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The Predicament of FinTechs in the Environment of Traditional Banking Sector Regulation – An Analysis of Regulatory Sandboxes as a Possible Solution

Johannes M. Gerlach and Daniel Rugilo*

Abstract

Recently, "Financial Technology-companies" (FinTechs) are increasingly changing the financial services industry worldwide and impose considerable challenges for regulators tasked to solve the arising trade-off between sound regulation and innovation support. In this regard, regulatory sandboxes, which were recently introduced in several jurisdictions, provide a promising solution, as they imply a liberalization of regulatory requirements in order to enable FinTechs to test their innovative services. However, we observe that no comparable initiative exists in Germany, even though the German regulator identified a need for action on this subject in order to maintain its international competitiveness. Thus, based on a detailed analysis of various sandbox models worldwide, this paper develops a set of own recommendations as a basis for the implementation of a sandbox concept which might be applicable in the German regulatory environment. In doing so, we identify current theoretical as well as practical regulatory issues within the context of the rapid FinTech evolution. To the best of our knowledge, this paper represents the first study on key international sandboxes as a basis to design guidelines specifically for the German financial market. Thereby, we contribute to the literature as we evolve an effective regulation within the new setting of innovative financial technologies. Moreover, our findings contribute to the practical solution of current challenges faced by both regulators and affected companies. Even though our derived implications focus on the German financial sector, the results may potentially be applicable in further jurisdictions with similar regulatory requirements.

Keywords: FinTech, financial sector, financial regulation, FinTech regulation, financial stability, regulatory sandbox, financial services industry, digital finance

JEL Classification: G21, G28, M13

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I. Introduction

FinTechs are increasingly changing the financial services industry worldwide, as their novel business models do not only result in increasing competition within the financial markets (*McKinsey,* 2016), but also pose considerable challenges to regulators' core mandates to ensure regulatory compliance and financial stability. Through their application of new technologies, FinTechs – comprising both incumbents and start-ups – already provide the entire range of financial services traditionally covered by established banks (*Arner et al.,* 2016; *Arner et al.,* 2017) and have become a significant segment within the traditional financial services sector in the meanwhile.

Besides their various opportunities to enhance efficiency and competition within the markets (*Bank for International Settlements,* 2017; *Ernst* & *Young,* 2017a; *He* et al., 2017), these highly innovative entities may also pose considerable risks to financial stability. This is because there is still uncertainty about how regulators should best apply their strict banking regulations to the novel settings of FinTech business models without simultaneously creating a major hurdle for innovation (*Maume,* 2017; *Michaels/Homer,* 2018; *Gerlach* et al., 2016; *Herger,* 2016; *Brummer/Gorfine,* 2014). Regulatory Sandboxes, which are recently developed and tested in several jurisdictions, provide a promising solution to the occurring trade-off between sound regulation and innovation support, without threatening financial stability or degrading consumer protection. This new approach typically implies a temporary liberalization or even exemptions from regulatory requirements to facilitate FinTechs to test their new services in a supervised environment (*Financial Conduct Authority,* 2015b; *He* et al., 2017).

Despite the diversity of successful[1] and potentially beneficial[2] sandbox solutions already elaborated worldwide, we observe that to date no comparable initiative exists in Germany. Therefore, the emigration of entrepreneurs to more dedicated economies could negatively affect the innovativeness and thus competitiveness as well as eventually the national economies' condition. In fact, so far only one legislation, which specifically addresses FinTech concerns, was implemented (*Maume,* 2017). However, Germany's status as one of the major FinTech markets as well as the rapid diffusion of FinTechs in the highly regulated German financial sector (*Dorfleitner* et al., 2016) clearly indicate the growing need for the (local) regulator to provide explicit regulatory guidance for FinTechs by creating a contemporary and flexible solution. Based on the identified need for action in the German context and the high interest of the federal supervisory authority – the Bundesanstalt für Finanzdienstleistungsaufsicht (Ba-

[1] In terms of usage and successful market entries of participating FinTechs.

[2] In terms of the suitability of sandboxes to reduce market entry barriers for (potential) new entrants.

Fin) – in this topic (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016), we aim to develop a sandbox framework that is, from the regulators' point of view, applicable in the German regulatory environment without compromising core regulatory objectives. Building on a detailed analysis of the various sandbox models worldwide, a major objective of this paper is to develop an own set of recommendations as a basis for an accessible and sustainable sandbox implementation for both, the regulator and the FinTechs. Moreover, even though our derived implications focus on the German financial sector, the results may be applicable in further jurisdictions with similar regulatory requirements. Additionally, our analysis of various sandbox models worldwide can be used as a basis for further research, which focuses on other than the German financial markets. Finally, emphasized by taking into account the empirically and theoretically discussed implications of market entry barriers as well as potential issues arising from the principal-agent theory, i. e. adverse selection and moral hazard, it seems favorable to address this topic not only from a practical but also from a theoretical point of view.

Several articles have already examined the similarities and differences among national sandbox solutions (*Zetzsche* et al., 2017; *Jenik/Lauer,* 2017). In contrast, our paper represents to our best knowledge the first study on key international sandboxes as a basis to design guidelines for a regulatory sandbox specifically for the German market. Thereby, we contribute to the current discussion of an optimal design of sandbox concepts from the perspectives of both the regulator and FinTechs. If successfully implemented, the proposed regulatory sandbox framework has the potential to lower regulatory barriers for FinTechs and to create a level playing field while safeguarding the stability of the financial system as a whole. Furthermore, it potentially strengthens the dialogue between financial firms and the competent authorities, giving the former the opportunity to clarify (emerging) regulatory questions and the latter to assess the inherent opportunities and risks. In the second place, we add to the recent literature on the evolution of FinTechs and thereby contribute to the general understanding of FinTech services and their various areas of operations (*Arner* et al., 2016; *Zetzsche* et al., 2017). Finally, by focusing on the German banking system, we contribute to the literature concerning existing regulatory frameworks and their approaches to govern FinTechs (*Scholz-Fröhling,* 2017; *Maume,* 2017; *World Economic Forum,* 2016).

In order to achieve our objective as well as to emphasize the need for action in the German context, this paper is structured as follows: Section 2 builds the theoretical framework of this paper. Herein, we firstly discuss our understanding of financial technologies and identify major representative FinTech markets worldwide. In order to explain the trade-off between sound regulation and innovation support, we address theoretical fundamentals of financial services regulation, specifically focusing on the German market and the lack of specialized

FinTech regulation and supervision in Germany. After we introduced the regulatory sandbox as a concept that may contribute to the solution of this trade-off, section 2 concludes by systematically deriving relevant countries, which built the scope of our further analysis. From this basis, section 3 then provides a detailed analysis of regulatory sandbox concepts already implemented in those countries, which we identified as relevant for our study. Building on this, section 4 suggests our framework for the implementation of a regulatory sandbox concept in Germany. Finally, the paper concludes by offering deductive remarks, limitations of this study and proposed future research.

II. Theoretical Background and Definitions

1. Digital Finance and FinTech

Regarding the term "FinTech", we observe that so far no unique definition could be established (*Dorfleitner* et al., 2016; *Ryu,* 2018; *Schueffel,* 2016). Albeit the lack of agreement regarding the terms' meaning there is consensus that "FinTech" is a composition of the words "Financial" or "Finance" and "Technology" (*Arner* et al., 2016; *Dorfleitner* et al., 2016; *Gomber* et al., 2017; *Kim* et al., 2016; *Kuo Chuen/Teo,* 2015; *Ryu,* 2018). However, regarding the meaning of FinTech some authors propose a functional, product or service oriented definition (*Arner* et al., 2016; *Kim* et al., 2016; *Kuo Chuen/Teo,* 2015; *Philippon,* 2016; *Ryu,* 2018) whereas others use an institutional oriented definition. Since this paper addresses the regulation of financial institutions as well as new competitors entering the financial services sector, it follows the institutional approach for defining FinTechs. Thus, for the purpose of this study, a FinTech is referred to as a company or entity, both start-up or established, that develops and offers innovative financial services by using new technology. Accordingly, FinTechs usually represent some kind of innovator or disruptor (*Dorfleitner* et al., 2016; *Gomber* et al., 2017).[3]

Furthermore, based on offered products and services as well as underlying technological concepts, it is possible to systemize FinTechs. For instance, using the comprehensive "Digital Finance Cube-theory", *Gomber* et al. (2017) systemizes FinTechs regarding the business functions digital financing, investment, money, payments, insurances and financial advice as well as regarding the used technological concepts such as Blockchain, Near Field Communication and Big Data Analytics. In fact, numerous authors propose differing systemization approaches, even though one has to state that all approaches are similar to each

[3] Entities that, by developing revolutionary products and services with powerful displacement potentials, threaten established competitors. For further details see *Deloitte* (2014)*; AGV Banken* (2015)*; Christensen et al.* (2015).

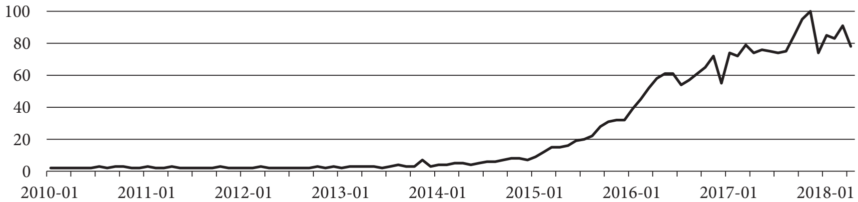
other (*Arner* et al., 2017; *Bank for International Settlements,* 2017; *Maume,* 2017; *Brummer/Gorfine,* 2014; *Clifford Chance,* 2017; *He* et al., 2017; *Financial Stability Board,* 2017; *Arner* et al., 2016; *Philippon,* 2016; *Schindler,* 2017; *Dorfleitner* et al., 2016).

From the traditional financial institutions' point of view, there are ongoing discussions on how to deal with these new competitors. In general, both competitive and co-operative strategies are eligible (*Gomber* et al., 2017). However, one thing remains to be sure: Leaving FinTechs or digital movers unchecked could be quite dangerous for traditional financial institutions. Based on a 2016 study this may traditional banks cause to suffer a loss of 5.0 % to 15.0 % of their customer based interest and fee income within the next five years (*McKinsey,* 2016).

2. Developments and Major Representative FinTech Markets Worldwide

The FinTech sector has become a considerable segment within the traditional financial services sector, continuing to evolve rapidly. The development of FinTech markets worldwide can be illustrated by using different kind of data. For instance, the annual global FinTech funding volumes can be used to point out the FinTechs' growth. According to "The Pulse of FinTech", a regular study by KPMG, the annual global FinTech investments grew with a compound annual growth rate (CAGR) of more than 53.0 % from 2011 (USD 2.4 billion) to 2017 (USD >31.0 billion), even though slowing down during the years 2016 and 2017 (*KPMG,* 2016; *KPMG,* 2017; *KPMG,* 2018). Moreover, the rising interest in FinTechs can be illustrated by using Google Trends' data, which can be used to analyze the relative worldwide frequency of the search term "fintech" within a specific time frame:

Furthermore, since 2015 Ernst & Young publishes the "EY FinTech Adoption Index", which aims at analyzing, comparing and illustrating the worldwide adoption of FinTech services. One key finding of the current 2017 report is that on average 33 % of all digitally active consumers across the surveyed 20 markets



Source of data (Google Trends, 2018).

Figure 1: Relative Worldwide Frequency of the Search Term "Fintech" from January 2010 until April 2018

use FinTech services, compared to 16 % in 2015.[4] This development outlines the strong growth and current market penetration of FinTechs, which now achieve levels of market presence that can influence both industry standards and customer expectations. Having a closer look at the 2017 data, one can assert that particularly emerging countries (China, India, Brazil, Mexico and South Africa) have high adoption rates (46.4 % on average), which may be due to the facts that these countries are characterized by not only having growing economies and tech-literate populations but also poor financial infrastructures and financially underserved populations (*Ernst & Young*, 2017b). Regarding the anticipated development of FinTechs, *Ernst & Young* (2017b) estimates show that global FinTech adoption may increase to 52 % on average, with particularly strong developments in South Africa, Mexico and Singapore. However, the following table summarizes and compares the 2015 and 2017 FinTech adoption rates:

Table 1

FinTech Adoption Rates 2015 and 2017

	FinTech adoption (%)	
	2015	*2017*
China		69
India		52
UK	14	42
Brazil		40
Australia	13	37
Spain		37
Mexico		36
Germany		35
South Africa		35
US	17	33
Hong Kong	29	32
South Korea		32
Switzerland		30
France		27
Netherlands		27
Ireland		26
Singapore	15	23
Canada	8	18
Japan		14
Belgium & Luxembourg		13
Average	*16*	*33*

Source of data (Ernst & Young, 2017b).

[4] In 2015, the study covered six markets.

Finally, based on the illustrated development of FinTech markets worldwide, it is possible to identify major FinTech markets, which are used as the basis for the further research in this paper. This identification process is conducted according to the following methodology and criteria, in which those countries covered by the EY FinTech Adoption Index represent the universe of potential major FinTech markets:

- Firstly, we classify countries with average and higher-than-average FinTech adoption rates in 2017 as major FinTech markets.[5]
- Secondly, we classify countries with particularly strong expected growth rates for FinTech adoption as major FinTech markets (*Ernst & Young,* 2017b).
- Thirdly, we classify Hong Kong, Japan and South Korea as major FinTech markets, since these countries have a considerable meaning for the global financial industry and are considered as Financial Hubs.[6]

As a result, we identify the following countries as major FinTech markets, thus building the basis for the following research in this paper:

Major FinTech markets		
Criteria	*Markets*	*Total*
Average and higher-than-average FinTech adoption rates	Europe: Germany, Spain, UK America: Brazil, Mexico, US Asia: China, India Other: Australia, South Africa	10
Particularly strong expected growth in FinTech adoption rates	America: Mexico Asia: Singapore Other: South Africa	3
Financial Hubs	Asia: Hong Kong, Japan, South Korea	3

Figure 2: Major FinTech Markets

[5] See table 1.

[6] Also financial center, meant as a city or region with a high concentration and variety of major financial institutions, which provide the entire range of high-end banking and financial services on a national or international basis. For further details see *Zhao et al.* (2004).

3. *Resulting Regulatory Predicaments*

As already noted by the Financial Stability Board (FSB), FinTechs may have a "material effect on financial markets and institutions and the provision of financial services" (*Financial Stability Board,* 2017). In fact, FinTechs already provide the entire range of financial services and products traditionally covered by established banks (*Arner* et al., 2016; *Arner* et al., 2017). As well as the widespread adoption of new technologies offers various opportunities, such as contributing to increasing innovation and enhancing efficiency in the financial services sector (*Maume,* 2017; *Ernst & Young,* 2017a; *He* et al., 2017; *Bank for International Settlements,* 2017), the exceptional rate of development of new business models[7] also poses considerable challenge to regulators, supervisors and policymakers worldwide. Despite the fact that many FinTech activities and business models fall within the scope of traditional banking regulations (*Financial Stability Board,* 2017), there are still considerable uncertainties about how to apply the regulatory requirements, i.e. consumer protection, anti-money laundering, compliance and licensing, to FinTechs (*Maume,* 2017; *Michaels/Homer,* 2018). Complying with these stringent regulatory requirements would pose not only financial, but also organizational as well as personnel challenges to FinTechs, particularly in the case of start-ups, and thus represent not only significant market entry barriers but also major hurdles for innovations (*Gerlach* et al., 2016; *Maume,* 2017; *Herger,* 2016; *Brummer/Gorfine,* 2014; *Arner* et al., 2016).

On the other hand, FinTechs also operate in business segments not yet covered by regulatory frameworks, thereby avoiding regulatory costs and oversight (*Bank for International Settlements,* 2017; *Financial Stability Board,* 2017; *Accenture,* 2016; *Michaels/Homer,* 2018). The resulting "regulatory gaps" (*Bank for International Settlements,* 2017) however, clearly contradict the core mandate of regulation to ensure a level playing field for incumbent firms and newcomers (*He* et al., 2017) and may moreover lead to new risks like the creation of a shadow-banking market.

Governments and regulatory authorities are aware of the need to provide clear regulatory guidance and thus are targeting an "optimal regulation" (*Ernst & Young,* 2017a) that promotes beneficial innovations and market competition without threatening financial stability and oversight or degrading consumer protections (*Schleussner,* 2017; *Arner* et al., 2016; *Bank for International Settlements,* 2017; *Financial Stability Board,* 2017; *Arner* et al., 2017; *Treleaven,* 2015; *He* et al., 2017; *Brummer/Gorfine,* 2014; *Zetzsche* et al., 2017; *Dombret,* 2016). Moreover, this regulatory trade-off is not only relevant in the financial services industry, but is also – from an economic point of view – relevant on a national basis: In order to remain competitive, national economies and its politicians

[7] Largely led by start-ups.

should be aware of the positive relatedness between (technological and organizational) innovation and economic growth (*Freeman,* 1995; *Brown et al.,* 2009). To address this (economic) trade-off between sound regulation on the one hand and fostering innovation on the other hand, policymakers worldwide are currently developing and testing different approaches.

4. *Regulatory Requirements of FinTech Business Models*

The banking sector is considered to be one of the most heavily regulated sectors worldwide (*Clifford Chance,* 2017; *Schleussner,* 2017). The fundamental mandates of financial regulation are to ensure the stability of the financial system, to create a level playing field between market participants and to protect consumers and investors (*Arner* et al., 2016; *Bundesanstalt für Finanzdienstleistungsaufsicht,* 2018b; *Fest,* 2008; *He* et al., 2017; *Schleussner,* 2017; *Zetzsche* et al., 2017). With regard to FinTechs, four main types of regulation are of particular importance: Consumer protection, anti-money laundering, compliance and licensing (*Maume,* 2017; *Schneider* et al., 2016; *Bank for International Settlements,* 2017). From a theoretical point of view, the rationale for consumer protection is based on the assumption that consumers have limited capacity to effectively assess and monitor the safety and soundness of financial institutions, which is due to information asymmetries as well as potential moral hazard-issues (i.e. unobservable behavior) in the financial markets (*Goodhart* et al., 2013; *Kim* et al., 2013; *Llewellyn,* 1999). Thus, in this context, the purpose of regulation is to adjust the system for market imperfections and to prevent market failures that ultimately would impair consumer welfare (*Llewellyn,* 1999).

Under German law, FinTechs become subject to regulation and supervision, if they operate businesses, which require a permission (i.e. a banking license) by the responsible regulators (§ 32 KWG). Those businesses include the provision of banking businesses (§ 1 sec. 1 KWG) and financial services (§ 1 sec. 1a KWG).[8] To obtain a banking license, an entity is required – amongst others – to comply with specific capital requirements and to meet suitable organizational measures (e.g. internal risk-management) to run operations properly (§ 33 KWG). Subsequent to completed license-granting, ongoing organizational and reporting obligations, e.g. capital and liquidity requirements according to §§ 10, 11 KWG as well as the required adoption of internal safeguards concerning money laundering (§ 25h KWG) and compliance (§ 25a sec. 1 no. 3c KWG), must be complied with.[9] Depending on the business model, a FinTech can also

[8] The requirement of a banking license is linked to the provision of banking businesses and financial services, independently of the use of new technologies and the innovativeness of products and services.

[9] § 2 sec. 1 no. 1–3 GWG.

be subject to the license requirements of payment service providers (§ 1 sec. 1 ZAG) and electronic money issuers (§ 1 sec. 2 ZAG) according to §§ 10, 11 ZAG. However, in all cases licensing and supervision is exercised by the BaFin (§ 6 sec. 1 KWG, § 4 sec. 1 ZAG) (*Deutsche Bundesbank,* 2018).[10] The majority of FinTechs is expected to be subject to licensing in any way. For instance, if a FinTech takes deposits from customers or becomes a contracting party to a credit agreement, it requires a license in accordance to § 1 sec. 1 no. 1 or 2 KWG. For those FinTechs that offer investment advisory as in the case of robo advice, again a license according to § 1 sec. 1a KWG is necessary (*Scholz-Fröhling,* 2017). If, however, a FinTech acts with negligence and provides banking services without the required license, the entity can be fined or the management may even face imprisonment of up to five years (§ 54 KWG). In Germany only § 2a VermAnlG represents a legislation specifically adopted for the FinTech business, which excludes a FinTech in the crowdfunding sector from the publication requirement of an investment prospectus (*Maume,* 2017).

This analysis outlines several regulatory challenges in dealing with FinTechs: The current regulatory framework poses significant market entry barriers for (potential) start-ups in the financial services industry. This is not in line with the BaFins' statement that regulation must neither be exploit as entry barrier for newcomers and to protect incumbents, nor to (constantly) privilege newcomers. Also, the German regulator itself identified the need for action in this regard (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016; *PwC,* 2017).[11] Anyhow, this issue is not only found to be discussed by practitioners but also experiences great relevance within the academic literature: In order to compete and contribute to innovative developments in a market, a new entrant needs to be able to enter it. In general, the conditions to enter a market depend on the height and number of barriers to entry. In the economic literature, numerous definitions of barriers to entry were developed (*Bain,* 1956; *Stigler,* 1968; *Ferguson,* 1974; *Fisher,* 1979; *von Weizsacker,* 1980; *Gilbert,* 1989; *Carlton/Perloff,* 1994; *McAfee* et al., 2004). Many of these define an entry barrier as a factor beneficial to incumbents, as it makes market entry unprofitable for (potential) new entrants and consequently reduces or limits competition (*Bain,* 1956; *Ferguson,* 1974; *Stigler,* 1968). Generally, barriers to entry are based on conditions that are either of strategic or structural nature. Strategic barriers result from deliberated behavior or

[10] Within the Single Supervisory Mechanism (SSM) however, those financial institutions which meet the definition according to Art. 4 sec. 1 no. 1 Capital Requirements Regulation (CRR) and additionally meet the European Central Banks' (ECB) criteria of "significant institutions" (SI), are directly supervised by the ECB. For further details see *European Central Bank* (2014).

[11] In this respect, it is noteworthy, that the increasing regulatory challenges imply an increasing demand for supportive services, which drives the "RegTech" developments. For further information see e.g. *PwC* (2017).

tactical actions by incumbents, which have the purpose to hinder the entry of new competitors. In contrast, structural barriers, which arise exogenously, are due to conditions of the industry such as cost and demand structures or technology. Consequently, these are the same for both incumbents and newcomers (*OECD,* 2006; *OECD,* 2007). However, in the context of FinTechs, the definition of *Fisher* (1979), which defines a barrier to entry as any condition that hampers entry although it would be socially beneficial, seems to be the most appropriate. For though the addition of FinTechs to the banking industry could promote competition and hence increase consumer welfare, in particular regulatory entry barriers in the form of capital, liquidity and licensing requirements pose a great hurdle for their entry in the industry (*Financial Services Authority,* 2013). Actually, particularly regulatory requirements in terms of capital and licensing requirements[12] are identified as two out of six (structural) regulatory barriers to entry (*Porter,* 1979; *OECD,* 2006), which can distort effective competition and stifle innovation as FinTechs may, due to financial or operational issues, not be able to comply with them (*Financial Conduct Authority,* 2015a). Instead, particularly incumbent banks benefit from these regulations, as they result in a "grandfathering" of their established business models.

Economic growth and customer welfare, increasing supply and thus consumer choice as well as potentially lower prices in the course of an entry of new FinTechs may yet be restricted (*Bennett/Estrin,* 2013; *Schleussner,* 2017). In fact, empirical evidence shows that the number of regulations and the amount of license fees may negatively affect the rate of entry, especially for small and medium firms (*Scarpetta et al.,* 2002; *Bennett/Estrin,* 2013). Moreover, *Molyneux* et al. (1994) find a relationship between the number and size of banks and barriers to entry, whereas other authors identify a interrelation between the extent of (regulatory) entry barriers and other market participants' welfare (*Besanko/Thakor,* 1992), the competitive intensity (*Hannan/Prager,* 1998) or degree of oligopolistic interaction (*Spiller/Favaro,* 1984). Anyhow, one has to note that concerning the extent and strictness of financial regulation, contrasting views in the academic literature exist: While *Eichengreen/Portes* (1987) demand strong regulations to reduce moral hazard problems in the banking sector, *Barth* et al. (2004) find evidence that high constraints on bank activities may instead contribute to financial crises. Thus, it is to conclude that regulation necessitates a trade-off between its resulting costs and benefits. An "over-regulation" (*Llewellyn,* 1999) that may compromise competition and creates entry barriers needs to be avoided.

Moreover, with regard to academic literature financial regulation in the form of laws and supervisory actions can be understood as a set of contracts within a principal-agent relationship, where financial institutions in general and FinTechs in particular represent the regulated agents. The objective of the principal,

[12] In this respect also named "government policy" (*Porter,* 1979).

i.e. the regulator, is to create incentivizing rules, which induce the agents to comply with the objectives of consumer protection and systemic stability (*Llewellyn,* 1999; *Freixas/Santomero,* 2003). Typical principal-agent problems, like adverse selection and moral hazard, which could arise from informational advantages possessed by the agents, are counteracted through a comprehensive set of regulations. The failure of unregulated firms, on the other side, may have an adverse impact on regulated institutions, inducing a potential cascade of banking failures in the financial system. Therefore, macroprudential banking regulations aim to implement substantial rules (e.g. capital adequacy requirements according to Basel III) and risk management procedures (*Alexander,* 2006; *Neuberger,* 1998).

To conclude, entrant firms certainly need to meet central standards, which prevent risks to customers or the financial system as a whole, and thus have their legitimation. However, those regulations that may inadequately impede market entries must be addressed. Even though regulatory requirements provide a level playing field between incumbents and new entrants as well as they guard against potential issues arising from typical principal-agent-problems, they should not result in a preclusion of FinTechs and thus hindering innovation in the industry.

5. *Regulatory Sandbox as Potential Solution*

In developing new regulatory approaches for FinTech businesses, several jurisdictions, including the UK, Australia, the US, Hong Kong, Singapore, the Netherlands and Canada launched so called regulatory sandboxes (*Accenture,* 2016; *Jenik/Lauer,* 2017). These sandboxes typically imply a temporary liberalization or even exemptions from regulatory requirements to provide a "safe space" for FinTechs to test their new products, services and innovative business models in a live, but monitored environment under direct regulators' supervision (*He* et al., 2017; *Financial Conduct Authority,* 2015b). While testing their business models under this unburdened regulatory regime, FinTechs are moreover in a constant dialogue with the regulators, facilitating a mutual knowledge exchange (*Bank for International Settlements,* 2017; *Maume,* 2017). The collaborative concept is an attempt to strike a balance between the regulators' competing objectives to promote innovation in financial services while safeguarding the financial regulations' core mandates (*Financial Stability Board,* 2017; *He* et al., 2017; *Bank for International Settlements,* 2017). Thus, the sandbox concept may be a part of the solution of the above mentioned trade-off between sound regulation and fostering innovation as well as reducing (regulatory) market entry barriers, which ultimately may contribute to sustainable competitiveness and economic growth.

Besides regulatory sandboxes, innovation hubs represent a second category of "innovation facilitators". These hubs can be understood as a preliminary stage to a more sophisticated sandbox concept and as a first contact point for FinTechs, where they can raise questions to competent authorities and receive elementary, non-binding regulatory guidance (*European Banking Authority,* 2018). To implement a holistic approach for regulators and FinTechs, however, the sandbox concept constitutes an indispensable element and thus represents this papers' focus.[13]

Historically, the theoretical basis of sandbox concepts originates from the information technology (IT) sector. Primarily in the context of software development, sandboxes provide an isolated testing environment for new codes before merging into the "live" system. This approach facilitates the identification of and protection against malfunctions or other changes that could inflict damage to the overall system resulting in potentially high costs (*Oktavianto/Muhardianto,* 2013; *Goldberg et al.,* 1996; *Wahbe* et al., 1993). The migration of those sandbox concepts into the financial regulatory environment was pioneered by the UK's Financial Conduct Authority (FCA) in November 2015 as a core component of its "Project Innovate" initiative (*Financial Conduct Authority,* 2017b). Afterwards, the application of sandbox concepts spread rapidly across various countries (*Financial Stability Board,* 2017). However, most introduced sandboxes are not constructed uniformly nor are they at the same stage of implementation (*Bank for International Settlements,* 2017; *He et al.,* 2017), reflecting the differing size and maturity of the particular financial sectors and the flexibility of the regulatory frameworks already in place (*Ernst & Young,* 2017a; *Financial Stability Board,* 2017).[14] However, albeit the diversity of existing models, the majority of sandboxes share some key characteristics and design components (*Zetzsche et al.,* 2017; *Bank for International Settlements,* 2017; *He* et al., 2017; *Jenik/Lauer,* 2017). If successfully implemented, regulatory sandboxes have the potential to lower regulatory barriers and help to speed up the market introduction of a wide range of new services. Furthermore, the gathered information and valuable insights during the test period might assist regulators to gain better understanding of risks and how to adapt current and future regulation to FinTechs without stifling innovation (*Financial Conduct Authority,* 2015b; *Zetzsche et al.,* 2017; *He* et al., 2017; *Jenik/Lauer,* 2017; *Ernst & Young,* 2017a).

Despite the benefits, to date no comparable initiative exists in Germany. However, the regularly organized workshops („BaFinTech") and the creation of an internal FinTech task force,[15] clearly express the high interest of the BaFin in this topic (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2017). Moreover, since the German Federal Ministry of Finance identified the opportunities and challenges

[13] For further details on Innovation Hubs see *European Banking Authority* (2018).

[14] i.e. rule-based vs. principle-based regime; for further details see *Brummer/Gorfine* (2014).

[15] See https://www.bafin.de/SharedDocs/Veranstaltungen/DE/180410_BaFinTech_2018.html for further details (Accessed: 12.07.2018).

that financial technologies entail for society, politics and economy, it consequently launched the "FinTechRat" in March 2017. This initiative is composed of FinTechs, banks and scientists and aims at strengthening the dialogue between politics and economy, supervising trends in the financial technologies area, advising the Federal Ministry of Finance and finally establishing Germany as the "FinTech-Hub No.1" within the European Union (*Bundesministerium der Finanzen,* 2017; *Bundesministerium der Finanzen,* 2019). Furthermore, the German Government is recently developing a blockchain-strategy in which it advocates the creation of a flexible regulatory framework for crypto-assets on both an European and international level (*FinTechRat,* 2019).[16] Against this background, one can conclude that these current political efforts once again fortify the relevance of the FinTech markets for the German competitiveness as well as the corresponding urgency and importance to develop a suitable regulatory framework.

Therefore, building on the above derived list of major FinTech markets (see figure 2), a detailed analysis of the respective sandbox solutions shall serve as a foundation to develop a set of recommendations for the concept of a regulatory sandbox specifically for the German market, which is in line with the regulatory framework and objectives. For this purpose the intersection of the above derived major FinTech markets with jurisdictions that already introduced an operational sandbox approach (*Jenik/Lauer,* 2017), represent the scope of this papers' further analysis on the various sandbox designs:

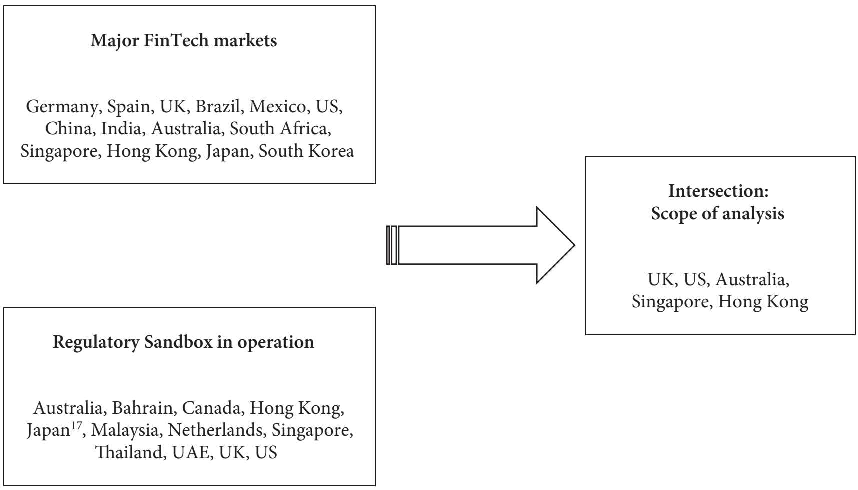


Figure 3: Major FinTech Markets in Scope of Regulatory Sandbox Analysis

[16] See https://www.bundesregierung.de/breg-de/themen/digital-made-in-de/blockchain-strategie-1546662 for further details (Accessed: 08.05.2019).

III. Analysis of Regulatory Sandboxes

In order to analyze the as relevant identified regulatory sandbox concepts[18] systematically, we focus on certain assessment criteria: If provided, we focus on the sandboxes' *objective*, the *effective date* and *stage of implementation*. Furthermore, we highlight specifications regarding the *application process*, *eligibility criteria* and *limitations* (e.g. participants, offered services, type and maximum number of clients, restrictions regarding the maximum exposure, customer safeguards, and disclosure). Finally, we emphasize the *duration* of the test as well as *applicable regulatory "tools"* and the questions whether and how the responsible authority provides *assistance* and *collaborates* with participating firms during the test period and when transitioning out of the sandbox. As mentioned above, the following analysis of the respective sandbox solutions serves as a best practice foundation for the development of a set of recommendations for a regulatory sandbox concept specifically for the German market, which is in line with the regulatory framework and objectives. Beyond that, a comprehensive table, which – using the above mentioned criteria – both summarizes and compares characteristics of the various sandbox approaches, is provided in the appendix.

1. Regulatory Sandbox: UK

As mentioned above, the FCA launched a comprehensive "Regulatory Sandbox" concept as a core component of its "Project Innovate". The overall aim of Project Innovate is to foster competition and growth in the financial services industry by supporting small and large businesses that are developing products and services which could improve consumers' experience and outcomes (*Financial Conduct Authority,* 2015b). On this basis, the objective of introducing the regulatory sandbox is to promote competition through (disruptive) innovation. The projected framework shall offer the possibility to test products and services in a controlled environment, thereby reducing the time-to-market at potentially

[17] Even though the Government of Japan introduced a sandbox framework in June 2018, it is hardly comparable to other sandboxes in scope, as it is not limited to a specific industry or area of regulation (https://www.jetro.go.jp/ext_images/en/invest/incentive_programs/pdf/Detailed_overview.pdf). Moreover, the official documentation is largely available only in Japanese (http://www.kantei.go.jp/jp/singi/keizaisaisei/regulatorysandbox.html). Consequently, as the paper focusses exclusively on banking sector regulations, Japans' rather unspecific and in foreign-language documented approach is excluded from the following analysis. However, it should be noted that Japans' Financial Services Agency introduced a "FinTech Proof-of-Concept Hub" in September 2017 to provide continuous support (https://www.fsa.go.jp/en/newsletter/weekly2017/262.html). However, its documentation is again in Japanese (https://www.fsa.go.jp/news/29/sonota/20170921/20170921.html). (All links in this footnote were accessed: 08.05.2019).

[18] Scope of analysis, see figure 3.

lower cost. Moreover, it strives to support the identification of appropriate customer safeguards for new products and services and achieving better access to finance (*Financial Conduct Authority,* 2015b; *Financial Conduct Authority,* 2018c; *Financial Conduct Authority,* 2017b; *Financial Conduct Authority,* 2018b). In this regard, the FCA developed its sophisticated regulatory sandbox, which was introduced in November 2015 and launched in June 2016 (*Financial Conduct Authority,* 2018a; *Financial Conduct Authority,* 2018c; *Financial Conduct Authority,* 2017b). The sandbox is open to both start-ups and incumbents as well as authorized and unauthorized firms. However, potential companies need to undergo an application process and meet certain criteria to participate in this concept (*Financial Conduct Authority,* 2018c). Moreover, the sandbox works on a cohort basis with two cohorts per year, thus offering two six-month test periods per year. For the first two cohorts the FCA received 146 applications of which 18 firms (cohort 1) and 24 firms (cohort 2) participated in the sandbox. Furthermore, 61 firms applied for participating in cohort 3 of which 18 were accepted by the FCA. Finally, in each case 29 firms participated in cohort 4 and 5, whereas 69 respectively 99 firms applied to participate. (*Financial Conduct Authority,* 2017b; *Financial Conduct Authority,* 2017a; *Financial Conduct Authority,* 2018d; *Financial Conduct Authority,* 2018e; *Financial Conduct Authority,* 2019a; *Financial Conduct Authority,* 2019b).

In more detail, applying companies need to explain its proposition, whether it is eligible and how it meets the FCAs' default standards (*Financial Conduct Authority,* 2018a). The required eligibility is based on certain criteria: First of all, firms must be in scope, which means that the companies' planned innovation is designed for or supports the financial services industry. The new solutions need to be genuine innovations, thus differing significantly from existing ones. Furthermore, directly or indirectly through increasing competition, the companies' innovations must lead to identifiable consumer benefit and the companies need to make clear why there is a "need for sandbox". Finally, in order to be eligible, potential participants need to have done sufficient research regarding its innovation and need to be ready for testing it with real customers in real markets (*Financial Conduct Authority,* 2015b; *Financial Conduct Authority,* 2018a).

Applicants must not only meet the required eligibility criteria but also a number of default standards, which were defined by the FCA. These encompass regulations regarding the duration for testing (three to six months), number of clients, customer selection, customer safeguards, disclosure, data and testing (*Financial Conduct Authority,* n/a). Finally, the FCA expects the testing companies to have a clear objective with the intended sandbox test (e. g. reducing costs to consumers) (*Financial Conduct Authority,* 2018c).

After reviewing the applications, the FCA decides which companies participate in the following cohort of the sandbox test. For each firm approved, the

FCA dedicates a case officer who supports the participating company regarding the designing and implementing of the test. In general, the FCA works closely with participants in order to ensure appropriate customer safeguards being in place and to mitigate potential harm during and after the test-period (*Financial Conduct Authority,* 2017b). Also, the FCA designed multiple tools to provide assistance during the test period and participation in the regulatory sandbox: First, the FCA designed a tailored authorization process specifically for unauthorized firms (restricted authorization). As a result, participating firms are allowed to test the agreed products and services (only), even though they are not able to meet the full requirements for a general, thus unlimited authorization. Moreover, the FCA can provide participating firms with no enforcement action letters, individual guidance or waivers. A no enforcement letter may be issued, if the FCA believes that the participating firms' activities do not breach the FCAs' requirements or harm its objectives and where the FCA is not able to assist with individual guidance and waivers. In this case, the FCA states that, as long as the test period lasts, no enforcement action against the company, respectively its intended activities, will be taken. Moreover, participating firms may often face uncertainties regarding existing regulatory requirements and whether and how they need to be applied in light of the intended activities. In these cases, the FCA gives individual guidance regarding the interpretation of applicable regulations. Finally, in the case of unduly burdensome rules, the FCA may be able to waive or modify specific rules for testing companies. However, this tool is limited to the FCAs' power and authority regarding the particular, questioned regulation (*Financial Conduct Authority,* 2015b; *Financial Conduct Authority,* 2018c; *Financial Conduct Authority,* 2017c). At the end of a sandbox test and before transitioning out of the sandbox, all participants have to submit a final report. The report should summarize the outcomes and findings of the sandbox test as well as the next steps planned (e.g. regarding product development) (*Financial Conduct Authority,* 2017b).

2. *Regulatory Sandbox: Australia*

In 2015, the Australian Securities and Investments Commission (ASIC) launched an Innovation Hub to support FinTechs in managing the relevant regulatory requirements. To achieve this objective, its key initiative was the creation of the ASIC's regulatory sandbox framework in December 2016 (*Australian Securities and Investments Commission,* 2017b). This sandbox approach consists of a licensing exemption allowing FinTechs to test their products or services without the requirement of financial services or credit licenses (*Australian Securities and Investments Commission,* 2017a; *Australian Securities and Investments Commission,* 2018), while ensuring adequate consumer protection (*Australian Securities and Investments Commission,* 2017b). A further objective of the sandbox is the facilitation of innovation (*Australian Securities and Investments Commission,* 2017a) by accelerating time-to-market and access to capital (*Australian Securities and Investments Commission,* 2017b). Despite these benefits, by the end of April 2019 only six businesses had used the regulatory sandbox (*Australian Securities and Investments Commission,* 2019). Similarly, a current survey reveals that only 1% of Australian FinTechs are currently using the regulatory sandbox, while 9% plan to use it in the next twelve months (*Ernst & Young,* 2017c).

To rely on the sandbox exemption, a FinTech must not be banned from providing financial services or from engaging in credit activities. Furthermore, the regulator explicitly excludes license-holders (i.e. established financial institutions) and is consequently eligible to early-stage financial institutions (i.e. start-ups) (*Australian Securities and Investments Commission,* 2017a; *Ernst & Young,* 2017a; *He* et al., 2017). A significant difference between the licensing exemption and the sandbox requirements of other financial regulators worldwide is the Australian "whitelist" approach, implying an automatic admission to the sandbox without an individual review by ASIC (*Australian Securities and Investments Commission,* 2017b). According to this, no formal application is required. Instead, the only requirement is a written notification and provision of certain information to the ASIC, before relying on the licensing exemption (*Australian Securities and Investments Commission,* 2017a). In contrast to this unique and comparatively flexible "whitelist" approach, the regulator prescribes strict qualitative as well as quantitative limitations concerning the operations of certain financial services or credit activities within the sandbox (*Australian Securities and Investments Commission,* 2017a). Amongst others, the ASIC provides a detailed list of financial services and credit activities that FinTechs are allowed to provide when utilizing the licensing exemption. However, issuing financial products or acting as a credit provider is not allowed under the exemption (*Australian Securities and Investments Commission,* 2017a; *Australian Securities and Investments Commission,* n/a).

Besides these product-specific requirements, further conditions have to be met to be able to rely on the relief of the licensing exemption. During the limited testing period of twelve months, the businesses may only provide services to up to 100 retail clients, while there are no limitations for wholesale or sophisticated clients. Yet, the total customer exposure may not exceed AUD 5 million. To maintain consumer trust and avoid systemic risk, the sandbox does not intend to waive any consumer protection requirements. Therefore, it specifies that every participant needs to comply with key consumer protection provisions and meet the disclosure and conduct requirements. In addition, the FinTechs must notify their clients that they rely on the licensing exemption and thus operate without license. Finally, the prescribed arrangement of adequate compensation schemes in case of losses as well as the implementation of dispute resolution procedures shall further ensure consumer protection (*Australian Securities and Investments Commission,* 2017a; *Australian Securities and Investments Commission,* n/a). Despite these strict specifications, the ASIC preserves the possibility to extent the testing period and/or the client limit (*Australian Securities and Investments Commission,* 2017a).

At the end of the sandbox period, the FinTechs can no longer rely upon the exemptions and are no longer allowed to continue operations, unless they have been granted a financial services or credit license. Similarly, they may proceed, if they have entered into an arrangement to provide services on behalf of a financial services or credit licensee, or if the ASIC has given individual relief extending the testing period (*Australian Securities and Investments Commission,* 2017a). Subsequent to the sandbox test, the participants are required to provide a short report of their experiences during the testing period (*Australian Securities and Investments Commission,* 2017a). However, neither does the regulator engage with the FinTechs prior to entering the sandbox, nor is a knowledge exchange officially stipulated between both parties during the testing (*Zetzsche et al.,* 2017).

3. Regulatory Sandbox: Singapore

Over the past few years, the Monetary Authority of Singapore (MAS)[19] has made some substantial investments to accelerate growth of the FinTech sector and implemented a range of supporting programs, positioning Singapore as a significant FinTech market (*Monetary Authority of Singapore,* 2018b). One key initiative was the formation of the FinTech & Innovation Group in August 2015, responsible for the development of regulatory policies and strategies relating to FinTechs (*Monetary Authority of Singapore,* 2018a). Finally in November 2016, the MAS released its "FinTech Regulatory Sandbox Guidelines" to provide a safe space for innovative firms to test their products and services while relaxing specific legal and regulatory requirements without deteriorating consumer protection and financial stability (*Monetary Authority of Singapore,* 2016a; *Monetary Authority of Singapore,* 2016b). The Sandbox is applicable for trials of new financial services by both (unregulated) FinTech start-ups and large (regulated and licensed) financial institutions (*Monetary Authority of Singapore,* 2016b; *Monetary Authority of Singapore,* n/a; *Monetary Authority of Singapore,* 2016c). Moreover, it is open to all interested firms with innovative financial services with no sectorial restriction on financial institutes (*Monetary Authority of Singapore,* 2016a). As there is no cohort scheme, applications to the sandbox can be submitted anytime (*Baker McKenzie,* 2017), so that by May 2019, two participants were actively using the sandbox whereas two already exited the sandbox

[19] Singapore's central bank and regulator of the financial services sector (see http://www.mas.gov.sg/About-MAS/Overview.aspx (Accessed: 04.07.2018)).

without obtaining the relevant regulatory status (*Fintech Singapore,* 2017; *Monetary Authority of Singapore,* 2019).

Based on the regulators' precondition to solely offer financial services which include new or emerging technology, or which use existing technology in an innovative way, the temporary relaxation of specific legal and regulatory requirements is conducted on a case-by-case basis (*Monetary Authority of Singapore,* 2016a; *Monetary Authority of Singapore,* 2016b; *Monetary Authority of Singapore,* n/a). Examples of those requirements that may be relaxed apply to cash balances, credit rating, financial soundness, fund solvency and capital adequacy. However, the MAS emphasizes that the sandbox should not be understood as a mean to circumvent legal and regulatory requirements and further clarifies that it will not compromise on requirements concerning consumer protection, prevention of money laundering and financing of terrorism (*Monetary Authority of Singapore,* 2016a). A further criterion, which the regulator will evaluate before granting permission to enter the sandbox, is the applicants' intention and ability to deploy the service in Singapore on a broader scale. To achieve the aspired well-defined space for experimentation, the test scenarios and boundary conditions, as well as the exit and transition strategy have to be clearly defined before entering the sandbox. The applicants are furthermore obliged to assess and mitigate significant risks and shall install appropriate safeguards to limit the consequences of failure for consumers and the financial system in collaboration with the regulator (*Monetary Authority of Singapore,* n/a; *Monetary Authority of Singapore,* 2016a). Similar to the Australian approach, the participants must notify its customers about the sandbox conditions and disclose the key risks, which the customer has to confirm. Despite these strict requirements, detailed specifications of the sandbox like the time frame, the maximum number as well as the type of customer and the maximum exposure are not predetermined by the guidelines. Instead, they are agreed on a case-by-case basis resulting in a cooperative and individually tailored solution (*Monetary Authority of Singapore,* 2016a).

During the testing period, which may optionally be extended, the sandbox can be discontinued by the regulator, if the participants are not capable to fully comply with the legal and regulatory requirements at the end of the sandbox period or in case of a breach of the agreed sandbox conditions (*Monetary Authority of Singapore,* 2016a; *Monetary Authority of Singapore,* 2016b; *Monetary Authority of Singapore,* 2016c). To prevent a forced termination of the sandbox, the participants are required to report to the MAS on agreed intervals (*Monetary Authority of Singapore,* 2016a). At the end of the sandbox period, the relaxation of the legal and regulatory requirements will expire, and the participants must exit the sandbox. However, the participants may proceed to deploy its financial services on a broader scale, if they fully comply with the relevant legal and regulatory requirements and both MAS and the participants are satisfied that the sandbox has achieved its intended outcomes (*Monetary Authority of Singapore,* 2016a).

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4. *Regulatory Sandbox: Hong Kong*

Hong Kong's regulator and supervisor of the banking business,[20] the Hong Kong Monetary Authority (HKMA), launched its Fintech Supervisory Sandbox (FSS) in September 2016 (*Hong Kong Monetary Authority,* 2019; *Hong Kong Monetary Authority,* 2016). Further initiatives by the HKMA, like the FinTech Facilitation Office, were implemented to enable a solid development of the local FinTech sector and to promote Hong Kong as a major FinTech hub in Asia (*Hong Kong Monetary Authority,* 2018).

The HKMAs' sandbox is exclusively eligible for authorized financial institutions (i.e. license holders) and their partnering technology firms and consequently precludes start-ups and non-bank institutions (*Hong Kong Monetary Authority,* 2019; *Hong Kong Monetary Authority,* 2016). It allows participants to conduct pilot trials without fully complying with the HKMAs' supervisory requirements. Thereby they can gather real-life data and user feedback within a controlled environment, which furthermore reduces time-to-market of new technology products as well as their development costs (*Hong Kong Monetary Authority,* 2019; *Hong Kong Monetary Authority,* 2016). Similar to the Singaporean approach, the HKMA does not release an extensive list of supervisory requirements that may be relaxed. Instead, relaxations will be discussed on a case-by-case basis with every individual applicant. Generally, all innovative FinTech products and services such as mobile payment services, biometric authentication, blockchain, robotics and augmented reality are in the focus of the sandbox, if they are intended to be launched in Hong Kong. In addition to external customers, also company staff members can be in the focus groups of targeted customers during the testing phase. From September 2016 to March 2019, 48 pilot trials were conducted in the sandbox, whereby 32 participants already exited and successfully rolled out their products and services. The tested FinTech products related largely to biometric authentication, application programming interfaces, Regtech and mobile application enhancements (*Hong Kong Monetary Authority,* 2019; *Hong Kong Monetary Authority,* 2016).

For the participation in the sandbox, the HKMA requires clearly defined terms concerning the scope, the timing and the termination of the pilot trials. Similarly, the HKMA strictly maintains on sufficient customer protection measures and reasonable risk management controls to mitigate risks that arise from the incomplete compliance with supervisory requirements. Therefore, the HKMA clarifies that the sandbox shall not be understood as a mean to bypass applicable supervisory requirements. Finally, the regulator requires the readiness of the systems and processes for the trial, which is moreover subject to close

[20] See https://www.hkma.gov.hk/eng/key-functions/banking-stability.shtml for further details (Accessed: 04.07.2018).

monitoring. The duration of the sandbox, exit arrangements, client limitations as well as the maximum exposure are not specified by the HKMA, but are instead agreed upon a case-by-case-basis in individual discussions (*Hong Kong Monetary Authority,* 2019; *Hong Kong Monetary Authority,* 2016).

Alongside the HKMA's sandbox approach, the Hong Kong Securities and Futures Commission (SFC)[21] (i.e. SFC Regulatory Sandbox) and the Hong Kong Insurance Authority (IA) (i.e. Insurtech Sandbox) each launched their respective sandbox solutions in September 2017 (*Securities and Futures Commission,* 2017b; *Insurance Authority,* 2018). While the HKMA's sandbox only applies to authorized financial institutions, the SFC's sandbox is applicable to both, corporations licensed by the SFC and start-up firms that intend to operate a regulated activity and utilize innovative technologies. Further requirements largely correspond to the HKMA, as also key investor protection requirements are not permitted to be relaxed (*Securities and Futures Commission,* 2017b; *Securities and Futures Commission,* 2017a). Likewise, the SFC can impose licensing conditions that limit the type and maximum exposure of those clients the firms plan to serve. Additionally, it can impose requirements to install adequate compensation schemes for investors, or to submit to periodic supervisory audits, facilitating a closer monitoring and supervision by the SFC (*Securities and Futures Commission,* 2017b; *Securities and Futures Commission,* 2017a). Lastly, the target audience of the IA sandbox are insurers authorized by the IA seeking for a controlled environment to test their Insurtech and other technology initiatives, which they intend to launch in Hong Kong. The IA prescribes analog principles applicable for the sandbox and does not publish an exhaustive list of supervisory requirements that may be relaxed, as each application will be evaluated on a case-by-case basis (*Insurance Authority,* 2018).

5. Regulatory Sandbox: US

In the US, no comprehensive regulatory sandbox concept as compared to the UK exists. Rather, authors and representatives do not agree whether there is a regulatory sandbox in operation or not (*Bologna,* 2017; *Jenik/Lauer,* 2017; *Accenture,* 2016). However, independently from whether or not a regulatory sandbox exists in the US, one has to state that this issue is not only discussed frequently[22] but also that several regulatory initiatives, addressing innovation in the financial services sector, exist.

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[21] Regulator of the Hong Kong's securities and futures markets; see https://www.sfc.hk/web/EN/about-the-sfc/our-role/for further details (Accessed: 04.07.2018).

[22] For instance, discussions regarding the benefits and downsides of regulatory sandboxes in general and the question whether and how a sandbox should be implemented in the US (*Allen,* 2018).

First of all, the Consumer Financial Protection Bureau (CFPB), one of many regulatory authorities in the complex and fragmented US financial regulatory system (*Gerlach* et al., 2016), launched its "Project Catalyst" in November 2012. This initiative is based on the CFPBs' belief that innovative developments imply markets working better for both consumers and suppliers of financial services and products. The aim of Project Catalyst is to facilitate innovation in order to enable the development of both safe and beneficial products and services in the financial services sector. In this regard, the CFPB announced a threefold strategy, consisting of the establishment of communication channels with stakeholders,[23] the development of programs and policies which support consumer-friendly innovation and finally the engagement in pilot projects as well as research collaborations (*Consumer Financial Protection Bureau,* 2016b). As a result, the CFPB developed the "Policy To Encourage Trial Disclosure Programs" and "Policy on No-Action Letters". The rationale of the "Policy To Encourage Trial Disclosure Programs", which became effective in October 2013, is to improve the way consumers receive information (e. g. regarding costs, benefits and associated risks) which are necessary to decide whether or not to use certain financial products or services. This again should increase competition and transparency, imply improved consumer understanding and lead to better-informed decision-making. In this respect, the CFPB has the authority to waive, for a defined time frame, certain disclosure requirements for companies with innovative versions and ideas for disclosures (*Consumer Financial Protection Bureau,* 2016b; *Consumer Financial Protection Bureau,* 2013). Moreover, similar to the FCAs' approach, the CFPB has the authority to issue no-action letters ("Policy on No-Action Letters", issued February 2016). In such a letter, which (following a formal application of potential companies) can be issued by the CFPB, staffs state that there is no intention to recommend enforcement or supervisory action against the company. However, a no-action letter is, for instance, limited to a predetermined period and certain statutes or regulations as well as possibly limitations regarding the volume of transactions. Using this tool, the CFPBs' aim is to prevent the regulatory framework in hindering innovation and to reduce regulatory uncertainties, which ultimately should promote the development of consumer-friendly innovations (*Consumer Financial Protection Bureau,* 2016b; *Consumer Financial Protection Bureau,* 2016a). To date, this tool was used once in September 2017, issued to an online lending platform (*Consumer Financial Protection Bureau,* 2017; *Bologna,* 2017).

Additionally, the "Financial Services Innovation Act of 2016" was published in September 2016. This initiative implements several actions to be conducted by agencies, whereas "agencies" comprise many regulatory authorities, boards, commissions etc. Each agency shall regularly identify and publish existing regu-

[23] E. g. entrepreneurs, innovative businesses, other regulators.

lations, which both apply or may apply to financial innovation and which the agency would consider to modify or waive. The act requires the agencies to set up a Financial Services Innovation Office (FSIO) in order to promote and assist financial innovations. In special circumstances and if appropriate,[24] agencies shall, acting through its FSIO, waive existing regulations. The act enables firms that offer or intend to offer financial innovations to submit a petition to an agency. This may result in the agencies' FSIO entering an agreement with the requesting company, which implies modifications or waivers for regulations where the agency has authority. Within the time frame from receiving the petition until the determination, the respective authority may undertake no enforcement actions which are related to the financial innovations that are subjected to the petition ("Safe Harbor") (*Mc Henry,* 2016b).

Finally, the U.S. Commodity Futures Trading Commission (CFTC) launched another FinTech initiative in May 2017, named LabCFTC. This initiative, which again is limited to the CFTCs' authorities and overseen markets, has a twofold purpose: Firstly, it aims at increasing regulatory certainty in order to encourage innovation, thus quality, resilience and competitiveness. Secondly, the CFTCs' objective is to identify and utilize new technologies. In order to accomplish this goals, the CFTC fosters a proactive engagement with the innovator community, academia, students and professionals, its participation in studies and research, the collaboration and cooperation among the FinTech industry as well as the CFTF market participants and the financial regulators both at home and overseas (*U.S. Commodity Futures Trading Commission,* 2017).

IV. Proposal of a Regulatory Sandbox Concept for Germany

Despite the variety of successful[25] and promising sandbox approaches worldwide, to date no such solution to the trade-off between sound regulation and promotion of innovation (in the financial sector) in Germany exists. However, as the previous analysis indicates, current regulatory concepts differ in several specifications, thus, there neither seems to be a "one size fits all solution" nor a general assessment regarding benefits and downsides of the applied concepts is possible. Nevertheless, we can use the findings of our detailed analysis as a foundation to develop a set of recommendations for a regulatory sandbox concept specifically for the German market, which is in line with the regulatory framework[26] and objectives. However, the analysis also indicates that despite the

[24] E. g. a rule being burdensome.

[25] In terms of usage and successful market entries of participating FinTechs.

[26] A possibly implemented regulatory sandbox needs to be in line with relevant national and international law and its scope is limited to the national supervisors' power and authority within the respective legislation.

discretion in licensing and other supervisory requirements, most of the sandboxes remain strict on fundamental regulations relating to consumer protection and anti-money laundering. Thus, as often challenged by the BaFin (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016), the core mandates of financial regulation to ensure the efficiency and stability of the financial system and to create a level playing field between market participants, are not compromised during the period of a regulatory sandbox.

Meanwhile the German banking supervisor BaFin[27] realized the need for a certain degree of flexibility in the context of FinTech and has henceforth dedicated itself to their diverse concerns. Against the background of the BaFins' objective to create a contemporary supervision without compromising its core mandates[28] (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016; *Bundesanstalt für Finanzdienstleistungsaufsicht,* 2018a), the aim of this section is to develop a sandbox framework which is applicable in the German regulatory environment. Similarly to the scrutiny of the legal and regulatory framework, also the regulators capacity as well as the market conditions of a particular country must be considered when developing a regulatory sandbox (*Jenik/Lauer,* 2017). However, as shown in sections 2.2 to 2.5, both the global and national developments in the FinTech markets as well as Germany being identified as one of the major representative FinTech markets worldwide, clearly provide strong evidence of the need for action in this regard. Moreover, from a theoretical point view, particularly with regard to market entry barriers and its potential consequences as well as the principal-agent theory with its potential adverse selection and moral hazard issues, it seems favorable to address this topic.

To facilitate the implementation of a regulatory sandbox in practice, the following suggestions are divided into three phases and address the same criteria as used in section 2 to analyze the respective sandbox concepts:

Objectives and scope		
Application phase	Testing phase	Exit phase

Figure 4: Phases of the Proposed Regulatory Sandbox Framework

The first phase concerns the FinTechs' prerequisites to apply for the sandbox. Generally, the sandbox should be applicable for both, start-ups and incumbents respectively licensed and unlicensed companies that intend to operate regulated financial services[29] under the BaFin. This all-embracing approach ensures a lev-

[27] According to § 6 sec. 1 KWG.

[28] In line with § 6 sec. 2 KWG.

[29] According to § 1 sec. 1, 1a KWG.

el playing field between market participants and thus cannot be confused with an economic promotion, which the BaFin has no mandate for (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016). The proposed services should be innovative in the way that they include new technology or utilize existing technologies in a novel or reinvented way. In addition, the written application must contain clear and concrete information, how the firms plan to operate during the testing phase, which include distinct definitions of the test scenarios, targeted customers, the expected exposure as well as a clear exit and transition strategy. Moreover, the applicants are supposed to have safeguards and risk management controls already in place, which meet the BaFins' requirements to appropriately protect consumers and the soundness of financial system during the sandbox period. Thus, risk identification and mitigation strategies depict important eligibility criteria to be permitted to participate in the sandbox. However, this screening process of the regulator, who represents the uniformed principal, is an adequate instrument to reduce ex ante private information (i.e. pre-contractual opportunism) held by the applicants, which represent the agent. Thus, potential adverse selection issues – driven by hidden information as part of the principal-agent problem – would yet be diminished (*Akerlof,* 1970; *Ross,* 1973; *Rothschild/Stiglitz,* 1976). Finally, there shall not be any application-deadlines as under the cohort-approach in the UK, however, the FinTechs must demonstrate their organizational preparedness to conduct the trials and to enter the market within an adequate time frame before applying.

Secondly, the implementation of the testing-phase shall then be conducted in close cooperation with the supervisor. As the BaFin intends to review each business model individually (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016), a case-by-case evaluation of adequate allowances and potential relaxations of specific regulatory requirements seems to be the most suitable approach in the German context. This facilitates both parties to jointly define clear boundary conditions such as the maximum number and type of clients as well as the maximum exposure and the time frame of the sandbox period. Similarly, an individual relaxation of certain regulations is eligible under this approach. Notably the authorization requirements according to § 33 KWG constitute a potential reference point in this respect, as amongst others the initial capital requirements of § 33 sec. 1 KWG may represent major hurdles especially to young firms. This alternative certainly requires the supervisor to thoroughly assess and balance those regulations that pose concrete issues or barriers to an individual FinTech and thus may be relaxed for a limited time, without putting the trust in the financial system at risk.

Furthermore, this principle-based sandbox approach enables the BaFin to react to each firm in an adaptive way, providing FinTechs with the flexibility they require in their respective stage of development. However, it must be clear that the core principles of consumer protection, anti-money laundering and countering the financing of terrorism policies (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2018a) will not be compromised at any time. The achievements of the already operating sandboxes suggest a time frame of participation of at least six month, during which the FinTechs have time to test their innovative products or services and to develop the capability to fully comply with the relevant regulatory requirements before exiting the sandbox. Finally, the trials shall be subject to close monitoring by the responsible supervisor. Therefore, the participants should be requested to provide periodic reports. These reports would represent an effective monitoring tool for the supervisor (i.e. the principal) to reduce the FinTechs' (i.e. the agent) freedom of action for post-contractual opportunistic behavior in terms of hidden action, which potentially may cause moral hazard issues (*Hölmstrom,* 1979). Since the ongoing supervision of institutions by the BaFin is executed in cooperation with the Deutsche Bundesbank,[30] those reports and resulting consultation may also be conducted by the latter.

Thirdly, the exit from the sandbox and the transition to a fully-fledged financial institution represents the final stage of the sandbox-participation, if a FinTech succeeds to fully comply to all relevant regulations and furthermore demonstrates a reliable technology, which can operate under the same supervision requirements as authorized institutions. Otherwise, a FinTech is not allowed to continue operations as the relaxation of regulatory requirements expire. Either way, the participants should be induced to provide a final report of its experiences and suggestions to facilitate a knowledge-exchange, giving the supervisor the chance to learn and continuously improve the approach.

These general suggestions for guidelines, if adequately applied, would not only preserve the trust in the financial system but also counteract the BaFins' concerns that sandboxes could potentially degrade consumer protections by creating a "supervision light" (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016). On the contrary, a sandbox developed on this basis does not contradict any of the supervisors' statutory duties and would moreover create a level playing field for market participants, which is clearly distinctive from a mere economic promotion of young start-ups. It would enable licensed as well as unlicensed start-ups and incumbents to test their innovative services in a controlled environment by the BaFin, thereby accelerating their time-to-market and access to capital. In summary, a German sandbox developed on this basis, could represent a sound solution to the above derived trade-off between encouraging innovation and ensuring compliance to regulations.

[30] According to § 7 KWG.

V. Conclusion

With this study, we aimed at developing a sandbox framework that is applicable in the German regulatory environment without compromising core regulatory objectives. Capital, liquidity and licensing requirements imposed by financial regulations pose a major hurdle for young FinTechs to enter the markets. Economic growth and customer welfare through innovation, increasing consumer choice and lower prices in the course of an entry of new FinTechs would yet be restricted. Through its ability to reduce time-to-market for FinTechs, a regulatory sandbox is a useful approach to overcome the regulatory barriers to entry and to foster competition in the financial markets while ensuring consumer protection and financial stability. Otherwise, young firms may be encouraged to circumvent those regulatory barriers by unauthorized and arbitrary operations, which in turn may cause new costs and sanctioning effort for regulators and supervisors as well as the emergence of shadow-banking markets (*Ringe/Ruof*, 2018). A further consequence may be the emigration of entrepreneurs to alternative and in this regard more dedicated economies. This again may, by affecting the innovativeness within the German financial services sector negatively, worsen its competitiveness and eventually impair the national economies' condition. The implementation of innovation hubs, however, does not represent a holistic approach to this topic and should not be used to justify an omission of an – from our point of view – indispensable and integral regulatory sandbox concept. Finally, it seems favorable to address this topic not only from a practical but also from a theoretical point view. This may be emphasized by taking into account the both empirically and theoretically discussed consequences of market entry barriers as well as with principal-agent problems. In this respect, we utilized the traditional principal-agency theory in the context of the relationship between the regulators and the FinTechs to demonstrate the capability of a sandbox approach to reduce typical principal-agent problems arising from adverse selection and moral hazard. The agents' (FinTechs) opportunistic behavior to pursue its personal interest at the expense of the uninformed principals (regulators) may be countered by a comprehensive application process (i. e. screening) as well as a constant dialogue and regular reports (i. e. monitoring). During the sandbox period, the potentially unexperienced FinTechs obtain the opportunity to understand and thereupon meet the regulatory requirements, while the competent authorities can assess the inherent opportunities and risks of the innovation.

Building on a detailed analysis of various sandbox models worldwide, which were systematically identified as relevant, we proposed an own set of recommendations as a basis for an accessible and sustainable sandbox implementation. These recommendations have the potential to contribute to the solution of the trade-off between sound regulation and innovation support. In doing so, we also contribute to different strands of literature regarding the evolution and general understanding of FinTechs and its services, the recent discussions of an optimal design of sandbox concepts and – specifically for the German market – the existing regulatory frameworks and their approaches to FinTech-supervision. In this regard, this study represents to our best knowledge the first study on key international sandboxes as a basis to design guidelines for a regulatory sandbox concept specifically for the German market. Hence, since the responsible regulator itself recognized a "need for action" in this regard (*Bundesanstalt für Finanzdienstleistungsaufsicht,* 2016), we not only contributed to the identified research gap in literature but also to the practical solution of current challenges that both regulators and affected companies face. However, even though our derived implications focus on the Germany financial sector, the results may potentially be applicable in further jurisdictions with similar regulatory requirements. Additionally, our analysis of various sandbox models worldwide can be used as a basis for further research, which focuses on other than the German financial markets.

Nevertheless, it is important to mention that this paper neither can provide a detailed regulatory framework for the German FinTech market and nor did we aim at this. Rather, we encourage to interpret this study as a "call for action" regarding the identified "need for action" by providing systematically derived general guidelines as a basis for further discussions and the implementation of a regulatory sandbox concept in Germany. Further limitations concern divergent legal systems (i. e. case law/code law) as well as cultural differences between the considered countries, in which Germany represents a code law country with a high reliance on comprehensive codes and laws (*Zogning,* 2017; *Durand/Tarca,* 2005). It is important to highlight that so far no empirical evidence regarding the assumed contribution of regulatory sandboxes to the trade-off between sound regulation and innovation support exists. Notwithstanding, based on conceptual and qualitative considerations we expect this causality to most likely exist.

Partly derived from these limitations, we identified needs for future research. Firstly, our analysis of various sandbox models worldwide can be used as a basis for further research, which focuses on other than the German financial markets. Secondly, subjected to accessible data, future research should empirically investigate the assumed interconnection of the existence of regulatory sandbox concepts and the resolutions of the identified trade-off. Additionally, it would be highly interesting to research on the question whether and how differing characteristics in national regulatory sandbox concepts imply differences in the efficiency and performance of those concepts, particularly in respect to the emergence and success of FinTechs. Since these questions are highly relevant for the sustainability and efficiency of financial industries and thus the sustainable and long-lasting competitiveness of national economies, we encourage both practitioners and researchers to further focus on these issues.

Appendix

Comparison of as Relevant Identified Regulatory Sandboxes

Criteria	*UK*	*US*	*Australia*
General aspects			
Responsible Regulator	FCA	Several	ASIC
Starting time	Jun. 2016	Several	Dec. 2016
Stage of implementation	In operation	Several	In operation
Objective	The regulatory sandbox aims at delivering more effective competition in the interests of consumers by • the ability to test products and services in a controlled environment • reducing the time-to-market at potentially lower cost • supporting the identification of appropriate consumer protection safeguards • better access to finance The overall aim of "Project Innovate" is to foster competition and growth in the financial services sector by supporting both small and large business, which develop products and services that genuinely improve consumers' experience and outcomes.		The regulatory sandbox aims at assisting and supporting FinTechs to test their products and services in an environment with reduced regulatory requirements whilst safeguarding adequate consumer protection. Moreover, the concept aims at facilitating innovation, accelerating time-to-market and improving flexibility and access to capital.

Singapore	*Hong Kong*		
	FSS	*SFC Regulatory Sandbox*	*Insurtech Sandbox*
MAS	HKMA	SFC	IA
Nov. 2016	Sept. 2016	Sept. 2017	Sept. 2017
In operation	In operation	In operation	In operation
The regulatory sandbox aims at assisting and supporting FinTechs to test their products and services in an environment with relaxed legal and regulatory requirements, however consumer protection and financial stability must not be deteriorated.	The regulatory sandbox enables financial institutions to conduct pilot trials to gather real-life data and user feedback in a controlled environment. Since there is no demand to fully comply with the regulatory requirements the time-to-market of new products and services as well as development costs should be reduced.	The regulatory sandbox helps to give regulatory certainty regarding risks that are relevant to the entities' regulated activities. It provides a confined regulatory environment before innovative products and services are offered on a larger scale.	The regulatory sandbox aims at facilitating pilot runs to collect sufficient data in order to demonstrate that certain Insurtech applications can broadly meet relevant supervisory requirements. Moreover, before launching a product or service on a large scale, the sandbox firms should obtain real market data and user feedback in a controlled environment.

Criteria	*UK*	*US*	*Australia*
Scope/Content	Firms in the sandbox may be provided with "sandbox tools" to conduct the test within the regulatory framework, e. g. • restricted authorization • individual guidance • waivers • no enforcement action letters Sandbox firms are assigned a dedicated case officer who supports the design and implementation of the test. The FCA works closely with sandbox firms to ensure that sufficient safeguards are in place and to mitigate potential harm during and after the test period.	Policy to Encourage Trial Disclosure Programs: The rational is to improve the way consumers receive information, which are necessary to decide whether to use certain financial products or services. This again should increase competition and transparency, imply improved consumer understanding and lead to better-informed decision-making. In this respect, the CFPB has the authority to waive, for a defined period, certain disclosure requirements for companies with innovative versions and ideas for disclosures. Policy on No-Action Letters: The rational is to prevent the regulatory framework in hindering innovation and to reduce regulatory uncertainties, which ultimately should promote the development of consumer friendly innovations. Entities may formally submit a request for a No-Action Letter. In such a letter, the CFPB may state that there is no intention to recommend enforcement or supervisory action against the company. No-Action Letters may for instance be limited to a predetermined period and certain statutes or regulations as well as possibly limitations regarding the volume of transactions.	The framework consists of three components: • Existing flexibility or exemptions provided by law • FinTech licensing exemptions applicable to certain products or services • Individual licensing exemptions Only licensing requirements are waived, not regulations.

Singapore	*Hong Kong*		
	FSS	*SFC Regulatory Sandbox*	*Insurtech Sandbox*
Relaxation of specific legal and regulatory requirements for operating MAS-regulated functions on a case-by-case basis. Legal and regulatory requirements that may be relaxed consist e. g. • fund solvency and capital adequacy • license fees Requirements that must be maintained consist • consumer protection • prevention of money laundering and financing of terrorism • fit and proper criteria particularly on honesty and integrity	The regulatory sandbox allows banks and their partnering technology firms to conduct pilot trials without fully complying with the HKMA's supervisory requirements. Relaxations will be discussed on a case-by-case basis with every individual sandbox firm.	No relaxation of regulatory requirements, which are key to investor protection. Sandbox firms must comply with the applicable financial resources requirements.	Flexibility in the supervisory requirements on a case-by-case basis.

Criteria	*UK*	*US*	*Australia*
	IRS Data Verification Modernization Act of 2016: Initiative that aims to automate and speed up taxpayers' income verification process for legitimate business purposes. The verification process should be conducted entirely automated, electronic, online and close to real-time in order to prevent delays for FinTech companies and banks that rely on leveraging data and technology to make faster, informed decision for consumer and small business lending. Financial Services Innovation Act of 2016: This act requires agencies (e.g. regulatory authorities, boards, commissions) to • identify and publish a list of existing regulation that apply or may apply to financial innovation and that the agency would consider modifying or waiving • establish a FSIO in order to promote and assist financial innovations as well as eventually waive existing regulations The act further enables entities that offer or intend to offer financial innovations to submit a petition to an agency in order to reach individual agreements regarding modifications or waivers for certain regulations. LabCFTC: Initiative by the CFTC that aims at increasing regulatory certainty in order to encourage innovation and to identify and utilize new technologies.		

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Singapore	*Hong Kong*		
	FSS	*SFC Regulatory Sandbox*	*Insurtech Sandbox*

Criteria	*UK*	*US*	*Australia*
Eligibility to apply for participation	Sandbox is open to • both start-ups and incumbents • authorized and unauthorized firms Applications must • explain proposition • meet the default standards (e. g. duration, number of customers, customer selection and safeguards) • meet the eligibility criteria (firm in scope? Genuine innovation? Consumer benefit? Need for a sandbox? Ready for testing? Background research?)		Exemption excludes license-holders (established financial institutions) and covers mostly early-stage financial institutions (start-ups).
Targeted customers?	Sandbox firms are expected to source (potential) customers by themselves. The appropriate type of customers is expected.		Retail, wholesale and sophisticated clients. No sectorial restrictions.
Targeted products/services?			Products and services allowed to be tested: • Financial services (giving financial advice and dealing with certain products such as listed Australian securities, deposits and payment products; however, no issuing of financial products allowed) • Credit activities (limited to activities as intermediary or assistant and further limitations such as volume; however, no allowance to act as a credit provider)

Singapore	*Hong Kong*		
	FSS	*SFC Regulatory Sandbox*	*Insurtech Sandbox*
The regulatory sandbox is applicable for trials of new financial services by both (unregulated) FinTech start-ups and large (regulated and licensed) financial institutions.	The regulatory sandbox only applies to authorized financial institutions (i. e. license holders) and their partnering technology firms, excluding start-ups and non-bank institutions.	The Sandbox is applicable to corporations licensed by the SFC and start-ups that intend to operate a regulated activity under the Securities and Futures Ordinance (SFO).	The regulatory sandbox only applies to insurers authorized by the IA.
Sandbox firms can choose the type of targeted customers. No limitations, specifications or sectorial restrictions. Agreed on a case-by-case basis.	Company staff members or focus group of selected customers. Agreed on a case-by-case basis.	SFC can impose licensing conditions, which limit the types of clients.	External customers, which can give live and real data or selected group of the insurers' staff. Clear definition of targeted users on a case-by-case basis.
Financial services that are not similar to already offered ones. Thus, financial services must include new or emerging technologies or use existing technologies in an innovative and different way.	All innovative FinTech products and services, e. g. mobile payment services, blockchain, robotics, augmented reality, biometric authentication.	All under the SFO regulated activities that utilize innovative technologies.	Innovative Insurtech applications.

Criteria	*UK*	*US*	*Australia*
Targeted region?			
Transition plan for full development/actions following the sandbox test	The sandbox firms must submit a final report summarizing the outcomes of the test before transitioning out of the sandbox. The report also should summarize the sandbox firms‘ findings and next steps.		At the end of the testing period, the sandbox firms are not allowed to continue operations, unless • they granted a financial services or credit license • they entered into an arrangement to provide services on behalf of a financial services or credit licensee • the ASIC has given it individual relief extending its testing period
Limitations			
Entry criteria	Sandbox firms are expected to have a clear objective. Tests are expected to be conducted on a small scale. Sandbox firms are expected to have clear testing plans, including • timeline and key milestones • measures to evaluate the success of the sandbox test • testing parameters (e. g. duration, customers, transaction limit) • customer safeguards • risk assessment • exit strategy		To rely on the licensing exemption, the sandbox firms must • have no more than 100 retail clients • have a total client exposure not exceeding AUD 5 million • comply with consumer protection requirements • have adequate compensation arrangements • have both internal and external dispute resolution procedures in place

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Singapore	*Hong Kong*		
	FSS	*SFC Regulatory Sandbox*	*Insurtech Sandbox*
Sandbox firms must have intention and ability to deploy its financial services in Singapore. However, the broader scale deployment is not limited to Singapore.	Technology initiatives must be intended to be launched in Hong Kong.		
At the end of the sandbox period, the relaxation of the legal and regulatory requirements will expire and the sandbox firms must exit the sandbox. The sandbox firms may proceed to deploy their financial services on a broader scale, if they can fully comply with the relevant legal and regulatory requirements.	Termination arrangements must be pre-specified.	Sandbox firms can request a removal or variation of some or all of the imposed licensing conditions, once they have demonstrated a reliable technology.	The sandbox firms must have an exit strategy if the pilot run has to be terminated unsuccessfully.
Sandbox evaluation criteria: • Financial services include new technologies or use existing technologies in an innovative way • Financial services address a problem or brings benefits to consumers and/or the industry • Intention and ability to deploy the proposed financial services in Singapore on a broader scale (after exiting the sandbox)	• Clearly defined scope and phases (if any) of the pilot trial, timing and termination arrangements • Sufficient customer protection measures • Reasonable risk management controls • Readiness of the systems and processes for the trial	• SFC can impose requirement to install adequate compensation schemes for investors or to submit to periodic supervisory audits • Sandbox firms may face close monitoring and supervision by the SFC	Principles applicable for the Sandbox: • Well-defined boundary and conditions of the trial • Adequate risk management controls to meet of the relevant supervisory requirements • Adequate safeguards to ensure customer protection • Adequate resources • Development of an exit strategy

Criteria	*UK*	*US*	*Australia*
	Eligibility criteria must be met, e.g. • Is the firm in scope? • Genuine innovation? • Consumer benefit? • Need for a sandbox? • Ready for testing? Further criteria: Sandbox firms are • are responsible for securing partners • required to have a significant UK presence • (usually) required to have a UK bank account		
Exit criteria/Exit strategy for test failure			
Duration	The sandbox operates on a cohort basis, 2 cohorts per year, each test period 6 months. Long enough to enable statistically relevant data to be obtained from the test.		12 months, extension option for another 12 months.

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Singapore	Hong Kong		
	FSS	SFC Regulatory Sandbox	Insurtech Sandbox
• Clearly defined test scenarios and expected outcomes • Clearly defined boundary conditions, protecting the interests of consumers • Significant risks must be assessed and mitigated • Clearly defined exit and transition strategy			
The sandbox will be discontinued when • the achievement of the intended purpose is unclear • the sandbox firm is not capable to fully comply with the relevant legal and regulatory requirements at the end of the sandbox period • a flaw has been discovered in the financial service, which cannot be resolved within the duration of the sandbox and the risks outweigh the benefits • MAS terminates the sandbox due to breaches of agreed sandbox conditions • the sandbox firm exits the sandbox		The SFC may revoke the license if the sandbox firms fail to meet regulatory requirements.	
Limited. Agreed on a case-by-case basis. Extension option available.	Limited. Agreed on a case-by-case basis.		Limited. Agreed on a case-by-case basis.

Criteria	*UK*	*US*	*Australia*
(*Max.*) *number of customers*	• FCA sets a strict limit to the size of the test (small scale testing) • Customer set should be big enough to obtain statistically relevant data Sandbox firms are requested to disclose information regarding the test, e. g. available compensation in the event of failure.		• Retail: maximum of 100 clients • Wholesale: unlimited Extension option for client limit available.
Max. exposure			• The exposure of each retail client to deposit products, simple managed investment schemes, securities, government bonds and payment products in relation to which services are provided must not exceed AUD 10,000 • The amount of credit under a credit contract in relation to which services are provided must not exceed AUD 25,000 • The sum insured under a general insurance contract in relation to which services are provided must not exceed AUD 50,000 • The total maximum exposure of all clients taking part in the testing must not exceed AUD 5 million

Singapore	Hong Kong		
	FSS	SFC Regulatory Sandbox	Insurtech Sandbox
Limited. Agreed on a case-by-case basis.	Limited. Agreed on a case-by-case basis.		
Not specified. Sandbox firms have to state and justify quantifiable limits such as transaction thresholds or cash holding limits.		SFC can impose licensing conditions, which limit the maximum exposure of each client.	

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