future Financial Research Institute "aims to encourage greater collaboration between business communities, academia and think tanks from Singapore and China" by "promot[ing] academic exchanges, information sharing and research co-operation" (MAS, 2019a, para. 1) – effectively fostering public/private interaction while also expediating the cross-border distribution of tacit knowledge as carried by participating researchers. It should be noted, however, that the cooperation is currently the only one of its kind. All other agreements concern foreign financial regulatory authorities either in terms of governmental agencies or central banks, such that their general objective is to facilitate regulatory collaboration and/or to set up fintechs with the right business connections to move overseas. Especially the bilateral exchange of knowledge appears to be recognised in its significance for the expansion of local innovative capacity: the thought of it being key to enhanced financial services is manifested in all agreements featuring explicit clauses for information sharing (see Appendix I).

The MAS' interest in instigating global collaboration and its concomitant role as a driving force for the same is reflected in an accumulation of cooperation agreements that far exceeds those of other countries: Hong Kong's Monetary Authority (2021), for example, has entered into nine agreements, the United Kingdom's Financial Conduct Authority (2021) maintains 11, and Australia's Securities and Investments Commission (2019) holds 15 (see Appendix O). Lim and Gaw (2020) argue the reason for this to be the borderless nature of digital services along with the financial authority's strong awareness of the benefits and risks this carries. Mohanty explains: "We [Singapore] survive on collaboration. It's part of our DNA. We're just a small country and if we don't collaborate, how will we succeed?" (Barefoot, 2018, 31:57). On another note, the MAS' participation in the GFIN and the creation of Singapore's own GIA give companies the opportunity to establish formal and informal connections, contribute to technology diffusion through facilitated internationalisation activities, or else promote technical collaboration. While the latter is also encouraged by the Co-Innovation Programme, cross-national technology diffusion is further supported through the alliances of the IPOS. Ultimately, it can be observed that the MAS builds global linkages either through the self-initiated approach of other regulatory bodies or its involvement with an external networking initiative for regulatory collaboration. Other governmental bodies, in contrast, primarily assist in the creation of direct connections between fintech firms and other industry-related actors.

In the context of internationalisation being strongly encouraged and highly relevant for the majority of fintech companies, Lim (Appendix B) has observed that the most common ways to enter a foreign market are either the formation of partnerships or the immediate establishment of a local business. To do so, Lim states that startups can leverage the SFA's extensive network before clarifying that capital only plays a subordinate role in comparison to the value of such connections for venturing abroad. While Lim explains that this is due to the wide availability of financial incentives offered by foreign governments (Appendix B), the accuracy of his assessment becomes particularly apparent in view of Validus' approach to internationalisation. Ng (Appendix A) reveals the entry to Vietnam, for instance, followed the collaboration with locally based pharmacy chain MEDiCARE. Ng also points out prospects of making a similar move with multi-country business Xero – an accounting platform with which Validus is already partnering in Singapore (Appendix A).

6.3.5 Sub-Conclusion

Singapore's national innovation system illuminates how knowledge and technology exchanges within the fintech industry contribute to its innovative capability, particularly regarding interfirm relations and public-private sector activities. While a good basis for information sharing and innovation is found in the inherently combinatory character of fintech, the industry greatly benefits from the government's smart nation agenda and its emphasis on both research and co-creation.

Specifically, the innovation system is reinforced through the official stance that “research, innovation and enterprise are cornerstones of Singapore’s national strategy to develop a knowledge-based innovation-driven economy and society” (Research Innovation and Enterprise Secretariat, 2016, p. 2). In particular regard to digital technologies, financial resources have thus been allocated to support public R&D capabilities and to thereby strengthen the fintech industry’s startup ecosystem (National Research Foundation, 2021).

At the 2020 SFF, Deputy Prime Minister Heng Swee Keat (2020) underlined Singapore’s sustained commitment to dedicated investments in initiatives of both innovation and collaboration. Therefore, this is analogous to the strategies of the financial authority and works in accordance with their plan of building “a financial centre where innovation is pervasive and technology is used widely” (Menon, 2020, para. 1). The MAS provides financial support for the development of innovative technologies and strengthens applied research through the engagement of public capabilities; however, arguably more important for an innovation system are the efforts that are directed towards the simultaneous creation of networking platforms that facilitate the formation of formal and informal relations among industry participants as well as their concomitant technological interchange. Even though fintech is fundamentally innovative, the system is bolstered by the pronounced promotion of international technology diffusion while its ties with academia and the polytechnics additionally stimulate valuable inflows of knowledge for private companies. Considering that a government’s ability to counteract surfacing systemic failures is a crucial determinant for the innovative performance of an industry (OECD, 1997), the positive impact of strong government involvement in Singapore’s fintech industry becomes especially apparent.

Apart from creating auspicious international linkages for the local innovation system, Singapore’s financial authority also aids companies with the internationalisation of their activities. It is reasonable to assume that this depicts a natural development in support of intangible fintech services; however, the MAS’ proactiveness which has led them to be at the forefront of regulatory cooperation and the cross-national business connections by which this is accompanied present fintechs with a unique advantage in entering foreign markets. Additionally, the MAS’ contribution to the establishment of a separate regulatory network (i.e., GFIN) encourages companies to venture abroad by reason of negotiated access to local assistance (see Appendix G). Singapore’s global alliances for a simplified formation of direct linkages between firms finally gain relevance in view of partnerships being one of the main modes for fintech internationalisation.

7 CONCLUSION

> If we seize opportunities well, the technologies that are disrupting the markets are also the same technologies that will allow us to disrupt our competitors. […] We pay a lot of attention to the fintech sector because it is a sector that does not depend on the size of our geography or the size of our workforce or the size of our land. If you master that well, there is no reason for us to think that it cannot be a key engine of Singapore's continuing success and growth […]. (Chan, 2018, para. 9)

Despite being a relatively young industry still, the rapid growth of adoption rates is testament to the attractiveness of fintech as well as to the value these digital services bring to everyday life. It is of no surprise that numerous promising fintech hubs have emerged worldwide, though particularly Singapore has shown undeniable awareness of the industry's economic potential and consequently received great international recognition for its strength in the same. By assuming a theoretical perspective, this thesis addressed the success factors behind the city-state's position as the leading fintech hub in Asia through a detailed study of industry-level competitiveness.

The conducted analysis was split into three parts: the underpinnings of national competitiveness, the characteristics of the fintech ecosystem, and the innovative capability of the industry. Their individual consideration revealed several contributing factors to Singapore's success in fintech; however, it also highlighted the necessity for a joint assessment. Whilst especially the diamond model and the ecosystem model discussed many of the same aspects, they did provide differing points of view that only in combination can create a complete picture of the industry. Their connection is apparent: being primarily concerned with the relationships between the different groups of fintech-related actors, the ecosystem model is naturally framed by the institutional setting of Singapore and therefore also embedded in its national context. This was then extended by insights into the local innovation system, which directed particular attention to the knowledge and technology flows among the ecosystem's main drivers of growth (i.e., fintechs) and finally incorporated supplementary public sector elements. With further regard to the industry's international context, the theoretical framework was able to explain location-specific advantages, incentives to foreign entrants, as well as the official support for internationalisation activities.

Findings indicate that the success of Singapore's fintech industry can be largely ascribed to the pursuit of a national strategy for technological transformation by the government and the concomitant consideration of digital financial services as a vital element in the achievement of this vision. With a conducive business environment historically rooted in the strong economic involvement of political leaders, the city-state had laid the foundations for its strong appeal to foreign entrants early on. More

recently complemented by the intentional and effective creation of an entrepreneurship culture, the resulting combination of both has proven advantageous for the fast development of a thriving startup scene marked by its diversity. In connection therewith, Singapore's financial authority has been resolute in their aim of driving innovation in financial services. Beyond following its traditional function of being a central regulating entity, the fintech ecosystem benefits from the authority's simultaneous assumption of a collaborative role within the industry. The repeated provision of large financial grants for advancements in digital adoption and fintech infrastructure thereby not only conveys a shared responsibility but also a shared ambition for progress, and hence emphasises industrial development as a joint effort of the public and private parties. Public initiatives appear all-encompassing overall, and it is ultimately their proactive implementation that has allowed for the timely addressing of the industry's emerging needs.

One of Singapore's strongest distinguishing features is found in a strategically useful geographic location, which presents local and foreign fintechs alike with a point of access to the underserved economies in SEA. While funding for their operations is widely available, the endeavours of early-stage ventures are particularly supported by VCs of a global character that ultimately allows for fast business growth. Companies such as Validus have moreover taken initiative in their endeavours for growth and are educating their customers on the possibilities of fintech services such as to improve usage rates and enhance innovative technologies. In fact, innovation being the key objective within the industry has led to a widespread openness in terms of sharing knowledge as demonstrated by the prevalence of partnerships, the increase in innovation labs, or the general importance placed on networking. The government's unified approach to fintech sustainably promotes related activities: the attention given to the development of high-quality regulation as well as its strict enforcement create trust between fintech service providers and consumers while public assistance for R&D strengthens technological competitiveness.

Singapore has been able to create a fintech ecosystem in which collaboration is rampant and, in this way, fostered local competition on the basis of facilitated innovation. Simultaneously, the government has taken the necessary steps for the industry to overcome the limitations of a small domestic market by accelerating internationalisation activities through the initiation of co-operation agreements, the creation of or participation in regional and global networks, and the introduction of other supportive programmes. With COVID-19 having fuelled the rate of digitalisation worldwide, these circumstances will continue to drive the city-state's success also in the next chapter of its fintech journey.

8 FUTURE PERSPECTIVES

Fintech remains a young industry, though its considerable growth has led to a dynamic environment in which things other than just the technology itself are changing at a rapid pace. In Singapore, much has happened since the city-state first embarked on its fintech journey in 2015. As the local industry is now becoming increasingly varied in its activities, future work can extend the contributions of this thesis by investigating success in relation to one or more specific activities (e.g., blockchain, artificial intelligence) rather than to the industry as a whole. It would be interesting to see whether factors of success vary by activity and, if so, how specific combinations can be defined.

Since industrial competitiveness also exhibits a vertical dimension, future work ought to look at the fintech industry from the level of individual businesses. Although the research performed as part of this thesis helps understand the contributing factors to firm success, it is necessary to take their strategies and capabilities into account in order to holistically examine Singapore's position as the leading fintech hub in Asia. Such a study would be able to provide insights into how collaboration and competition are perceived, how internationalisation is approached, or how networks are characterised. This could be done by conducting interviews, surveys, or a combination of the two.

Another possibility is to assess success in quantitative terms based on measures related to the performance of either businesses or the overall industry. In terms of the latter, for example, the level of local innovation could be assessed through the total number of high-tech patent grants or the sum of investments in R&D. The classification of a dependent variable for fintech success would allow future work to find a concrete answer as to which factors have an impact on competitiveness, which factors can be neglected, and whether there are any interdependencies. In this context, a longitudinal study would furthermore permit to evaluate the effect of both variant and invariant factors over time.

Lastly, future work can take the findings of this thesis as a point of departure for the comparative analysis of fintech hubs. While it is difficult to remove case studies from their context, this could nevertheless draw attention to the differing or joint characteristics of their respective industries, their state of development, or their speed of growth. Since the fintech industry is global in scope, however, any future analysis must naturally not be confined to the national level. Especially regarding COVID-19, it would be of interest to consider changing attitudes towards remote working and outsourcing in their relevance for a successful fintech hub.

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10 APPENDICES

10.1 Appendix A

Interview with X.Y. Ng, conducted 17th February 2021

Question 1:

Can you give me a little bit of background about yourself as well as the company you work for?

Answer:

Absolutely. I run the Marketing and Comms Team at Validus. We're a fintech lending business, specifically lending to the SMEs of the markets that we're in. We were founded in 2015, in Singapore; we were founded in Singapore and are headquartered in Singapore. At the moment, we are present in four markets: Singapore, Indonesia, Vietnam, and Thailand. We only just received our license to operate in Thailand, was it last week? Every week feels like months here. So, we only just recently started in Thailand. We started in 2015, but the growth only really happened in the last three years – it was pretty quick. We proved a model, did a Series A, and then a year after operating we expanded into Indonesia and then we expanded into Vietnam and then followed by Thailand. Our key focus is ASEAN countries, the developing countries in SEA specifically, and the mission is to drive financial inclusion for SMEs in this part of the world.

P2P [Peer-to-Peer]-lending, or fintech lending, isn't new per se. It's been around for a while. It's quite big in the UK and China, but SEA is just taking off as in the last five years. We've had this big proliferation of fintechs in the region and we're part of that initial group of fintechs that have used the crowdfunding model to try and address the SME financing gap in the region. With what sets us apart with all the other players in the market – there's quite a number of regional fintech lending platforms. The biggest thing that sets us apart in Singapore specifically is our investor base. Our investor strategy. We onboard investors who are accredited investors, specifically high net worth individuals and institutional lenders. What I mean by that is really we work with investors who are institutional; we work with FIs, we work with family offices, funds, for example. We don't open up the platform to retail investors like myself, for example, or my mom and dad. We chose to work with accredited investors only, because in essence they are a group of investors that are naturally more sophisticated and understand the risks and rewards that come with an alternative investment instrument. Also, it keeps our cost down in terms of servicing this group of investors, because it is a much smaller volume and like I said, they are much more sophisticated. The effort of servicing this

group of investors is quite different to, for example, if we were to go with a retail group. With institutional investors, we are able to keep the cost of funds pretty low, which translates into us being able to offer lower interest rates to businesses as compared to other players in the market.

Another big difference is our model. Because we connect SMEs to access to financing from these investors, we've got quite a couple of products that-. We provide financing for businesses; one of them is the straightforward unsecured business loan. That in itself is really simple: if a business comes and says that they need 100.000 dollars, for example, they apply for that, we do a credit assessment, and we determine their interest rate, fees and credit limit. And then we put them up on the marketplace where the investors can then invest in. A lot of platforms offer unsecured business loans as their main product; other products would include invoice financing or purchase order financing, invoice discounting, merchant cash advances. Different financing products for businesses. For us, we're very focused on invoice financing. So, what we do different to other fintech lenders is that we choose to primarily provide financing through these two solutions of invoice financing and purchase order financing so that we can finance entire local supply chains. What that does for the businesses is that it drives their growth quite quickly, and it's a very efficient way of us addressing the financing gap – because that's where it's needed most with short term cash flow solutions. And that in turn strengthens the entire supply chain and boosts the economy. We're hoping to achieve our mission by using that as our main model at the moment, and it also keeps the risk low for our investors. Compared to other online lenders that offer straight-up unsecured loans to businesses just based on credit assessment that they do off the back of whatever data they can get, we have an extra layer of security in terms of making sure that we've partnered with corporates to finance their SME vendors. We're financing the supply chain and that in itself is a less risky environment. We know that the loans will get repaid, because they get repaid directly from the buyers, and the money is being used to help the businesses grow or take on more projects. And that really kickstarts the economy as well.

Question 2:

Alright, thank you. Besides the differentiating factors that you have just mentioned, your company is also doing well in terms of winning one of the Singapore FinTech Awards for the *Validus Credit and Customer Monitoring System* – which was praised as being very innovative. Do you think that Validus' innovative capability is a competitive advantage as well?

Answer:

Oh, absolutely. I think there really only are a few areas where you can differentiate yourself. Firstly, obviously it's the model and the strategy. And secondly, it's the pace of innovation and the impact of those innovations. We've been really lucky to have a very good data science team, who have

developed that tool to be able to help us proactively understand our SMEs' need for financing. We can proactively offer them financing solutions even before they get themselves in that position where they're: "Oh, I need to bridge my cash flow and I need more working capital than they apply." What we've done is we've taken this one step higher, earlier, and say to them that: "Hey, with this extra working capital that we can offer you, this is what you could do with it potentially: you could capitalise on opportunities that otherwise you may not be able to because you haven't got the funds to do that and increase your revenue."

We were awarded winner of *Singapore Financial Institution* last year for this particular innovation. So, that was really good. I'd say that innovation is a given for any fintech business. A big one. And I think the last differentiating factor for us is people. For a lot of tech startups, or a lot of tech companies, you see that naturally there is a lot of tech talent. And more often than not, the core team has got a very strong tech background. What sets us apart from our competitors is that we've got a management team that is made up of mainly people that have got a lot of experience in SME banking – directly relevant experience. Coupled with the tech capabilities that we've got, it has created a very stable and a very good environment for the business to grow and for us to be able to achieve our mission in a much more effective or quicker way than other businesses. We're very lucky to have those talents and the amount of experience that we've got in the team.

Question 3:

Speaking of the talent in your team, do you source these professionals mainly from the Singaporean market? Or do you look outside of Singapore as well?

Answer:

We do believe in having a *glocal* team – that's what we call it. We hire within the markets that we've set up in. With Singapore – naturally, our co-founders aren't Singaporeans. We don't have a mandate to only hire Singaporeans, of course. It really comes down to the experience, how relevant it is. And we do look for diversity as well. We're quite good with gender diversity, just to make sure that we've got that good balance in the team. There is no hard enforced rule or a mandate in terms of hiring only locals; however, we do really value local experience. Within the Singapore team, most of the people and management team across the office definitely got local experience. And there is also a lot of us who have had a regional or global experience. We definitely value that. And then in each of the other markets we're set up in it's the same hiring criteria. It is necessary to have a local perspective or local experience but at the same time we also really do value that international experience or whatever else they bring to the table.

Question 4:

Alright, let’s move on to the next question. Maybe you can tell me about what you believe constitutes the success of Singapore’s fintech industry? Is there anything that Singapore does different to other fintech hubs and that strengthens its overall competitiveness?

Answer:

Absolutely. I think Singapore traditionally has had a really good reputation for having really good infrastructure for businesses to be set up here. It is a very intentional plan by the government, and they've done a really good job in terms of developing Singapore into a financial hub. For Validus, specifically, the decision to start and base the business in Singapore was due to the reasons that not only made it conducive to set up the business but really supported our needs as a growing fintech company. In terms of it being a financial hub already, with a very strong, stable regulatory framework, really robust infrastructure – those two things naturally led to us making the decision that it's a great environment for us to build the test bed as a marketplace lending platform to test the product and the services that we offered. And I think on top of that, the Singapore government's commitment to develop Singapore into a more tech innovation hub also meant that there are a lot of support schemes and initiatives that we as a fintech startup could leverage at that time to gain certain competitive advantages and to support our growth strategies. For example, there were different grants that we could apply for, that meant that we could adopt different technology and different solutions at a much lower cost to be able to enable us to grow much faster than our peers in the other countries. I think also that strategically, where we're located with Singapore being the hub of Southeast Asia, it's got really close proximity to emerging markets like that of Indonesia, Vietnam and Thailand – those three markets at the moment that we're in. That really does help in terms of our growth strategy; the close proximity means that we are able to travel much more easily, we are able to collaborate better and that way we also are able to then better bridge the SME financing gap in the region. I think all of those things put together make Singapore a really good place for us to set up shop and has definitely contributed to our growth in the last three years hugely and immensely.

We do actually get a few rewards, and that's also to do with us being quite active in the industry. We understand the value of communications and marketing, of course, and we do believe that it is important that there is the right recognition for fintechs that do well just as much as there is a strong regulatory framework to support the growth of the industry – we feel like the rewards are really necessary, too. So, it's not by sheer luck in that sense. We do make sure that we actively participate and are very active in the industry with the other players especially with the regulators, with associations. That has also really helped in terms of driving the growth of our business.

Question 5:

You mentioned the government's role for industry growth. From what I've understood, you consider it a positive development that the government is taking such strong actions. However, do you think there might also be a possibility of there being too many regulations? Or do you think the government should perhaps do even more?

Answer:

I think in a lot of cases we always say that the government can do more. There's always so many gaps anyway. But I think in the specific context of Singapore the government has done a really good job in terms of setting up the regulatory framework and putting their foot down and saying that: "This is the list of criteria that you've got to meet. These are the guidelines that you've got to adhere to." And in doing so, what they've done is drive the responsible and sustainable growth of the industry. At the moment, I personally don't think that we are being overregulated and all the regulations in place for crowdfunding platforms like us is absolutely necessary to weed out any sort of illegal lending activity. At least to deter the rise of that happening, so I think it's definitely necessary.

And I think Singapore has always been a bit of a benchmark for the region. We've found that, for example with Indonesia, in recent years they've also started clamping down on illegal lending operators. And they've come up with more regulations as well. Sometimes for some companies it becomes a bit of a blocker, or they become bigger challenges to overcome in order to meet those guidelines. But I think it's absolutely necessary to weed out the stronger companies, the ones that have got the right intentions and also are well supported enough to both carry through their intentions or their objectives in the first place. Having started in Singapore, I think that really helped us meet the regulatory requirements in all the other countries. It's given us a good foundation in that sense and with being able to easily meet those criteria and set up shop in the other countries and do the same thing as what we have done in Singapore with SME financing.

Question 6:

If we shift the perspective a little bit, do you think there are any particularities to the culture within Singapore that strengthen the industry?

Answer:

Culturally, I suppose because Singapore is such a hub. It's traditionally been such a financial hub anyway and now there is deliberate intention to develop Singapore into a tech hub. So, that also means that we are a country that is very open to foreign talent – people coming in, investors, encouraging different business and startup to set up shop in Singapore. Naturally, that has made us very multicultural. I mean, given the history, we're already quite a multicultural society. But then with the government's deliberate intentions to grow Singapore into a tech hub, a financial hub, that also

really means that they've created an environment where it's really easy for different people, different cultures to come together and build a business. I think in that sense we've really benefitted from having that diversity as well.

Question 7:

On a more individual level, do you think there's anything particular that is driving the success of businesses? For example, are there any specific expectations for people and their careers?

Answer:

I'm not sure I understand the question. I think in terms of a culture it's definitely quite competitive.

Question 8:

For example, I would assume that people are generally hard-working if you say that the culture is very competitive.

Answer:

Yea, absolutely. I think in general we do hire people that are naturally very driven. We do look for certain qualities in people that we hire. We intentionally are after people that don't necessarily – we're not necessarily looking for people that are experienced in every level that we hire for or the skill set. What we look for more than anything is really the learnability, which is what my co-founders like to say. How open that individual is to new ideas, how resourceful that person is in taking new ideas and actually doing something about it or actually taking it to the next level. So, for us it's having that attitude.

And in terms of being hard-working, I think naturally as it comes with being part of a fast-growing business, it comes with the space. It's definitely an expectation that everyone here is hard-working, because we do want to take the business to the next level, and we want to see growth even more. A lot of people that have joined Validus really appreciate the fact that what we're doing is making a difference in the society. It is directly impacting business growth, which is then directly driving employment, for example, in the economy. For us, knowing that plays a part in how we see our jobs and what we do and that drives us as well. I think having purpose specifically in the roles that we are in this business is very important and that's really driven the kind of people that we have managed to hire. That just comes with it, I think.

In terms of being hard-working, we still operate like a start-up. Technically we're not considered a startup anymore – we've been around for a couple of years. But we do still operate like a startup and the energy level is really good. It's not like we are a big company with a lot of processes and legacy, infrastructure that we've got to deal with. We don't, so in that sense everyone is still very driven and there's good energy in their business. It's not like we've got a [*unintelligible*] environment. And it's a

very flat hierarchy as well, there's a lot of autonomy and people are always encouraged to share their views or ideas so we're very different for example from what you would expect in a bank. We're still quite corporate - it's a bit in the middle. And in terms of a culture, it's good in that sense that we're not too comfortable and everyone's very driven. So, it's good.

Question 9:

Going back, you said that your company has benefitted from governmental schemes. Do you recall which ones?

Answer:

There are quite a few grants the government has in place for new businesses and new startups. I won't go into detail about each one, but there are grants where you could apply to get, say for example, a certain percentage of your digitalisation efforts covered or subsidised. So, that's helped of course. And also, in terms of hiring. Recently, because of COVID, the government introduced more measures and more relieve measures for businesses. We've taken advantage of that, too. That has allowed us to hire more talent of a certain experience level at a much lower rate. And that benefitted from being able to send our employees onto training programmes that are being highly subsidised as well. So, a lot of re-skilling or a lot of training that normally we wouldn't be able to do – just because of the stage of growth that we're in. We can't typically afford that at the moment. With government assistance, that has allowed us to do that.

I think more importantly, we have also really benefitted a lot from being an active member of the trade associations. For example, with the SFA, that's given us a lot of support in terms of at least having a network. And also, because we're very lucky to be backed by some very reputable VCs such as Vertex Growth, Vertex Ventures, FMO, Open Space. Each of the VC partners have not only provided support in terms of equity investment, but also a lot of learning opportunities. A lot of mentoring opportunities. And we've benefitted a lot from their network, too. Working in such collaboration with trade associations and with our VC partners, that has been a very supportive environment for us to be able to help us grow the business in all these different ways and opportunities that we've managed to leverage. I think that's been a really important point. And in terms of government assistance over COVID, because of COVID-19, that's really just taken it to another level.

Question 10:

You mentioned your network of VC investors and trade associations. Are there any other players in your network?

Answer:

Yes, definitely. The SFA, for example. All their members are fintechs in the space. There's a lot of opportunities where we could collaborate with other fintech to, for example, come up with new products or new solutions to the gaps that perhaps exist in the market. It's pretty similar with each association that we work with. Also, there are trade associations for businesses specifically, small businesses in a certain industry. With those associations, what we proactively do is to go to them and offer workshops to drive the financial literacy for businesses. Part of what we do is also a bit of education on our part. Because it is really important that businesses have more understanding and more awareness of the financial services that they can access and the options that they have. That forms a big part of what we do. Recently, there's been more of a focus for us. We are actively working with associations to do webinars, to improve the financial literacy of businesses, as well as hold workshops. We've also been contributing articles so that we increase that education bit within our target segment.

Question 11:

In terms of educating your customer base, do you think that this in turn helps them to better signal what your company needs to do to be able to provide better services?

Answer:

Yes, absolutely. The more you know, then the more you would have expectations. Which is really good in our case, in terms of traditionally businesses are only aware of banks offering financing solutions for loans. With the emergence of fintech lenders like Validus, it just means that they've got more options now and potentially different options for different needs. For us, we offer specifically short-term financing solutions which is meant for bridging the cash flow gap and not, for example, a whole lumpsum injection for your capital. It could be used for hiring more people, to start a new project, for example. Different use cases. I think with that it's been a really important part that businesses understand what the different financing solutions are best used for, and the options that they've got. And in turn they can turn around and push financial services providers for better services.

I think traditionally SMEs have not been serviced as well as consumers. There aren't as many services. That's one. And the banks, they have been doing a good job, but there's also a really big group of businesses that just are not able to access bank services. With what we're doing, we're increasing the awareness for businesses that: “Hey, you actually can access services and whilst you don't currently, maybe you're not currently eligible for them, but in time to come you should be able to expect that you can access these services.” And I think that then pushes the industry in general. The businesses will first have to realise: “Hey, that will really benefit my business. Having access to

all this suite of financial tools will really benefit my business, and I want them." Then that pushes the industry to come up with solutions to meet that need. So, I think it's a bit of a chicken and egg thing. The businesses have to ask for it, there has to be that demand, and then companies can meet that demand in that sense.

Question 12:

Going back to networking, do you also collaborate with technology companies or FIs? If not, do you perceive this as an opportunity from which you could benefit in the future?

Answer:

We do actively work with banks, as well as other FIs like VISA. As of being a fintech lending platform, there's a lot of opportunities to collaborate with other tech companies to be able to provide better services or come up with a new solution. I can give you two examples. One is we've partnered with *Xero*, which is an accounting platform for businesses. We've made it very easy for businesses to be able to apply for financing if they're a Xero customer. If they're already using the Xero platform and automating streamlining their accounting, they'll be able to see that: "I've got all these invoices coming, I've got all these payments to be made" or "I've got a bit of a cash flow gap here". Within the Xero platform, through the partnership, we've made it a lot easier for businesses to be able to just apply for a loan. They don't have to necessarily give us a lot of documentation or submit a lot of documents for us to make a lending assessment. What we do is, through the partnership, we're able to access certain information on their Xero account and then we make the lending decision based on that. For the business that's doing that it's a lot easier to apply for financing and suddenly they're also – I suppose, in that sense they can also easily access financing where they were previously not able to. So, that's one example.

Another example that we've recently partnered with is a property technology company. That scenario is quite similar. We offer financing directly on the *Really Singapore* platform, so businesses who are using their service to bid for construction projects – for example, if they've won the project, they can easily apply for financing off the back of that project on that platform. We've collaborated with really Singapore to make that happen, and because we get upfront information or data on these businesses and the projects they've won, we're able to pre-approve businesses for up to a certain amount. That also means they don't have to – again, the application process is a lot simpler. Previously when they didn't realise that they are able to obtain financing just by winning a project, and now suddenly they've got access to financing when they need it. If they need it. That way we're increasing access to financing for SMEs and hopefully with that it will enable them to grow their business faster, quicker, increase their revenue, and ultimately, it's driving economic growth for the market that they're in.

Question 13:

Other than partnerships within Singapore, do you have any partnerships that reach outside of the country?

Answer:

Yea, absolutely. In every market that we're in, in every country that we're in, we do a very similar thing. Xero is also not a one country business. They are in a couple of countries, so we actually hope to replicate what we've done in Singapore across the other markets. So that the SMEs in the other markets get to benefit, too. And for Really Singapore, at the moment they're only in Singapore. But we do have very similar partnerships in each of the markets that we're in. For example, in Vietnam we're actively speaking with technology businesses that serve SMEs or have got a local supply chain. We partner with them to see how we can finance their SME vendors. Very similar sort of a model, it's just different businesses that we partner with. In fact, with Vietnam, one of the key partnerships that we've got there is where we partner with MEDiCARE Vietnam. They are a company that has got pharmacies. We are partnering with them and look at: "Oh, how can we fund these pharmacies?" That's basically what we look at. So, quite similar in that sense.

And outside of partnering with corporates and technology companies, we partner with FIs. So, we do work with banks. In fact, we don't necessarily compete with banks because they – we're serving the customer segment that they don't serve at all. Typically, we describe it as that we serve the underbanked businesses. We're not really in direct competition with banks. In fact, I think in most cases we complement their services. A business that was previously able to get only 100.000 dollars from a bank as a credit limit – and they require more working capital to run their business – they now can apply to us and we're able to top up the difference potentially. In other cases, if they get rejected by a bank or they were not eligible for financing through a bank previously, now they have options like us to be able to get the financing in the first place. So, we do work closely with banks to do that – either fund their existing customers more, or we look at how we could collaborate to finance more SMEs. And other FIs we do also regularly engage with and speak to. For example, with VISA, we have got a partnership there where we have developed a solution for SMEs so that they're able to access working capital through a virtual credit card system that helps facilitate their cash flow so they can easily allot their capital and then re-invest in their products through that virtual card solution. We did that a couple of years ago with VISA, and it's still an ongoing product that we offer.

Question 14:

You mentioned that you benefit a lot from both your partnerships and network, while describing the industry to be very collaborative in nature. Seeing as fintech in Singapore is becoming increasingly international also in terms of foreign entrants, do you think that this poses a threat? Or does it perhaps contribute to more collaboration opportunities?

Answer:

I don't think it's a bad thing. It's definitely good for the growth of the entire ecosystem. Especially for the region, given that we are such a hub. It's good that there are more entrants, and I think with competition it really does improve the level of services or have, you know, more innovative products in the market. I think competition is good for the industry in general and consumers, whether or not it's individuals or businesses. I suppose with competition it's more that it brings about more challenges for businesses like us. I mean, if we get more players in the space, potentially that could dilute our market share. And that may or may not be good for the industry as a whole. But it all goes through a bit of a pattern in terms of – So, we started out with having a lot of entrants in the first couple of years and I think we're now headed towards a consolidation period in the industry. With P2P lending, as we start to mature, as the industry starts to mature a little bit, we're going to see fewer players. That's not necessarily a bad thing for us.

But I think also not so much that there are more players that's impacting competition. I think the larger threats are more economic based. For example, there's a risk of COVID fallout and previously the US and China trade tensions. All those events have led to a lot of economic instability. For fintech players like us, that does impact the business in terms of the demand for loans. And for us, it's the risk involved. Because the SMEs that we serve are directly impacted by those incidents, and that also impacts their ability to service their loans. Because of that, that impacts our business in general. I think with COVID-19 fallout – I mean, there's been a lot of good government relief measures. And in Singapore particularly there has been introductions of relief measures such as lower loan rates. That has actually led to a reduced demand for a product like ours because it's typically at a higher interest rate than banks, for example. And that has then basically led to new pricing levels and us restructuring our products because of the higher risk environment, and us looking at how we can better service our pool of SMEs. That has led to some changes, but I wouldn't call them a threat. I'd probably call them challenges. And more so than competition that's within the industry.

10.2 Appendix B

Interview with Teck San Lim, conducted 12th March 2021

Question 1:

Can you give me a little bit of background about yourself and the SFA?

Answer:

OK, sure. I joined SFA about one year ago. Before that I was working in the insurance industry for about 15 years. And then I left the industry and joined over to the SFA. In terms of SFA, we were formed about five years ago around the end of [*unintelligible*]. When we started, we had less than 30 members. As of right now, we have about 920 members. It's actually quite a huge jump in our membership. I think that the main increase really came during the COVID period. It was really after March last year. Before March last year we had about 300+. So, over the past one year we had about 600+ new members, which is a bit of a surprise to me. I actually went in to find out a bit more. I realised that during the COVID period, there have been quite a number of new fintechs setting up and a lot of our new members are really new fintechs. And it's companies who were incorporated within the past one year. I guess it's not really a surprise, because I think the one good thing that came about from COVID is that a lot of companies, a lot of banks and insurance, realised the importance of digitalisation. That's why they are moving very rapidly into digitalising their current operations – be it in terms of the onboarding part or be it in terms of the compliance part. A lot of the new companies set up this past one year is on the direct tech side of this. Companies who help banks, insurance to look after their regulations, to measure that they stay compliant to the regulations.

Question 2:

You mentioned that you grew a lot, especially in the last year. What would you say is the specific role of the SFA within the industry?

Answer:

In terms of role, I would say we are the one building bridges. We are helping to build bridges between our fintech members. What we believe is that fintechs services can always complement each other. If you are doing one solution and we are doing the other solution, we can partner up and offer our solution as a bundle to a customer. So, we're helping to build a bridge between members themselves. The other way, the bridge that we are building is between the fintech companies and our government agency, the MAS. We do have quite a close relationship with MAS, in terms of if MAS is looking for

any feedback about any new regulations that they want to introduce or the possible impacts to the fintechs, they come to us and we help them to collect the feedback. Similarly, if the fintechs have any feedback or views which they want to make known to the regulators, they can go to us as well.

The bridge that we are building is really from Singapore out to other countries, as well. Singapore is a very small country, so in terms of population size we have about six million. If we are purely focussing on the Singapore market itself, I don't think you can go very big. So, we always encourage our members to go overseas. To help them, we signed a few MoUs [Memorandum of Understandings] partnerships with overseas fintech associations and with other government agencies overseas. For example, if I have a member who wants to expand over to the UK side of things, I can help them to link up with the UK fintech association, I can help them to link up with the UK government agency, and also to the Singapore government agency sat over UK. If we're talking about Denmark – if I remember correctly, the ambassador for Denmark to Singapore actually visited SFA recently, a few months ago. So, we do maintain very close ties with overseas fintech associations and government agencies as well.

Question 3:

Apart from the work of the SFA, can you tell me what you believe constitutes the success of the fintech industry in Singapore?

Answer:

One very important part is really the support from the government sector. I would say that the government regulator, MAS, is quite forward-looking in terms of the fintech developments in Singapore. We do have a few regulations which are in place to regulate the developments of the Singapore fintech industry. For example, you can talk about the Payments Services Act or you can talk about – I think there are other regulations which are looking into the regulating of the fintech ecosystem in Singapore. Another thing is the level of support. During the COVID period, the MAS worked with SFA to roll out quite a few grants and support for fintech companies. If you are a fintech company certified by SFA, you qualify for certain grants which will help you to at least maintain your business or grow your business during the COVID-19 period.

And the second thing is that Singapore itself is a business hub. So, you have the majority of companies who set up their regional HQ [headquarters] here in Singapore. If you are the B2B kind of fintech company, it is a very good place for you to set up operations here. Because you have a lot of regional HQ set up here in Singapore. From Singapore you can reach out easy to countries around the region, around SEA. You can go about business in Vietnam, Indonesia, where the population

are still relatively young and there's a really huge potential for fintech companies to go. Or even that you talk about Singapore and China. Singapore and China have actually a quite close business relationship. So, from Singapore you can expand over to China as well.

Question 4:

When you talk about the close relationship with China, does this have any particular reason? For example, are there a lot of Chinese individuals working in Singapore's fintech industry that would help such a development?

Answer:

If you look on the broader side, Singapore and China have always been quite close in terms of all the business relationships. Especially during the past three years, you could see a number of Chinese fintech expanding over to Singapore. I guess one reason for their expansion to Singapore is that although Singapore is a multiracial country – we have Chinese here, Malay here, and Indians here. But the majority of Singaporeans are still Chinese. So, it makes sense for Chinese people to come over here. Because in terms of language barrier, there won't be that much compared to if you expand over to Malaysia where Malay is a more often spoken language.

Question 5:

This also implies that China is a good destination for fintechs, since the barriers to entry are lower due to a shared language. And it's more difficult going the other way, for example to Malaysia. However, I've read that a lot of fintechs in Singapore first go into SEA when they internationalise. I haven't found so much about China, so what has stood out to me is mostly the go-to countries such as Thailand or Vietnam. What is your assessment of this? Or in other words, where do fintechs first go when they internationalise?

Answer:

The top three choices for Singapore fintechs would be places in the region. I talk about Indonesia, where you have a very large population of people who are underserved in terms of financial services, and talk about Vietnam, where there are less proportional people who are underserved but they have a very huge youth market. The third one I would say is Malaysia, because in terms of the culture Singapore and Malaysia are the closest among all the SEA countries. In terms of the destination, these are the top three for Singapore fintech companies. If we talk about the fourth and fifth choice, I would say that the fourth choice would be Australia. The fifth one would be Europe. Europe I'm talking in general, the whole of Europe. Because of the Europe agreement and everything.

You are right, for China now I would say it's more of a one-way traffic. You have Chinese fintech coming over to Singapore, but you see less Singapore fintech going over to China. One reason is that to be honest, the development of fintech in China is much a hit-off Singapore. And also, for them, the barriers to entry are actually quite high. It's not that easy to set up a fintech business in China. Usually how we see is that in terms of the cooperation between China and Singapore, fintech is really a partnership kind of relationship. Maybe Singapore, instead of going into China they partner up with a Chinese fintech who is already established there in China.

Question 6:

On this topic, how would you say that fintechs commonly internationalise? Is it through partnerships, for example with multinational companies or other fintech companies? How do they usually enter foreign markets?

Answer:

In terms of foreign markets, the trend that I observed is through partnership. I think the top way is through partnership. The second one is you go in and set up a business. For companies who went into overseas countries to set up a business, I would say that a lot of them are actually following their customers. For example, if I am serving [*unintelligible*] here in Singapore, I could open an office in the UK to serve the [*unintelligible*] branches over there. It's really about following your customers where they go.

Question 7:

And when they do that, do you think it is more important for these companies to have the right connections to internationalise? Or is it maybe more a matter of having the necessary capital? What would you say is the most important thing for them to have?

Answer:

Capital is important, of course. But I would say that a connection could be much better than just pure capital. Why I say this is because, a lot of countries actually have incentives for companies to expand over there. If we talk about the UK or Australia, they do offer grants and support to companies to expand over to their countries. Even if you do not have the capital at the start you can go to the government agency over there to see what kinds of grants and support they can offer you. So, I would say connection is better than capital. But, of course, capital is important as well.

Question 8:

And I suppose that applies the other way around as well. So, the grants and financial help that Singapore can offer to foreign entrants coming into the market. What would you say are the specific incentives that Singapore offers these companies? Or even the local companies, what are the incentives to set up business in Singapore?

Answer:

If you are talking about fintech in particular, MAS have quite a number of grants available for fintech to come over to Singapore. I would say that in terms of the grants, it's not really about giving you support to set up a business here. I think the focus for MAS is for you to grow your business. For example, MAS will not give you money to help you set up an office here. But if you are doing a PoC with a company here in Singapore, MAS can provide certain grants to help you offset some of the costs for the PoC. At least from the MAS' point of view, they are not giving money to ask you to set up a business here. What they want you to do is to set up a business here and grow your business here.

Question 9:

The MAS helps businesses grow by providing them with the capital to do so. Are there any other incentives? For example, incentives could be that Singapore has a strategic geographic location or that there already exists a good network for fintech. What do you think, are there any other reasons besides purely financial ones for companies to operate in Singapore?

Answer:

I would say it is the government support. And the stability of government. I think that is one of the main criteria that companies look into when they wish to expand overseas. You will not want to grow a business when you know that the government – for example, Denmark. You would want to go into Denmark right now, I would say. So, I guess governments play a very important part as well. Other than Myanmar, I would say that maybe China – might not be very good example, but the government [*unintelligible*] I go see plays a part as well why you don't see a lot of foreign fintech in China.

Question 10:

When you say that there is a lot of government support, how does this compare to other fintech hubs? What is unique about the support given in Singapore?

Answer:

I'm going to use Hong Kong as the best example. Hong Kong and Singapore have always competed as a financial hub. In terms of government support, based on what I know – because I'm also in close contact with the fintech association in Hong Kong – I don't think one is much better than the other. But a lot of reason why all the companies choose to set up in Singapore rather than Hong Kong I guess is really the access to market. Why is it access to market? If you set up in Hong Kong, you are maybe looking at China. But right now, I would say that Hong Kong is in a very fury state because of all the new government rules that they are setting up. It is skewed in a very fury state whereas Singapore is more stable. And then in terms of access to market, you might not have that next goer access to China, but what you have is access to countries around the region of SEA areas. Which has a bigger potential market than China. Because China now they are relatively well-served in terms of all the financial services, whereas for countries around the region like Indonesia or Vietnam there's still potential for fintechs to go in and then help to improve the financial service there.

Question 11:

When you talk about these customers in SEA, is it mostly individual customers? Or is it SMEs for which fintech is trying to bridge the financing gap?

Answer:

I would say it is both. So, you have a B2B type of solution. You also have a B2C type, to really go and improve the access to financial services. B2B type, I see quite a number of those peer-to-peer lending platform set up around the region. Also, have seen examples of companies who helps to provide loans, or microloans, to the people rather than to a company. I guess it's a mixture of both B2B and B2C.

Question 12:

In Oliver Wyman and the SFA's report on Singapore's fintech ecosystem, they are talking about the fact that in the early stages of fintech there used to be a bigger focus on B2C activities whereas now it is shifting towards B2B. Looking at the businesses within Singapore, have you noticed anything in that regard?

Answer:

Yes, you are right. I would say that in terms of the early stage of any development in any countries, the B2C market will always come first. And that's the way you move over to the B2B side. Whilst I would say that the banking side – the banks are usually the ones who got fintech first. Then followed

by the insurance or followed by the asset management side. I see that's a norm in most other countries also. You start off your B2C side, especially on the payment side. I think those are the lower hanging fruits you can choose to go first.

Question 13:

When you say that fintech is first introduced through the banks–

Answer:

Yes, you see that banks are adopting fintech first and then you can see that after that it is followed by the insurance or the asset management houses.

Question 14:

Just for my understanding: Before startups set up, it would be the banks that first adopt fintech technology?

Answer:

Yes, correct. Now I have a number of startups, so they are looking for their customers. In terms of customers, I would say that usually banks are their first few customers. Then followed by insurance. So, usually banks are the early adopters of fintech.

Question 15:

Besides as a customer for fintech, banks commonly partner with startup companies. How is trust established between these two parties? What signals to financial institutions that it is beneficial for them to work with such young fintechs?

Answer:

A few things. First one is that a lot of these startups are started by former people in the financial industry, who have left the industry and then started their own startups. So, there's a connection there. Second thing is that a lot of times, before they really embark on full-scale project, they are usually envisioning a smaller scale PoC. Just to see how things can up before they really go on the full scale.

Question 16:

In terms of trust between FIs and startups, I read that the SFA introduced the FinTech Service Provider Compliance Readiness Framework last year. Have you noticed any differences since the introduction of this framework? Has it improved the relationships?

Answer:

In terms of improving the relationship, I can't really comment on that. The purpose of the introduction of the self-assessment framework is to give and show to the fintechs the types of regulations that they are required to follow if they are going to work with a FI. I'm not sure if you're aware, in terms of if you are a bank or insurer in Singapore, you're subjected to a stricter set of regulations by the MAS. I would say that in terms of your cyber security, your outsourcing, there is a set of guidelines implemented by MAS that you need to follow. But the thing is that because most of the startups are a very small team, they might not have someone specifically tasked for these compliance or regulation laws. So, it's a bit hard for them to keep track or to understand all of these different types of regulations.

What SFA did is that we have worked with Ernst & Young and also MAS to introduce this self-assessment framework. Basically, it's about breaking the regulation into bite-sized info so that it's easier for the fintechs to understand. And then after that, you can google self-assessment, it's a checklist to see if you have fulfilled the basic requirements to work with these banks and insurance. I guess the purpose of the self-assessment framework, first of all, is to get the fintech companies up to date with all the different regulations. Second of all, the second objective of this self-assessment framework is we hope that with this self-assessment framework the fintech can show the banks, the insurance that: "Hey, I do meet these criteria so it's okay for you to work with me." Of course, the banks will still need to do their due diligence on their onboarding of these fintechs. The main objective is to get the fintechs up to date with the regulations rather than to improve their relationship with the banks.

Question 17:

Besides the collaboration with FIs, what other types of collaborations have you observed? What other industry players do startups collaborate with?

Answer:

A lot would be companies in the financial industry. I would say that they partner up and cooperate with banks, insurers, and of course among themselves. For example, if my business is cryptocurrency exchange, I could be working with another fintech company in the development of my crypto exchange.

Question 18:

When creating these partnerships irrespective of who with, do you think that the introduction of network initiatives helped? For example, Business sans Borders or the ASEAN Innovation Network. Has this increased the number of partnerships that you're seeing?

Answer:

Yes. Actually, I would say that networking helps a lot. Why I say this is because– Pre-COVID, SFA organised a number of physical networking sessions and we also bring our fintech members overseas for [*unintelligible*]. But because of COVID-19, we are not able to do the physical networking sessions and we can't travel overseas. I do have members who give feedback to me, saying that they wish that we can do more networking sessions once everything is okay to resume.

Question 19:

And how do fintechs commonly enter networks? How do they build their own networks?

Answer:

It's through industry events, by networking sessions. A lot of them is through networking sessions, either organised by SFA or other associations or other partners. Another way how they meet each other is through being invited for webinars. For example, I invite you as a speaker to my webinar and I would invite other members as well. So, you get to know each other. It might not be a pure networking session per se, but because of being involved in a lot of events and webinars you get to know more people. Another way is through matchmaking. For example, it's how you approach bankers and got to know me. It's like: "Hey, can you help me to introduce this so-and-so from where?" If I can, I also help to do the link up.

Question 20:

Going back a little bit, we already talked about the composition of the industry. Do you think the fintech industry in Singapore is very diverse? Are there a lot of different ethnicities coming together?

Answer:

Yes, I would say so. You do have a number of foreigners who are starting their fintech in Singapore. So, I guess it's a very wide mix of nationalities in the fintech ecosystem in Singapore.

Question 21:

What effect does this have on the industry?

Answer:

I guess it's a good thing, because we get exposed to ideas from different people in different countries. The thing is that if you are a closed nation, usually your ideas tend to be a bit more limited. By having people from all over the world join us we get exposed to different views, different ideas. All the while Singapore has been adopting a very open policy when it comes to such foreigners working in Singapore. It's a very open policy which applies also in fintech.

Question 22:

So, you would say the industry welcomes foreign professionals to come over and work in Singapore.

Answer:

Yes, yes. Of course. I'm not sure if you have heard about this new stream that is introduced by Singapore Government. It's called a *Tech.Pass*. This is a sort of special employment pass which we target at CTO-level kind of people, people who are highly good in technical. We do have a special stream for such people because we want to attract them to Singapore.

Question 23:

Is that specific to fintech? I have read, which is why I was asking in the first place, that Singapore is trying to get local residents into jobs before considering foreign professionals for the same positions. However, fintech appeared to be more open in this regard.

Answer:

Yes, we welcome foreigners to Singapore. Of course. But we are welcoming foreigners who can contribute to Singapore economy. We wouldn't welcome all foreigners, but we only welcome foreigners who are able to contribute to the Singapore economy. If you're looking at the Singapore politicals, then yes, you come across articles who say that Singapore seems to be against foreigners coming over to Singapore and snatching their jobs. But I don't think this is really the case. We welcome foreigners, but it's the foreigners who are able to contribute to Singapore. I guess that applies to almost every country in the world. You do welcome people, but the thing is that people must be able to contribute.

Question 24:

We already covered a lot of aspects of Singapore's fintech ecosystem. In your opinion, what is the current role of academia and research?

Answer:

In terms of schools, we are trying hard to get our students interested in fintech. To be honest, if you are a fintech starting up in Singapore one of the main issues that you encounter is the lack of talents in this industry. What we are trying to do now is that we are trying to get our students to be interested in the fintech so that when they graduate, they can help to fill this vacancy in the fintech talent space. So yes, schools do play a part. And research-wise, of course it will always play a part. I would say without any investment in technology or infused in your AI [artificial intelligence] or machine learning, there wouldn't be any improvement in fintech.

Question 25:

Would you say that it is a unique characteristic of Singapore that so much effort is directed into producing the right talent? For example, I read the that the SFA is now starting the FinTech Youth Chapter in specific collaboration with the polytechnics in Singapore. Do you think this is an advantage of Singapore as compared to other markets?

Answer:

I would say so. It leads back to my first point where I say we are working with schools to build up the next generation of fintech talents. A way to look at it is that we hope that we can build up the next generation of Singaporean fintech founders. Fintech founders here in Singapore they are foreigners, so in a way we are trying to build up the next generation of fintech founders which we hope are Singaporeans.

Question 26:

And in doing that, it appears that you connect the development of this talent with the simultaneous creation of their networks. From the very beginning, these efforts have a very international focus.

Answer:

Correct. Singapore is a small market. There's only so much you can grow. If you really want to expand your business, going overseas is the way to go. This is similar to what the Singapore Government is thinking, that's why we have agencies like Enterprise Singapore who are actively helping Singaporean company to go overseas.

Question 27:

Going back to the government and fintech regulation, I already asked you how the regulation compares to that of other hubs. Do you think there is anything the government could do that they are not doing right now and that would further help the industry?

Answer:

Let me see. There's really nothing much on what the government has not been doing. I mentioned before the MAS has been quite forward-looking in terms of the development of fintech ecosystem and they have been doing quite a lot. Off-hand I can't think of anything that they could be doing but have not done yet.

Question 28:

I agree, there seems to be a lot of regulation already in place. Do you think that the government is targeting or looking for companies with a specific set of characteristics to drive the growth of the industry?

Answer:

Not really. I wouldn't say that the regulations are trying to drive a certain segment within the fintech ecosystem. It's more to regulate and give confidence. For example, the Payments Services Act, it's impacting all fintech players who are handling money. It's really to give assurance to the people that the government is looking at this and to make sure that the companies are not going to run off with your money if you conduct any transactions with them. It's to give the consumers a peace of mind that fintech companies setting up here are regulated and it's not a 'Wild Wild West'. Or even, companies can just get your money and run off. Even on the crypto side of things they are regulated under some regulations. It's not a free for all kind of thing. If you're talking about investment in cryptos, there are certain actions that this crypto company has to take before they can onboard a customer.

Question 29:

I already mentioned in my email to you that I had the opportunity to talk to X.Y. from Validus. She was saying, for example, that she believes the recognition of companies to be a very important aspect of government activities. Through the Singapore FinTech Awards, for example. Do you agree with this?

Answer:

The FinTech Awards are actually organised by SFA. I guess it plays a role in recognising people who have made contributions to the industry and I think it's a very good thing. I think all of us would feel good if our efforts are recognised externally by an association or another external body. So yes, it helps.

Question 30:

Do you think such events help to make Singapore more attractive for international fintech companies?

Answer:

For international companies it might not be one of the more attracting factors to be honest. You wouldn't choose to expand to a country because of awards or a recognition kind of thing. It's because of the business environment that allows you to go in, grow your business. That's more important than the so-called recognition and things like that.

Question 31:

Doesn't it at least help such companies to be more aware of Singapore as a destination?

Answer:

My view is that Singapore is actually a brand by itself. It's a very attractive ranking. For example, from the UK you start your business here in Singapore. And you go out and say that you are from Singapore – there's a sort of a recognition placed upon it. Because you are a Singaporean company. It's really an overall image of Singapore as a country by itself.

Question 32:

Would you say that Singapore is then very aware of the image they are trying to portray?

Answer:

Yes. Correct.

Question 33:

Fintech is a relatively new industry seeing as it only really started in 2015. What has changed since then?

Answer:

We started off with a lot of B2C or payment solution kind of company, but right now we are tending to see more B2B types of fintechs here. In terms of the different types of companies we are getting, we are seeing a wide variety. You have companies who are into AI, into machine learning, into data analytics. It's not just looking at the delivering of financial services to the underserved, but it’s to improve the quality of the financial services.

Question 34:

Looking into the future, how do you think the industry in Singapore will evolve?

Answer:

Personal opinion: I hope that we will improve, we will go much faster. But to be fair, the future for fintech is bright. Because of the COVID-19 situation, a lot of banks and insurance see the importance of digitalisation. They are trying to digitalise their whole process and look into fintechs to improve their business and operations. And another good thing, because of the COVID-19 situation as well, is that people are used to the idea of remote working. One of the previous issues for Singaporean fintech is the access to talent, so maybe access to developers, to people who are expert in the UI/UX area of view. Right now, everyone is so used to remote working. We are seeing a new model where you have your senior management based in Singapore, so your CEO, your CTO are in Singapore. But your development teams are overseas in countries like Vietnam or Thailand or even the Philippines. It's one of the factors that also helps to digitalise. If you are going to start a fintech company here in Singapore, you are not restricted to the people living or working in Singapore. You can just base your senior people here whereas your operations, your tech development can be people from elsewhere. It's one of the factors that will drive the success of the fintech industry here in Singapore.

10.3 Appendix C

ASEAN Member States

Source: US-ASEAN Business Council (2019)

10.4 Appendix D

Regulatory Sandbox

Source: MAS (n.d.)

10.5 Appendix E

Financial Sector Technology and Innovation 2.0 Scheme

Source: MAS (2020d)

10.6 Appendix F

List of Fintech Innovation Labs

Lab	Description
Accenture Innovation Hub Singapore	Located in the heart of Singapore's city centre, the Accenture Innovation Hub is a newly-launched 16,000 square foot facility infused with capabilities to help clients address their toughest industry challenges and keep pace with rapid change. At the Innovation Hub, ideas are transformed into innovative solutions through design thinking – it begins with shaping of client-specific solutions, followed by rapid prototyping before implementation at scale.
Allianz Asia Lab	Allianz Asia Lab welcomes collaboration with technological disruptors, digital entrepreneurs and start-ups to identify new ways to meet customer needs along the insurance value chain. Together with you, Allianz Asia Lab aims to pioneer the next-generation of innovative solutions in fields such as health, mobility, insurtech, analytics and cyber security. Together we will reinvent the way insurance is delivered and experienced in Asia.
Aviva Digital Garage	In its capacity as a global and regional centre of digital, analytics and innovation excellence, Aviva's Digital Garage will bring together four functions: • Innovation and New Business: will turn radical and disruptive ideas into digital prototypes that can be tested in the market. • Digital Projects: which make life easier for customers, and digitalise Aviva's businesses around Asia. • Digital Businesses: which have extensive experience of helping real customers, will bring a commercial edge to the Garage. • Collaborators: who will bring their respective expertise to the Garage Digital is a central part of Aviva's group strategy, because its customers are increasingly choosing this as their preferred way to interact with the brand.
ANZ Innovation Lab	ANZ BlueSpace is ANZ's innovation lab which is used to encourage dynamic dialogue, fresh thinking and ideation to help accelerate their Institutional banking capability and support ANZ's customers with their own innovation. The innovation lab has been instrumental in facilitating collaboration with the thriving FinTech ecosystem in Singapore, and incubating several disruptive ideas leading to the development of prototypes to support their customer-centric agenda.
AXA Digital Hive	The Digital Hive is AXA's place to break boundaries, test, innovate, create and understand the possibilities and opportunities for the Singapore market. It's where AXA Singapore monitors and drives continuous improvement in all our digital offerings and creates new and innovative solutions for their customers. It is the key venue to showcase AXA Singapore's digital capabilities, and facilitate the sharing of ideas both internally within AXA and externally with their partners and stakeholders.
BAASIS Lab by Mbanq	BAASIS Lab (by Mbanq) is a start-up accelerator, launched by Life.SREDA Venture Capital and powered by Mbanq, the global digital banking enabler and Banking-as-a-Service (BaaS) platform, based out of San Francisco.
Bank of China Innovation Lab	Persistently enabling advancement through technology and driving development through innovation, BOC aims to build a world-leading financial technological centre in the new era. With accelerated evolving of financial products, high technologies and faster adaption to the market trends, the Innovation Lab will further drive BOC's business growth and promote the regional development. With the establishment of the three-tier innovation management system, the BOC Head Office chose Singapore to set up its first global Innovation Lab in 2018. As the first global innovation lab launched by Bank of China, BOC Innovation Lab Singapore possesses strategic significances and aims to create a unique innovation culture and to provide an effective exchange platform, redefining the working mode of Bank of China in the future.
BNP Paribas Design Factory Asia	BNP Paribas Design Factory Asia was set up in June 2017 to create a space where all business lines within BNP Paribas can co-create. Here, scrum teams formed by individuals from across the bank work together to solve client problems and address business needs. The teams are guided by agile methodologies and design thinking principles, working with the start-up eco-system and corporate solution providers to bring these solutions to life.
BNY Mellon Singapore Innovation Center	The Singapore Innovation Center was launched by BNY Mellon in November 2016. It is part of the ninth global centers around the world. The centre focuses as well as facilitates the collaboration with FinTechs and Clients to create evidence-based, data-driven management solutions and building relationships that move beyond defining problem statements to develop innovative solutions.

Capgemini Applied Innovation Exchange	The Applied Innovation Exchange (AIE) is Capgemini's global platform that leverages a framework for action, a network of exchange locations, and a high-performance engagement experience together with a broad community of designers, technologists, sector experts, business and technology partners, academics, research organizations and startups. The AIE is designed to enable enterprises to discover relevant innovations and to contextualize and experiment with them within their specific industry. The cohesive network of Exchanges provides organizations an immersive and transformative environment for the exploration, discovery, testing and application of innovation, as well as the rapid deployment at scale and sustainability of their target business impacts.
Citi Innovation Lab	In line with its strategy to be the world's leading digital bank, Citi is focused on developing a culture of innovation across its institutional and consumer businesses. Citi's global network of innovation labs located in Dublin, Tel Aviv, Singapore and New York explore and test new ideas, technologies and solutions to accelerate product roadmaps and expedite commercialization opportunities for our consumer, markets and transaction banking businesses. Each lab has its unique focus and areas of expertise, but share best practices and are designed to provide a globally consistent experience. Together with Citi Ventures, the labs also drive the growth agenda for Citi through a global corporate entrepreneurship program.
DBS Asia X	DBS has been deeply immersed in furthering our digital transformation agenda. This includes embarking on a comprehensive and holistic mission to changing the culture and mindset of staff, re-architecting the bank's technology infrastructure, and leveraging Big Data, biometrics and artificial intelligence to reimagine banking. DBS Asia X (DAX) is a space where DBS collaborates with start-ups and the broader FinTech community to reimagine, inspire and create the future of innovation. Located at the Sandcrawler Building in Fusionopolis, DAX is at the heart of Singapore's start-up ecosystem. With full access to project pods, journey rooms, agile co-working spaces for up to 100 people, innovation showcases and recreation areas, residents at DAX are free to go to their favourite spots for away-from-desk conversations. The 16,000 square feet environment also houses an auditorium to hold informative talks and workshops.
Deloitte Greenhouse	The Deloitte Greenhouse is an innovation and problem-solving accelerator, where we take business leaders out of business as usual, and into a Lab experience where every element has been consciously-designed to accelerate problem solving, achieve alignment and prioritize action plans. The Southeast Asia team specialises in Strategy Labs, Customer-Centric Innovation Labs, and Business Model Innovation Labs.
Deutsche Bank Innovation Labs	Deutsche Bank Innovation Labs are a focal point for innovation with a simple, practical role: they connect startups to decision makers within Deutsche Bank. In this way, they help Deutsche Bank adopt emerging technology solutions that enhance, improve and reimagine the way we serve their clients.
EY wavespace	EY wavespace™ in Singapore focuses on the disruptive technologies of intelligent automation, including artificial intelligence, machine learning, blockchain and robotic process automation, among other digital capabilities. The centre seeks to combine EY insights in disruptive technologies with deep industry domain knowledge and market experience. The Singapore center is one of 18 flagship EY wavespace™ centers worldwide, and seamlessly connects with other flagships to enable global collaboration across the wavespace™ centers.
HSBC Singapore Innovation Lab	The opening of the HSBC Singapore Innovation Lab was the first of such a dedicated and strategic space for the bank in Asia Pacific. Launched in 2015, the Lab focuses on driving and developing the next generation digital and mobile banking needs of corporates with a particular focus on cash management, liquidity, trade and supply chain. Staffed with a team of business and technology experts, we partner with clients, technology firms, academia and the government to generate new ideas and concepts for prototyping. Cutting-edge client propositions will be put to trial through business simulations to derive practical insights into digital disruptions, and fine-tuned before being fully launched in the market. The lab continues to be a key incubator for HSBC's world-wide innovation programme, leveraging our international reach and connectivity to accelerate and amplify the benefits and opportunities to our clients with international ambitions.
IAG Firemark Lab	IAG Firemark lab is focusing on frontier innovation capabilities related to data and AI. Dedicated team of innovation, data & AI experts. Identify and understand data and analytics opportunities and challenges. They incubate scalable AI and data opportunities by testing, building and scaling propositions that are unproven but have potential to deliver new risk insights or enable adjacent market entry. They learn by doing, build in-house and partner with corporates, research institutions and start-ups.
ING Labs	Global challenges need global solutions. That's why we collaborate with others, both on existing platforms and on new ones we have yet to create. We explore, experiment and validate in a structured innovation process that includes governance and funding for our ventures and the partners we work with. These can be start-ups, scale-ups, researchers, entrepreneurs, or other corporates.

	It's about mutually beneficial partnerships that turn ideas into scalable solutions. ING believes in a world where digital solutions enable anyone to trade in a seamless and transparent fashion. At ING labs, we create ventures and partnerships that leverage new technologies and connected ecosystems, through fast and agile prototyping. The scope of ING Lab in SGP is Global Trade, and not just Trade Finance. Global trade is a strong contributor to wealth and economic growth. The offline, analogue world is transforming towards a digital, aggregated world where DLT, cloud, IoT and advanced analytics allow companies across the globe to optimise their supply chain. We build - and invest in - ventures that are making a move in this value space.
KPMG Digital Village	KPMG Digital Village helps business on their innovation journey - whether it's building an innovation culture, developing innovative solutions, or investing in the next big idea to add value to the core business. Like a living lab for innovation, KPMG Digital Village brings corporates, start-ups, investors and government bodies together in a collaborative ecosystem to drive the adoption and integration of innovative solutions, and deliver tangible outcomes to specific business challenges.
LongHash	LongHash is a global blockchain incubator with 6 physical offices around the world (Shanghai, Singapore, Hong Kong, Tokyo, Berlin, Zug) with plans to expand to 10 locations by Q2 2019. Our mission is to accelerate the development and understanding of blockchain technology. LongHash is also a member of the Singapore FinTech Association and ACCESS
LumenLab (MetLife Innovation Centre)	LumenLab is MetLife Asia's innovation centre. Based in Singapore, they are MetLife's pioneers for disruptive innovation charging ahead to create new businesses in health, wealth and retirement. Through their focus on building new products and services grounded in data and technology, they aim to help people achieve richer and more fulfilling lives. By creating an insights-driven engine, they are committed to driving a culture of innovation at MetLife to uncover new businesses and fundamentally reshape how the industry engages with its customers.
Mastercard Lab	Since its inception in 2012, Mastercard Labs in Singapore has been the hub of innovation in Asia Pacific, bringing smart, innovative payments and commerce solutions to market. During the same period, they have formed deep relationships with over 150 Fintech start-ups to solve the biggest industry challenges and scale the solutions for consumers, financial institutions, businesses, merchants and governments. They are a team of technologist, designers, challengers, go-getters who work collaboratively with subject matter experts globally to dream up and execute next generation innovations in commerce. Where others take a "wait and see" approach; they are more likely to say "let's make it happen".
MUFG Innovation Centre	-
OneConnect Innovation Lab	-
PayPal Innovation Lab	PayPal Innovation Lab helps foster innovation, R&D, entrepreneurship and capability building in Singapore through collaboration with government agencies, Institutes of Higher Learning (IHL), industry associations and ecosystem partners. Incepted in 2016, PayPal Innovation Lab's key focus areas are: • Incubation: Developing and nurturing the next generation of FinTech start-ups alongside PayPal's technology development centre. • R&D: Conceptualizing the Future of Money in a Smart Nation through its R&D centre and think tank. • Small & Medium Enterprise (SME): Supporting and enabling local businesses in the areas of payments and e-Commerce.
Prudential Innovation Lab	-
R3 Asian Center	R3 is an enterprise blockchain software firm working with a broad ecosystem of more than 200 members and partners across multiple industries from both the private and public sectors to develop on Corda, their open-source blockchain platform ,and Corda Enterprise, a commercial version for enterprise usage. The Corda platform is already being used in industries from financial services to healthcare, shipping, insurance and more. It records, manages, executes institutions' financial agreements in perfect synchrony with their peers, creating a world of frictionless commerce.
Refinitiv Applied Innovation Lab	With labs in New York, London, Cape Town, San Francisco and Singapore, the Refinitiv Applied Innovation team is a global network of data scientists, engineers and designers. With data and information at the core of their business, the lab applies data science, data visualisation and advanced user experience to co-create quick, agile and collaborative experiments and proofs-of-concept with customer, partners and FinTech start-ups.

SCB eXellerator lab	The eXellerator lab is part of SC Ventures, a business unit created in Standard Chartered Bank to promote innovation, invest in disruptive financial technology and explore alternative business models. Focused on “rewiring the DNA in banking”, SC Ventures leverages human-centric design, a lean start-up approach and FinTech enablement, while nurturing an intrapreneurial culture by empowering people to take initiative.
SMBC Asia Retail Innovation Department (ARID)	Asia Retail Innovation Department’s vision and mission to develop and execute SMBC’s retail business in Asia, ARID has a Laboratory team which comprises business product owners and IT solutions development team. The combined Lab team develops digital banking products, solution and prototypes, for our affiliated banks and partner banks.
Solaria Labs (Liberty Insurance)	Solaria Labs was created with one simple mandate: to create new products and services that make a better, safer future for us all. Backed by Liberty Mutual, a Fortune 100 insurance company, Solaria Labs started in 2015 and expanded its operations to Singapore in June 2017. As a lab, they not only explore disrupting the traditional insurance models, but also diversifying into new products and sectors including the Freelance Economy, Logistics, and Cybersecurity. Since their inception, they have launched products including All Set (recently acquired), a platform which connects users with quality home-service providers, and Total Home Score, a data service which helps home buyers, renters, and real-estate professionals understand a home's complete value by calculating scores related to surrounding noise and road quality.
Synechron FinLabs	Synechron FinLabs acts as an innovation hub - allowing their clients to reap the benefits of our digital R&D investment and scale transformative ideas with access to the brightest minds using cutting-edge technology. Synechron combines the “Power of 3” - business process knowledge, digital design and core technology delivery excellence - to drive transformative solutions. Here, clients can actually touch and feel the latest digital technologies and be energized and inspired to develop transformative solutions. Visitors can do everything from role-playing the customer journey through a typical digital engagement scenario in order to understand the impact of beacons, drones, biometric authentication and virtual reality, to prototyping around new technologies like AI and blockchain.
The FinLab	The FinLab, a joint venture between UOB and SGInnovate, is a business accelerator that propels the growth of technology companies and catalyses the digital transformation of businesses. Since their inception in 2015, The FinLab has run two acceleration cycle for financial technology (FinTech) companies. In the third cycle of The FinLab’s programme, they have expanded their portfolio to focus on matching the supply of innovative FinTech and technology solutions to meet the needs of SMEs that are embarking on the digital transformation journey.
The Open Vault at OCBC	The Open Vault at OCBC (TOV) was set up to help OCBC Group accelerate innovation by leveraging the latest technology. TOV focuses on collaborating with external FinTech firms to rapidly test and validate new ideas and solutions – before bringing winning prototypes quickly to the market. In becoming digital leaders and heroes, they also create and support a mindset shift among the people in OCBC. In 2018, OCBC Bank was awarded "The Best Innovation Centre by Financial Institution in Singapore for 2018" by The Asian Banker.
UBS Evolve	EVOLVE's vision is to transform the way they provide services to our clients and staff. EVOLVE aim to do this by developing solutions that meet the needs of our fast growing wealth management clientele in Asia. EVOLVE leverage technology as a catalyst to drive innovation and engage internal talent to develop future business capabilities. Alongside this, EVOLVE apply a design thinking approach to co-create innovative solutions that support a sustainable innovation culture within the UBS group.
VISA Innovation Centre	The Visa Innovation Centre Singapore is part of Visa's global network of centres, and their first Centre in Asia Pacific. They have created a space that provokes curiosity and creativity, so that Visa can work with their partners to explore and build the future of commerce together.

Source: MAS (2020g)

10.7 Appendix G

Global Financial Innovation Network Regulatory Compendium Table

GFIN Regulatory Compendium Table (Activity)

Notes: "X" marks when a regulation is explicitly required "Y" denotes when a regulation is heavily implied

		Activity									
Organisation	Jurisdiction	Legal guidance on innovative business	Authorisation support	Live Sandbox	Certain waivers or exemptions	RegTech Firm engagement	SupTech Firm engagement	Third party engagement	Facilitating hackathons and Techsprints	Assistance finding public/private partners	Other
Australian Securities and Investments Commission (ASIC)	Australia	x	x	x	x	x	x	x			Facilitating showcase events
Central Bank of Bahrain (CBB)	Bahrain	x	x	x	x	x	x	x	N/A	x	Digital Lab testing environment will be developed soon, which will facilitate introduction between sandbox companies & financial institutions. The lab will also enable running virtual hackathons, challenges & TechSprints.
Bermuda Monetary Authority (BMA)	Bermuda	x	x	x	x	x	x	x		x	
Alberta Securities Commission (ASC)	Canada (Alberta)	x	x	x	x	x	x	x			
British Columbia Securities Commission (BCSC)	Canada (British Columbia)	x	x	x	x	x	x	x			
Ontario Securities Commission (OSC)	Canada (Ontario)	x	x	x	x	x	x	x			
Autorité des marchés financiers Québec (AMF)	Canada (Quebec)	x	x	x	x	x	x	x			Fintech Lab and Technological Innovation Advisory Committee
Guernsey Financial Services Commission (GFSC)	Guernsey	x	x		x	x	x	x	x		
Hong Kong Insurance Authority (IA)	Hong Kong		x	x		x	x	x			Streamline process of authorization of solely digital insurers
Hong Kong Monetary Authority (HKMA)	Hong Kong	x	x	x	x	x	x	x	x	x	
Hong Kong Securities and Futures Commission (SFC)	Hong Kong							x			
Magyar Nemzeti Bank (Central Bank of Hungary, MNB)	Hungary	x	x	x	x	x	x	x	x	x	Information Repository for legal instruments and provisions of financial services
Jersey Financial Services Commission (JFSC)	Jersey	x	x			x	x	x			
Astana Financial Services Authority (AFSA)	Kazakhstan	x	x	x	x	x	x	x		x	

GFIN Regulatory Compendium Table (Activity)

Notes: "X" marks when a regulation is explicitly required "Y" denotes when a regulation is heavily implied

		Activity									
Organisation	Jurisdiction	Legal guidance on innovative business	Authorisation support	Live Sandbox	Certain waivers or exemptions	RegTech Firm engagement	SupTech Firm engagement	Third party engagement	Facilitating hackathons and Techsprints	Assistance finding public/private partners	Other
Capital Markets Authority (CMA)	Kenya	x	x	x	x (Principle based where applicable)	x	x	x		x	Information sharing agreements with global jurisdictions, participating in fintech festivals and organizing demos and showcase events
Bank of Lithuania (LB)	Lithuania	x	x	x	x (Principle of proportionality is applied in regulatory sandbox)	x	x				More information about regulatory sandbox: https://www.lb.lt/en/regulatory-sandbox
Monetary Authority of Singapore (MAS)	Singapore	x	x	x	x	x	x	x	x	x	
Financial Supervisory Commission Taiwan (FSC)	Taiwan	x	x	x	x	x	x	x	x	x	
Central Bank United Arab Emirates (CB UAE)	UAE		x			x	x		x	x	Research and application support for FinTech-related solutions within banking
Abu Dhabi Global Market (ADGM)	UAE (Abu Dhabi)	x	x	x	x	x	x	x	x	x	
Dubai Financial Services Authority (DFSA)	UAE (Dubai)	x	x	x	x	x	x	x		x	
Financial Conduct Authority (FCA)	United Kingdom	x	x	x	x	x	x	x	x	N/A	
Consumer Financial Protection Bureau (CFPB)	United States	x		x	x	x	x	x	x		Dedicated Office of Innovation; Created ACFIN to support coordination between Federal and State regulators

GFIN Regulatory Compendium Table
(Industry sectors)

Notes: "X" marks when a regulation is explicitly required "Y" denotes when a regulation is heavily implied

Organisation	Jurisdiction	Industry sectors: Trading infrastructures	Securities	Insurance	Consumer credit	Investment advice	Banking	Payments	Investment funds	Crowdfunding	CBT
Capital Markets Authority (CMA)	Kenya	x	x			x			x	x	Yes
Bank of Lithuania (LB)	Lithuania	x	x	x	x	x	x	x	x	x	Yes
Monetary Authority of Singapore (MAS)	Singapore	x	x	x		x	x		x	x (only securities based crowdfunding)	Yes
Financial Supervisory Commission Taiwan (FSC)	Taiwan	x	x	x	y	x	x	y	y	y	Yes
Central Bank United Arab Emirates (CB UAE)	UAE						x	x			Yes
Abu Dhabi Global Market (ADGM)	UAE (Abu Dhabi)	x	x	x	x	x	x	x	x	x	Yes
Dubai Financial Services Authority (DFSA)	UAE (Dubai)	x	x	x (restrictions)			x	x	x	x	Yes
Financial Conduct Authority (FCA)	United Kingdom	x	x	x	x	x	x	x	x	x	Yes
Consumer Financial Protection Bureau (CFPB)	United States				x		x	x	y		Yes

GFIN Regulatory Compendium Table
(Industry sectors)

Notes: "X" marks when a regulation is explicitly required "Y" denotes when a regulation is heavily implied

Organisation	Jurisdiction	Industry sectors: Trading infrastructures	Securities	Insurance	Consumer credit	Investment advice	Banking	Payments	Investment funds	Crowdfunding	CBT
Australian Securities and Investments Commission (ASIC)	Australia	y	x	x	x	x	x (some features)	x	y	x (some)	Yes
Central Bank of Bahrain (CBB)	Bahrain	x	x	x	x	x	x	x	x	x	Yes
Bermuda Monetary Authority (BMA)	Bermuda	x		x				x	x		Yes
Alberta Securities Commission (ASC)	Canada (Alberta)	x	x			x			x	x	Yes
British Columbia Securities Commission (BCSC)	Canada (British Columbia)	x	x			x			x	x	Yes
Ontario Securities Commission (OSC)	Canada (Ontario)	x	x			x			x	x	Yes
Autorité des marchés financiers Québec (AMF)	Canada (Quebec)	x	x	x		x					Yes
Guernsey Financial Services Commission (GFSC)	Guernsey	x		x			x		x		Yes
Hong Kong Insurance Authority (IA)	Hong Kong			x							Yes
Hong Kong Monetary Authority (HKMA)	Hong Kong	x					x	x	x		Yes
Hong Kong Securities and Futures Commission (SFC)	Hong Kong	x	x			x			x		Yes
Magyar Nemzeti Bank (Central Bank of Hungary, MNB)	Hungary	x	x	x	x	x	y	x	x		Yes
Jersey Financial Services Commission (JFSC)	Jersey		x	x		x	x	y	x	y	Yes
Astana Financial Services Authority (AFSA)	Kazakhstan	x	x	x			x		y		Yes

Source: GFIN (n.d.)

10.8 Appendix H

Global Financial Innovation Network Members

Coordination Group	
Kazakhstan	Astana Financial Services Authority (AFSA)
Australia	Australian Securities & Investments Commission (ASIC)
Québec, Canada	Autorité des Marchés Financiers (AMF)
Bahrain	Central Bank of Bahrain (CBB)
United States	Consumer Financial Protection Bureau (CFPB)
United Arab Emirates	Dubai Financial Services Authority (DFSA)
United Kingdom	Financial Conduct Authority (FCA)
Guernsey	Guernsey Financial Services Commission (GFSC)
Hong Kong	Hong Kong Monetary Authority (HKMA)
Hong Kong	Hong Kong Securities and Futures Commission (HKSFC)
Singapore	Monetary Authority of Singapore (MAS)

Members	
United Arab Emirates	Abu Dhabi Global Market (ADGM)
Alberta, Canada	Alberta Securities Commission (ASC)
Australia	Australian Prudential Regulation Authority (APRA)
Lithuania	Bank of Lithuania (BL)
Philippines	Bangko Sentral ng Pilipinas (BSP)
Bermuda	Bermuda Monetary Authority (BMA)
British Columbia, Canada	British Columbia Securities Commission (BCSC)
Kenya	Capital Markets Authority (CMA, Kenya)
Israel	Capital Market, Insurance, and Savings Authority (CMISA)
Eswatini (Swaziland)	Central Bank of Eswatini
Kenya	Central Bank of Kenya (CBK)
United Arab Emirates	Central Bank of the UAE
Curaçao and Sint Maarten	Centrale Bank van Curaçao and Sint Maarten
Mexico	Comision Nacional Bancaria y de Valores (CNBV)
United States	Commodity Futures Trading Commission (CFTC)
Luxembourg	Commission de Surveillance du Secteur Financier (CSSF)
United States	Federal Reserve Board (FRB)
United States	Financial Industry Regulatory Authority (FINRA)
Mauritius	Financial Services Commission Mauritius (FSC)
Ontario, Canada	Financial Services Regulatory Authority of Ontario (FSRA Ontario)
Taiwan	Financial Supervisory Commission Taiwan
Colombia	Financial Superintendence of Colombia (SFC Colombia)

United States	Federal Deposit Insurance Corporation (FDIC)
Gibraltar	Gibraltar Financial Services Commission
Hong Kong	Hong Kong Insurance Authority (IA)
Isle of Man	Isle of Man Financial Services Authority (IOMFSA)
Israel	Israel Securities Authority (ISA)
Jersey	Jersey Financial Services Commission (JFSC)
Hungary	Magyar Nemzeti Bank (Central Bank of Hungary)
Malta	Malta Financial Service Authority (MFSA)
Georgia	National Bank of Georgia (NBG)
State of New York, United States	New York State Department of Financial Services (NY DFS)
State of Arizona, United States	Office of the Arizona Attorney General
United States	Office of the Comptroller of the Currency (OCC)
Ontario, Canada	Ontario Securities Commission (OSC)
United Arab Emirates	Securities and Commodities Authority, UAE (ESCA)
United States	Securities and Exchange Commission (SEC)
Nigeria	Securities and Exchange Commission (SEC Nigeria)
Bahamas	Securities Commission of the Bahamas (SCB)
Brazil	Securities and Exchange Commission of Brazil (CVM)
Seychelles	Seychelles Financial Services Authority
South Africa	South African Reserve Bank (SARB)
West Virginia, United States	West Virginia Division of Financial Institutions
Wyoming, United States	Wyoming Division of Banking

Observers	
Global	Consultative Group to Assist the Poor (CGAP)
Europe	European Bank for Reconstruction and Development (EBRD)
Africa	Financial Sector Deepening Africa (FSD Africa)
Global	International Monetary Fund (IMF)
Qatar	Qatar Development Bank
China	Qianhai Financial Authority
Global	World Bank Group

Source: GFIN (2021b)

10.9 Appendix I

Regulatory Cooperation Agreements

Country/ Region	Authority	Date Signed	Information Sharing	Referral	Joint Projects
Abu Dhabi	Abu Dhabi Global Markets Financial Services Regulatory Authority (ADGM)	08.03.2017	✓	✓	✓
Australia	Australian Securities and Investments Commission (ASIC)	16.06.2016	✓	✓	✓
Bahrain	Central Bank of Bahrain (CBB)	13.11.2018	✓	✓	✓
Brunei	Autoriti Monetari Brunei Darussalam (AMBD)	12.05.2018	✓	✓	✓
Cambodia	National Bank of Cambodia (NBC)	04.04.2019	✓		
Canada	The Ontario Securities Commission Autorité des Marches Financiers (Quebec) British Columbia Securities Commission The Alberta Securities Commission The Financial and Consumer Affairs Authority of Saskatchewan The Manitoba Securities Commission The Financial and Consumer Services Commission (New Brunswick) The Nova Scotia Securities Commission	12.11.2019	✓	✓	✓

China	People's Bank of China (PBC)	14.11.2018	✓		✓
	Asia-Pacific Future Financial Research Institute (AFF)	11.05.2019	✓		✓
	Digital Currency Institute of the People's Bank of China (DCI)	03.12.2020	✓		✓
Denmark	Danish Financial Supervisory Authority (Danish FSA)	29.06.2017	✓	✓	✓
Dubai	Dubai Financial Supervisory Authority	29.08.2018	✓	✓	✓
Egypt	Central Bank of Egypt (CBE)	14.02.2018	✓	✓	✓
France	Autorité de Contrôle Prudentiel et de Résolution (ACPR)	27.03.2017	✓	✓	
	Autorité des Marchés Financiers (AMF)	27.03.2017	✓	✓	
Hong Kong	Hong Kong Monetary Authority (HKMA)	25.10.2017	✓	✓	✓
Hungary	Magyar Nemzeti Bank	09.12.2020	✓	✓	✓
India	Government of Andhra Pradesh (GoAP)	22.10.2016	✓		✓
	Government of Maharashtra (GoM)	26.02.2018	✓		✓
	Department of Economic Affairs (DEA)	02.06.2018	✓		✓
Indonesia	Otoritas Jasa Keuangan (OJK)	11.10.2018	✓	✓	✓
Japan	Japanese Financial Services Agency (FSA)	13.03.2017	✓	✓	
Kazakhstan	Astana Financial Services Authority (AFSA)	12.11.2018	✓	✓	✓

	Astana International Financial Centre Authority (AIFCA)				
Kenya	Central Bank of Kenya (CBK)	15.07.2019	✓	✓	✓
Korea	Korean Financial Services Commission (KFSC)	16.07.2018	✓	✓	✓
Latin America and Caribbean	Inter-American Development Bank (IDB) Group	13.11.2018	✓		✓
Lithuania	Bank of Lithuania	14.03.2018	✓	✓	✓
Malaysia	Malaysia Securities Commission (Malaysia SC)	15.09.2017	✓	✓	✓
Philippines	Bangko Sentral ng Pilipinas (BSP)	03.12.2017	✓	✓	✓
Poland	Polish Financial Supervisory Authority (KNF)	15.11.2017	✓	✓	✓
Switzerland	Swiss Financial Market Supervisory Authority (FINMA)	12.09.2016	✓	✓	✓
Thailand	Bank of Thailand (BOT)	11.07.2017	✓	✓	✓
United Kingdom	Financial Conduct Authority (FCA)	11.05.2016	✓	✓	
United States of America	Association of Supervisors of Banks of the Americas (ASBA)	09.06.2017	✓	✓	✓
	Commodity Futures Trading Commission (CFTC)	13.09.2018	✓	✓	✓
Vietnam	State Bank of Vietnam (SBV)	25.04.2018	✓		

Source: MAS (2021c)

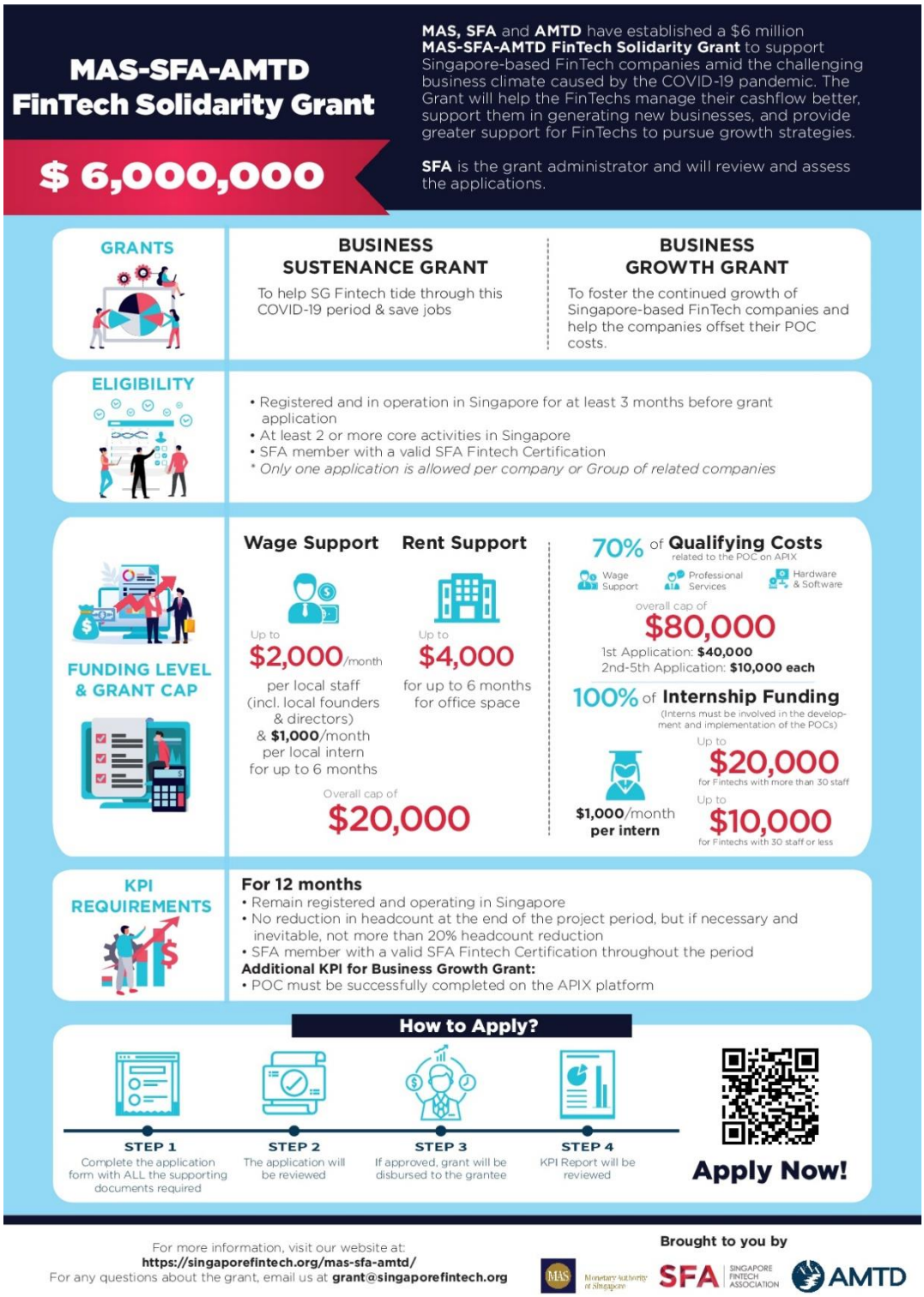
10.10 Appendix J

COVID-19 FinTech Care Package

Source: MAS (2020b)

10.11 Appendix K

FinTech Solidarity Grant



Source: MAS (2020i)

10.12 Appendix L

Global Patent Prosecution Highway Participating Offices

Source: Japan Patent Office (n.d.)

10.13 Appendix M

Number of Financial Institutions, by Licence Type/Status

Banking

Local Bank	*4*	Qualifying Full Bank	*10*	Full Bank	*20*
Wholesale Bank	*97*	Merchant Bank	*21*	Finance Company	*3*
Money Broker	*2*	Representative Office (Banking)	*37*	Financial Holding Company (Banking)	*1*
SGS Primary Dealer	*13*				

Capital Markets

Capital Markets Services Licensee	*942*	Approved CIS Trustee	*17*	Registered Fund Management Company	*290*
Exempt Capital Markets Services Entity	*119*	Exempt Corporate Finance Adviser	*118*	Licensed Trust Company	*59*
Exempt Trust Company	*27*	Exempt Person Providing Trust Services	*4*	Approved Exchange	*4*
Approved Holding Company	*5*	Approved Clearing House	*4*	Recognised Market Operator	*61*
Recognised Clearing House	*6*	Licensed Trade Repository	*1*	Central Depository System	*1*
Authorised Benchmark Administrator	*1*				

Financial Advisory

Licensed Financial Adviser	*61*	Exempt Person Providing Financial Advisory Services	*59*	Exempt Financial Adviser	*477*

Insurance

Direct Insurer (Life)	*17*	Direct Insurer (General)	*52*	Direct Insurer (Composite)	*9*
Reinsurer (Life)	*3*	Reinsurer (General)	*30*	Reinsurer (Composite)	*9*
Captive Insurer (Life)	*1*	Captive Insurer (General)	*77*	Captive Insurer (Composite)	*4*
Lloyd's Asia Scheme	*26*	Authorised Reinsurer (General)	*3*	Authorised Reinsurer (Composite)	*2*
Registered Insurance Broker	*93*	Exempt Insurance Broker	*40*	Financial Holding Company (Insurance)	*3*

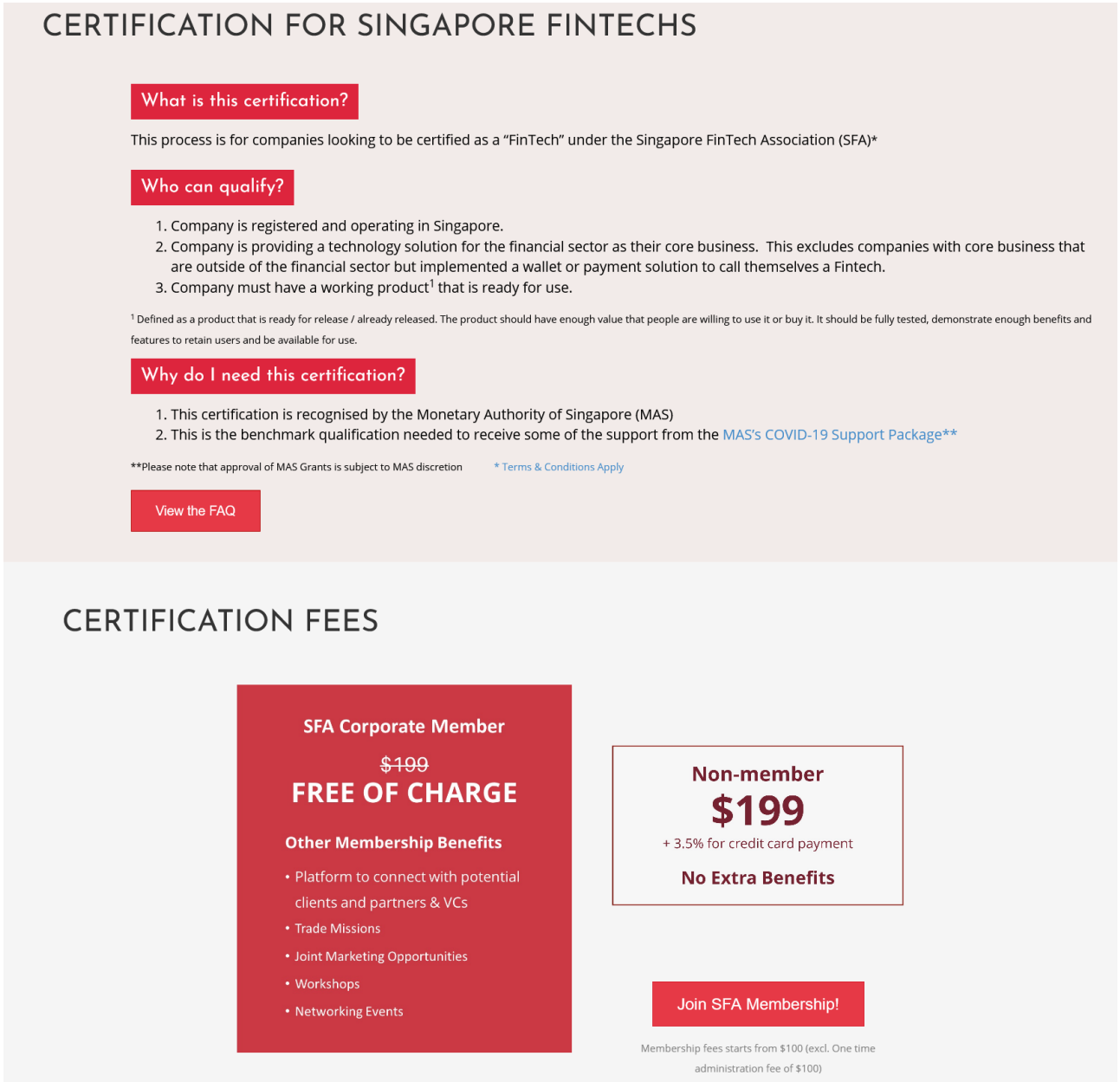
Payments

Credit and Charge Card Licensee	*4*	Money-changing Licensee	*262*	Standard Payment Institution	*3*
Major Payment Institution	*149*	Designated Payment System Operator	*6*	Designated Payment System Settlement Institution	*6*

Source: MAS (2021b)

10.14 Appendix N

Singapore FinTech Association FinTech Certification



Source: SFA (2018b)

10.15 Appendix O

Regulatory Cooperation, Hong Kong

Country/Region	Authority
Brazil	Central Bank of Brazil
France	Autorité de Contrôle Prudentiel et de Résolution
Poland	Polish Financial Supervision Authority
Singapore	Monetary Authority of Singapore
Switzerland	Swiss Financial Market Supervisory Authority
Thailand	Bank of Thailand
United Arab Emirates	Abu Dhabi Global Market Financial Services Regulatory Authority
	Dubai Financial Services Authority of Dubai International Financial Centre
United Kingdom	United Kingdom Financial Conduct Authority

Source: Hong Kong Monetary Authority (2021)

Regulatory Cooperation, United Kingdom

Country/Region	Authority
Australia	Australian Securities and Investments Commission
Canada	Canadian Securities Administrators (The Autorite des Marches Financiers (Quebec), British Columbia Securities Commission, The Alberta Securities Commission, The Financial and Consumer Affairs Authority of Saskatchewan, The Manitoba Securities Commission, The Financial and Consumer Services Commission (New Brunswick), The Nova Scotia Securities Commission)
	Ontario Securities Commission
China	People's Bank of China
Hong Kong	Hong Kong Insurance Authority
	Hong Kong Monetary Authority
	Securities and Futures Commission
India	Reserve Bank of India
Singapore	Monetary Authority of Singapore
South Korea	Financial Services Commission of the Republic of Korea
United States	US Commodity Futures Trading Commission

Source: Financial Conduct Authority (2021)

Regulatory Cooperation, Australia

Country/Region	Authority
Canada	Ontario Securities Commission
	Canadian Securities Administrators (The Autorite des Marches Financiers (Quebec), British Columbia Securities Commission, The Alberta Securities Commission, The Financial and Consumer Affairs Authority of Saskatchewan, The Manitoba Securities Commission, The Financial and Consumer Services Commission (New Brunswick), The Nova Scotia Securities Commission)
China	China Securities Regulatory Commission
Hong Kong	Hong Kong Securities and Futures Commission
Indonesia	Otoritas Jasa Keuangan
Kenya	Capital Markets Authority of Kenya
Luxembourg	Commission de Surveillance de Secteur Financier
Malaysia	Malaysia Securities Commission
Singapore	Monetary Authority of Singapore
Switzerland	Swiss Financial Market Supervisory Authority
United Arab Emirates	Abu Dhabi Global Market Financial Services Regulatory Authority
	Dubai Financial Services Authority
United Kingdom	Financial Conduct Authority (2)
United States	US Commodity Futures Trading Commission

Source: Australian Securities and Investments Commission (2019)