



Exploring how social interactions influence regulators and innovators: The case of regulatory sandboxes

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ABSTRACT

Like incubators, regulatory sandboxes constitute a prominent mechanism to enable entrepreneurial activities that guide financial technology (FinTech) firms through regulatory frameworks in the financial industry. Because they are new, there is a lack of research on regulatory sandboxes; most studies have investigated legal aspects while overlooking the management perspective. To address this gap, this paper builds on incubation research studies to explore how social interactions within regulatory sandboxes influence the practices of regulators and regulatees, using social capital theory. An exploratory-abductive approach is adopted, using data collected from 16 semi-structured interviews. The findings indicate that regulator-regulatee social interactions increase the legitimacy, risk management capabilities, and knowledge of regulatory frameworks among regulatees and, as to regulators, increase their understanding of regulatory constraints and potential risks in enabling technologies, better inform them of regulatees' support needs, and offer them early access to regulatory innovations. The findings also reveal that the practices of regulators and regulatees may be negatively affected due to lowered trust and discrepancies in expectations and underlying goals. This research contributes to the incubation literature by focusing on the micro and meso levels of knowledge exchange and the entrepreneurial finance literature by promoting the role of incubation models.

1. Introduction

As enabling technologies like artificial intelligence, blockchain, and Big Data analytics have revolutionized industries including financial markets (e.g., Diaz-Rainey et al., 2015; Palmié et al., 2019), debates on the role of new players in supporting entrepreneurial financial technology (FinTech) firms in raising capital have emerged (Block et al., 2018). For instance, one stream of research has focused on investigating the influence of regulation on both traditional (e.g., Cumming and Schwienbacher, 2018) and non-traditional funding forms (e.g., Hornuf and Schwienbacher, 2017). Notably, non-traditional financing alternatives like crowdfunding (i.e. raising capital from the crowd) may not necessarily be aligned with existing banking regulations (Navaretti et al., 2017), giving rise to legal issues and the need for

regulatory change (Cumming et al., 2019). In addition, attributable regulatory challenges appear to be barriers for FinTech firms due to the high cost of compliance and the consequences of non-compliance, a lack of regulatory knowledge, and legal uncertainty (Arner et al., 2015; Appaya and Jenik, 2019; Haddad and Hornuf, 2019; IOSCO, 2017; UNSGSA et al., 2019; Zilgalvis, 2014). As a result of these challenges, regulators have noted the urgent need to find new approaches to regulate financial markets and promote innovation (Jenik and Lauer, 2017). Among different safeguards, this study focuses on regulatory sandboxes as both a support and a policy instrument (Borrás and Edquist, 2013) adopted by regulators to stimulate innovation and competition while achieving broader goals like the stability of financial markets. Fundamentally, regulatory sandboxes grant licensing exemptions to participants so that they can test their solutions for a set

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period of time, subject to conditions imposed by regulators in each jurisdiction (Arner et al., 2016; Zetzsche et al., 2017).

Zetzsche et al. (2017) claim that regulatory sandboxes promote bi-directional knowledge exchange between regulators and market participants; it is through interactions with innovators that regulatory frameworks become more resilient and informed about financial market dynamics (Bromberg et al., 2017). In the present study, social interaction is described as a required mechanism for resource and knowledge transfer (Inkpen and Tsang, 2005). From a regulator's perspective, sandboxes provide an opportunity to test and learn how different regulatory practices influence participants (Arner et al., 2017), while participating innovators gain a greater "understanding of regulatory and supervisory expectations" (ESA, 2019, p. 5). These findings indicate that regulatory sandboxes influence both regulation and innovation. However, considering the novel nature of this instrument, there is lack of in-depth academic and non-academic management research on policy instruments (Martin, 2016), which may be due to the ad hoc nature of policy intervention (Patanakul and Pinto, 2014). Innovation management research has rarely investigated aspects of technological transformation in capital markets (Diaz-Rainey et al., 2015). We thus know little about how social interactions among regulators and innovators participating in regulatory sandboxes influence practices of regulators or regulatees. Accordingly, we still lack evidence regarding how sandboxes may enable FinTech firms in the entrepreneurial finance setting. To help address these gaps, we focus our research on the incubation stage—defined as a validation process to test developed ideas in the marketplace—instead of idea generation or scaling (O'Reilly and Binns, 2019) to conduct a qualitative study that systematically explores regulator-regulatee social interactions in the context of regulatory sandboxes.

This problem is important to investigate for the following reasons. First, fundraising for entrepreneurial ventures is gaining greater attention among policymakers at different levels (Block et al., 2018). Internationally, bans on novel fundraising forms like initial coin offerings (ICOs) cause spillover effects that hamper the diffusion of ICOs across countries, as financial trade inherently crosses borders, thus requiring an orchestrated regulatory approach (Bellavatis et al., 2019). Second, the economic impact of the FinTech phenomenon is growing significantly, with FinTech providers already having seized one-third of total banking revenues globally (Accenture, 2018). Third, FinTech initiatives and opportunities are continuously growing, and there is a pressing need for regulators to develop effective approaches like regulatory sandboxes to stimulate innovation while still ensuring financial market stability. Over 50 regulatory authorities worldwide have either established or announced a regulatory sandbox (see the overview in UNSGSA et al., 2019). Along these lines, regulators have started to modify current sandbox models, offering additional programs or changing current practices. For example, the Monetary Authority of Singapore (MAS) has recently launched Sandbox Express, while the Global Sandbox initiative is undergoing a cross-border pilot phase with eight FinTech participants (FCA, 2019a; MAS, 2019). Finally, neither regulators nor innovators necessarily know how FinTech innovations can comply with regulations in a heavily regulated industry; there is thus a need for a collaborative platform that facilitates experimentation and knowledge exchange regarding new solutions that comply with regulatory frameworks. We ground the importance of this study in these reasons, emphasizing the lack of knowledge on how regulatory sandboxes function in different contexts, how the relevant actors interact, how such social interactions influence innovation and regulation, and whether sandboxes deliver on the promise of fostering innovation.

Regulatory sandboxes as support instruments share similar objectives with incubation models like business incubators and accelerators, such as promoting innovative businesses through the provision of support services, and are currently being debated as new players in the entrepreneurial finance literature (Block et al., 2018). This study builds on the extant incubation literature, an emerging stream that

investigates the role of support institutions and individual actors in the technology transfer process at the micro and meso levels (Cunningham and O'Reilly, 2018; Tsai et al., 2009). Specifically, we connect this research to conversations investigating the outcome of different interaction activities on enabling successful incubation (Bøllingtoft and Ulhøi, 2005; Díez-Vial and Montoro-Sánchez, 2016; Patton, 2014; Peters et al., 2004; Rice, 2002; Rubin et al., 2015; Scillitoe and Chakrabarti, 2010). For instance, from the perspective of tenants, Scillitoe and Chakrabarti (2010) examine the influence of interactions among start-ups and incubator managers that enable knowledge sharing on business and technical support for new ventures. Similarly, Rubin et al. (2015) explore knowledge sharing among different incubator stakeholders, while Peters et al. (2004) investigate the impact of interactions on the incubation process from the perspective of incubator managers. These studies all find that incubator-incubatee interactions have a profound impact on the success of the incubation process by improving incubator practices and tenants' knowledge or capabilities. However, findings from incubation studies may not be readily transferable to the sandbox context due to its distinctive characteristics, including the fundamental role of regulators in protecting the stability of financial markets. The underlying question in the present study is thus whether regulator-regulatee social interactions can yield similar impacts in the context of regulatory sandboxes.

The objective of this study is to explore the following research question: How can regulator-regulatee social interactions influence practices of regulators and regulatees? To answer it, we use social capital theory (SCT) as a lens to understand regulator-regulatee interactions, mainly because knowledge transfer requires social interaction (Inkpen and Tsang, 2005; Zahra et al., 2000). With this study, we contribute to the incubation research stream by extending existing conversations on the influence of social interactions on entrepreneurial and innovative activities through theoretical propositions, offering opportunities for future research and implications for regulators and practitioners. Moreover, this study contributes to our understanding of novel technology transfer mechanisms such as regulatory sandboxes and the role of individual actors like regulators in facilitating those processes (Cunningham and O'Reilly, 2018). We thus extend contributions to recent studies in the entrepreneurial finance literature (e.g., Block et al., 2018; Cumming et al., 2019) that highlight the growing importance of incubation models in bridging start-ups with funding sources. We also contribute to the FinTech literature, which has been criticized for being under-theorized, by discussing our findings in relation to SCT (Gai et al., 2018; Gimpel et al., 2018; Puschmann, 2017).

The paper begins by defining the FinTech phenomenon and regulatory sandboxes, followed by reviewing the relationship between regulation and innovation. We then review the literature on interaction activities in incubation studies and justify the use of our theoretical lens. A description of the qualitative research method is provided before we present the empirical findings and discuss them in relation to the theoretical lens. Finally, concluding remarks are presented, along with the main implications for research and practice, study limitations, and suggestions for future research.

2. Theoretical background

2.1. The FinTech phenomenon and regulatory sandboxe

The present study understands FinTech as "technology-enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on the provision of financial services" (FSB, 2017, p. 7). While the use of technologies to provide financial services is hardly new, recent FinTech developments after the global financial crisis in 2008 are characterized by the use of enabling technologies by newcomers and by new services offered in both developed and developing markets (see an overview by Arner et al., 2017; Palmié et al., 2019). Gomber et al. (2017) propose a

three-dimensional framework for synthesizing the FinTech literature. The first dimension represents business functions that include business-to-business and business-to-consumer models offering financial services across industries such as financing and insurance. FinTech firms can be divided into six solution areas: payment, wealth management, crowdfunding, lending, capital market, and insurance (Lee and Shin, 2018). The second dimension refers to enabling technologies like blockchain and artificial intelligence that support operational elements. The third dimension highlights firm types and encompasses start-ups, technology firms, and traditional banking institutions (Gomber et al., 2017).

Prior research has discussed the emergence of the financial service sector as resulting from the integration of disruptive technologies, indicating a more proactive role for regulators due to the increase in market participants and the need to find more effective regulatory approaches (Arner et al., 2017). Among the approaches commonly adopted by regulatory authorities, regulatory sandboxes and innovation hubs have gained the most attention (Appaya and Jenik, 2019; Arner et al., 2017; ESA, 2019). This engagement challenges the conventional role of government in fostering entrepreneurial activity (Doblinger et al., 2019). We narrow this study to focus on regulatory sandboxes, given the attention they have received and their rapid growth from their establishment in the UK in 2016 to more than 50 regulatory authorities that either operate or have announced a regulatory sandbox (FCA, 2017; UNSGSA et al., 2019). Regulatory sandboxes are novel types of customized support and policy instruments that provide eligible FinTech market participants, including start-ups, technology firms, and incumbents, with licensing exemptions to allow business model experimentation without exhausting firm resources (Teigland et al., 2018). These instruments are often initiated and operated by a government's executive branch, with a regulatory or monetary authority at either the state or national level; they are usually established following public consultation to engage ecosystem stakeholders, with regulators welcoming feedback from the public (FCA, 2015). The literature distinguishes between three types of innovation policy instruments: regulatory, economic and financial, and soft instruments (see the overview by Borrás and Edquist, 2013). Thus, we may claim that regulatory sandboxes are purposive regulatory instruments that have the ultimate purpose of protecting consumers from potential risks and financial markets from systemic risks (Borrás and Edquist, 2013; Magnuson, 2018) while protecting sandbox participants against financial losses arising from violating protections laws (Lee and Shin, 2018).

Although regulatory sandboxes have gained attention among financial market participants, what a regulatory sandbox is and what can be achieved during participation are open questions. In a recent report, after three years of operating a regulatory sandbox, De Nederlandsche Bank (DNB) and the Dutch Authority for the Financial Markets (AFM) state that participants might have the misconception that regulatory sandboxes offer a legal free experimental space, which may cause confusion among market participants (DNB and AFM, 2019). Additionally, a survey by the Consultative Group to Assist the Poor (CGAP) and the World Bank Group report that a lack of human resources and technical knowledge were the greatest constraining factors preventing regulators from promoting innovation in financial markets, even as some jurisdictions had committed substantial human resources to operate regulatory sandboxes (Appaya and Jenik, 2019). Furthermore, when enabling technologies are applied in novel ways like cryptocurrency payments, regulators openly state that supervisory rules can be unclear for both participants and regulators (DNB and AFM, 2019). These limitations may explain why jurisdictions like Singapore (three sandbox participants) and Australia (seven) have lower numbers. Notably, despite low participation and acknowledged drawbacks, regulatory authorities in developed economies have not given up; rather, they have made improvements to attract more applicants. For instance, MAS launched the Sandbox Express to streamline the application process. An estimate of 522 market participants applied to sandboxes

around the globe, with 200 being accepted (Appaya and Jenik, 2019). Despite the increasing importance of these instruments from the perspective of regulators and market participants, this phenomenon has remained largely ignored among researchers, particularly in management research.

2.2. Relationship between regulation and innovation

This section reviews what we know about the relationship between regulation and the management of innovation in financial services. This is important to consider because FinTechs have disrupted the strategies, organizational capabilities, and culture of traditional financial institutions through the innovative application of enabling technologies. However, as financial markets are highly regulated, the role of regulators is more prominent than in other sectors, requiring regulatory authorities to strengthen their understanding of FinTech-related technologies to facilitate innovation instead of impeding it (Mention, 2019). In addition to having regulators reconsider their governing mechanisms, market participants need to operate and comply with regulatory frameworks in novel ways (Milian et al., 2019). Hence, technological transformation cannot be viewed in isolation from regulation, which can either enable or impede change in capital markets (Diaz-Rainey et al., 2015).

Several studies have focused on regulatory changes in financial markets due to increased FinTech participation (Mazzucato, 2013; Ng and Tang, 2016; Tapiero, 2014; Weihuan et al., 2015). For example, Hornuf and Schwiendbacher (2017) explore the impact of securities regulation on crowdfunding in different jurisdictions, arguing that leaner and better tailored regulations are required to support equity crowdfunding, which affects the creation and growth of small businesses. All these studies attest to the positive influence of regulatory practices on innovative activities (Patanakul and Pinto, 2014). Haddad and Hornuf (2019), for example, confirm that regulations in the form of compliance and administrative burdens have a significant impact on the growth of entrepreneurial FinTech firms. However, regulatory intervention can have a negative impact on innovation by inhibiting productivity or market entry (Cumming and Schwiendbacher, 2018; Patanakul and Pinto, 2014).

In the same manner that regulatory intervention influences innovative activity, the potential influence of FinTech innovators on regulators has also been discussed (Arner et al., 2017; Zetzsche et al., 2017). Specifically, regulators can acquire knowledge of different business models and gain a better understanding of technological elements (Zetzsche et al., 2017). This knowledge can facilitate changes to regulatory policies (FCA, 2017). Regulators' engagement with FinTech innovators provides insights into the complex risks, key opportunities, and current and future challenges associated with FinTech innovations (ESA, 2019). These findings imply that innovators influence regulators, which in turn leads to changes in regulatory mechanisms. The main barriers hindering regulators from offering sufficient support to innovation were identified as a lack of human resources, regulatory constraints, and gaps in technical knowledge (Appaya and Jenik, 2019). We thus argue that innovators can influence regulators' technical knowledge and improve their ability to respond to innovation. However, there is currently no systematic evidence in the literature that provides detailed insight into how regulatory practices change as a result of social interactions with FinTech innovators—or vice versa—which is what we explore in this empirical study.

2.3. Interaction in incubation studies

Business incubators commonly share the purpose of promoting new firm creation, entrepreneurship, and innovation (Hackett and Dilts, 2004; Theodoraki et al., 2018). They "have become a popular policy option and economic development intervention tool" (Lasrado et al., 2016, p. 205) and have recently been recognized as new

players in the entrepreneurial finance arena, apart from venture capitalists or business angles, by providing support in the form of access to networks or other value-added services (e.g., Block et al., 2018; Cumming et al., 2019). Prior incubation literature emphasizes the prominent role of social interaction to promote successful incubation (Bøllingtoft and Ulhøi, 2005; Díez-Vial and Montoro-Sánchez, 2016; Patton, 2014; Rice, 2002; Rubin et al., 2015; Scillitoe and Chakrabarti, 2010).

Incubation studies have not only investigated interactions among incubator staff and tenants but have also extended the discussion to include a diverse set of stakeholders in different networks, including interactions between universities and industry (Alexander et al., 2018; Santoro and Chakrabarti, 2002), universities and start-ups (van Stijn et al., 2018), and universities and spinoffs (Soetanto and van Geenhuizen, 2019). Such interactions provide access to tangible and intangible resources like physical, social, and financial capital, knowledge, and legitimacy (van Weele et al., 2017). Along similar lines, studies have employed the construct of engagement to represent access to resources in dyadic settings (Perkmann et al., 2013).

The extant literature provides evidence on the influence of interactions. For instance, using the theoretical lens of absorptive capacity and a social network approach, Díez-Vial and Montoro-Sánchez (2016) examine how ties among research centers and co-located firms influence innovative activity in science parks and confirm that knowledge sharing among these actors significantly promotes firms' innovative capability. Specifically, they find that formal and informal interactions contribute to creating a trust-based environment in which partnerships evolve to foster knowledge sharing. In a similar study using absorptive capacity theory to look at university incubators, Patton (2014) explores incubator-incubatee interactions to assess their influence on founders' knowledge acquisition; his findings confirm that such interactions enable iterative dialogue which subsequently stimulates absorptive capacity. In another stream of research that employs SCT, Bøllingtoft and Ulhøi (2005) explore mechanisms that facilitate networking in "network incubators" as novel incubator models that are distinct from the traditional model. Their findings suggest that trust is an underlying mechanism between individuals and agents in network incubators in enabling networking and cooperative interactions (Bøllingtoft and Ulhøi, 2005).

We thus find in the literature widespread agreement on the influence of interaction among incubators and tenants in different incubation models. The construct of social interaction is selected as an appropriate lens to explore activities that occur in regulatory sandboxes on the basis of findings that propose sandboxes as a testing arena for regulators and innovators (Arner et al., 2017) that allows those involved to exchange knowledge (Zetzsche et al., 2017). Other fields of study, such as organizational learning, also confirm the positive influence of regulator-regulatee interactions, suggesting that they allow "regulators and organizations to exchange knowledge and information regarding best practices within the industry, discuss potential refinements to operating procedures, and collectively diagnose and troubleshoot problems within organizational routines" (Desai, 2016, p. 639). Specific to incubation studies, Peters et al. (2004) investigate tenants' influence on the incubation process, reporting that incubator managers learn about the needs of their tenants through interaction, enabling them to redesign their processes and incubation services appropriately.

In the incubation literature, despite some research that examines industry-specific business accelerators focused on financial markets (e.g., Pauwels et al., 2016), there is a lack of management research that explores social interactions with actors like public agencies, investors, and larger organizations (Baraldi and Havenvid, 2016). Pauwels et al. (2016) investigation of the incubation model of accelerators in Europe includes a single FinTech support instrument (the FinTech Innovation Lab) in its sample of 13 accelerators. However, that accelerator is driven by an industry actor and is thus a poor comparison for publicly led regulatory sandboxes. On this basis, we argue that

existing evidence on interaction activities in incubation studies provides only limited insights due to the distinctive characteristics of regulatory sandboxes, such as the role of regulators to monitor and enable innovation, being governed by regulatory authorities, offering licensing reliefs, and regulatory support, and other contextual factors that have different levels of influence on regulator-regulatee social interactions.

2.4. Regulator-regulatee social interactions

For this study, we conceptualize regulator-regulatee social interactions as an enabling activity among regulators and sandbox participants that affects both groups and their practices (Nonaka, 1994; Zott and Amit, 2010). Regulators' practices include the assessing, monitoring, and supervising that are undertaken during social interactions with regulatees or other stakeholders in the sandbox context. These activities may influence regulators' knowledge and understanding of enabling technologies. To support this view, we find evidence that a lack of technical knowledge is a barrier for regulators in effectively supporting innovation (Appaya and Jenik, 2019). In addition, we have found that regulatory sandbox initiatives have evolved since their establishment as a result of lessons learned (FCA, 2017), which has led to the enhancement of regulatory sandboxes in several jurisdictions including Abu Dhabi's Digital Sandbox and Singapore's Sandbox Express (Duff, 2019). We may argue that these changes have occurred due to regulator-regulatee social interactions that have improved regulators' practices. For the second construct, we define practices of regulatees as testing and validation activities of financial solutions in which FinTech innovators engage with domestic or international regulators to develop innovative and legally compliant solutions in the context of regulatory sandboxes. As a result of regulator-regulatee social interactions, we may argue that sandbox participants develop their knowledge and capability base.

2.5. Theoretical lens for understanding regulator-regulatee interactions

To gain a deeper understanding of regulator-regulatee social interactions and support our discussion section, this paper employs SCT. This theoretical lens is selected given that social capital, understood as a set of relationships for a network actor, "plays a critical role in the transfer and exchange of network knowledge" (Inkpen and Tsang, 2005, p. 154) across different analytical levels, including the individual, the organization, and the broader society (Eveleens et al., 2017). More importantly, empirical evidence suggests that knowledge transfer is facilitated by social interaction (e.g., Zahra et al., 2000). Another reason for selecting this lens is that social capital has been identified in incubation studies as an important intangible form of capital that gives access to knowledge sources; however, there is limited knowledge of the social aspects of incubation (Scillitoe and Chakrabarti, 2010; Tötterman and Sten, 2005). Nonetheless, SCT is commonly applied to investigate the impact of social capital dimensions in other relevant settings like university-industry collaboration (Al-Tabbaa and Ankrah, 2016; Grzegorzczak, 2019) and enablers of innovation capabilities (Camps and Marques, 2014).

The underlying assumption in SCT is that network connections provide access to resources encompassing three main dimensions: structural, relational, and cognitive (Inkpen and Tsang, 2005; Lee, 2009; Nahapiet and Ghoshal, 1998), thus contributing to the actor's knowledge, value creation, and performance (Eveleens et al., 2017; Tsai and Ghoshal, 1998). The structural dimension refers to the position of an actor in a network characterized by network interaction and configuration in terms of ties, connectivity, density, frequency of contact, and hierarchy. The relational dimension reflects normative behaviors and includes aspects like trust, norms, obligations, and expectations to guide network connections. Establishing norms and building trust-based relationships are important factors in creating a conducive environment for collaboration and knowledge exchange. Finally, the

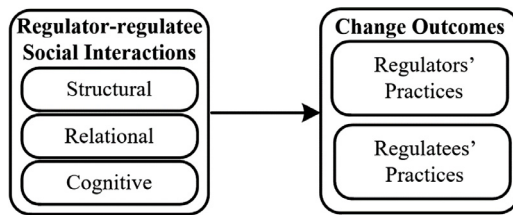


Fig. 1. Preliminary analytical framework.

cognitive dimension relates to the communication context and includes shared goals, culture, language, and codes. This includes having a common understanding of desired outcomes, beliefs, and narratives of best practices, along with sharing knowledge through common language and codes (Inkpen and Tsang, 2005; Lee, 2009; Nahapiet and Ghoshal, 1998). The cognitive dimension thus promotes value creation by enhancing knowledge transfer and firm capabilities among network actors (Theodoraki et al., 2018).

Building on Inkpen and Tsang's (2005) conceptualization of social interactions as a locus for knowledge exchange, this study empirically explores the underlying role of network knowledge transfer in changing the practices of regulators and regulatees as outcomes. To achieve this, we employ the three dimensions of SCT: structural, relational, and cognitive. Fig. 1 outlines our preliminary analytical framework that guides this study.

3. Research design

We adopted a qualitative research design in the form of an exploratory-abductive approach (Dubois and Gadde, 2002; Dubois and Gadde, 2014) to develop new explanations through theoretical propositions. This approach was selected as it is well-suited to study a new phenomenon with limited academic knowledge and to discover new theoretical relationships (Dubois and Gadde, 2002).

3.1. Sampling

A purposive sampling procedure was applied to recruit participants associated with regulatory sandboxes in different locations (Patton, 1990). We aimed to sample (1) regulatory sandboxes that were operating and had at least one participant, whether currently enrolled or graduated, and (2) sandbox participants that were either engaged in a sandbox when we conducted the study or had been so in the previous three years. These selection criteria were used to determine the suitability of regulatory sandboxes, regulators, and sandbox participants based on information provided on regulatory sandbox webpages. A total of 15 regulatory sandboxes were identified as relevant, including the UK Financial Conduct Authority (FCA), Abu Dhabi Global Market (ADGM), MAS, Hong Kong Monetary Authority (HKMA), and Bank Negara Malaysia (BNM). All the regulators identified were contacted using the email addresses provided on their websites. Of the regulatory authorities we contacted, nine responded to seek additional information. Following several email correspondences and in some cases multiple phone calls, six regulators from five jurisdictions agreed to be interviewed. Additionally, one financial specialist from a global observer organization actively involved in the regulatory sandbox scene agreed to participate. In general, the interviewees were proposed by the regulatory authorities and had different roles; Table 1 outlines the interviewed regulators.

As for sandbox participants, most regulators provide the names of participating firms on their websites. Using this as a starting point, LinkedIn searches and profile screening were undertaken to identify and contact informants who met the selection criteria. Additionally, we manually searched for informants with roles like (co-)founders, CEOs, and compliance managers of firms participating in sandboxes: start-ups,

Table 1
Description of Regulators.

	Role of Informant	Participant Code	Regulatory Jurisdiction	Launch Year of Sandbox
1	Financial Specialist	R-1	North America	-*
2	Regulator	R-2	North America	2017
3	Senior Regulator	R-3	Europe	2017
4	Senior Regulator	R-4	Oceania	2016
5	Executive Director	R-5	Europe	2018
6	Senior Manager	R-6	Asia (MENA)	2017
7	FinTech Specialist	R-7	Asia (MENA)	2017

* Global observatory organization; MENA: Middle East and North Africa.

technology firms, and financial institutions. A total of 87 sandbox participants were contacted through LinkedIn's mailing feature; further communication was made through personal email with 22 sandbox participants who expressed interest and requested additional details. Eventually, nine informants agreed to participate, with the remainder either declining due to limited capacity or failing to reply further. In sum, the selection approach led to interviews between November 2018 and September 2019 with 16 participants (9 regulatees, 6 regulators, and a single financial specialist) residing on 4 continents and associated with 11 regulatory jurisdictions. Table 2 provides an overview of the regulatees.

3.2. Data collection

For data collection, the interviews followed a semi-structured format, conducted via Skype calls (6 of 16 were video calls) that lasted approximately 40–60 min each and were recorded. All interviews were conducted in English, with transcripts developed from the recordings. Since different stakeholders were involved, the pre-defined set of open-ended questions was adapted to explore experiences from the perspectives of both regulators and regulatees. In general, the questions focused on understanding the nature, purpose, and frequency of the social interactions that occur at different stages and how such interactions have influenced practices of either regulators or regulatees or both. These stages begin with social interactions prior to testing, interactions during testing, and interactions after graduation from the sandbox. The interview guides for both regulators and sandbox participants are attached in Appendix B.

3.3. Data analysis

For data analysis, we followed the Gioia method in part; in its original form, it provides a two-step process of systematic reduction of categories with 1st order concepts and 2nd order themes that are more abstract, followed by aggregated dimensions (Gioia et al., 2013). However, since this study adopts an abductive rather than an inductive approach—informing us about prior research while relying on a theoretical framework to guide further analysis—we inverted the data analysis procedure described by Gioia et al. (2013) to begin with the SCT dimensions. However, the abductive approach, unlike deductive and inductive reasoning, facilitates the process of systematic combining that requires the researcher to alternate between the empirical reality, literature, and theoretical framework (Dubois and Gadde, 2002, Dubois and Gadde, 2014). Thus, using the SCT as a lens for analysis, we began by considering whether relevant theoretical concepts commonly related to the structural, relational, and cognitive dimensions could be connected to the categories that emerged from the coded data to provide a certain level of understanding. This represents the first round of coding (1st order concepts), a continuous process that varied throughout data analysis. For the second round of coding that resulted

Table 2
Description of regulatees (sandbox participants).

	Role of Informant	Participant Code	Fintech Classification	Regulatory Jurisdiction	Phase in Sandbox
1	Founder and Policy Manager	SP-1	Insurance	Europe	Operation
2	CEO and Co-founder	SP-2	Payment	Europe	Graduated
3	Executive Manager	SP-3	Payment	Asia (MENA)	Operation
4	CEO and Founder	SP-4	Insurance	Europe	Graduated
5	CEO and Founder	SP-5	Insurance	Asia	Operation
6	Director of Regulatory and Policy	SP-6	Other – identity	Europe	Graduated
7	CEO	SP-7	Lending	Europe	Operation
8	Head of Compliance	SP-8	Payment	Asia	Graduated
9	Vice President Operations	SP-9	Capital market	North America	Operation

In 2nd order themes, we coded emergent themes from the interview data to create new categories, while shifting between the data, theoretical framework, and analysis (Dubois and Gadde, 2002). As we progressed through the data, more patterns were identified, and categories were distilled. Further, we refined the last set of categories, labelling them with terms based primarily on theoretical constructs from SCT. Accordingly, we continually evaluated whether the categories acquired could be related to theoretical concepts that are either nascent or well-established in the SCT literature. In a final procedure, we cross-referenced the theoretical concepts against the SCT dimensions, which were also labelled aggregate dimensions (Gioia et al., 2013). Triangulation was achieved by analyzing multiple perspectives (Patton, 1990). NVivo 12 was used to facilitate the analytical procedure (Gaur and Kumar, 2018).

4. Findings and discussion

In this section, we present the key findings that emerged from the analyzed data in the context of regulatory sandboxes. We further discuss the research question—How can regulator-regulatee social interactions influence practices of regulators and regulatees?—with respect

to the SCT dimensions. Based on this discussion, theoretical propositions are offered as suggestions for future research. Fig. 2 illustrates the data structure that was established from the analysis. Also attached in Appendix A is a table that outlines the concepts and themes, supported by illustrative quotes that emerged from the data analysis.

4.1. Structural dimension

4.1.1. Network ties

In regard to how actors are related in the networks explored, two categories emerged from the interview data: (i) regulatees’ and regulators’ partnerships and (ii) regulator-regulatees’ follow-up post sandbox exit.

For the first category, our findings indicated that regulatees have access to either formal or informal networks to obtain information or access to specific resources. These networks are established for a variety of purposes, including partnering to strengthen operational aspects or service base, community engagement, and establishing ties with the regulators. We also found evidence that regulators can either directly or indirectly influence regulatees’ network ties. Directly, this is reported to happen through email introductions to cross-border regulators;

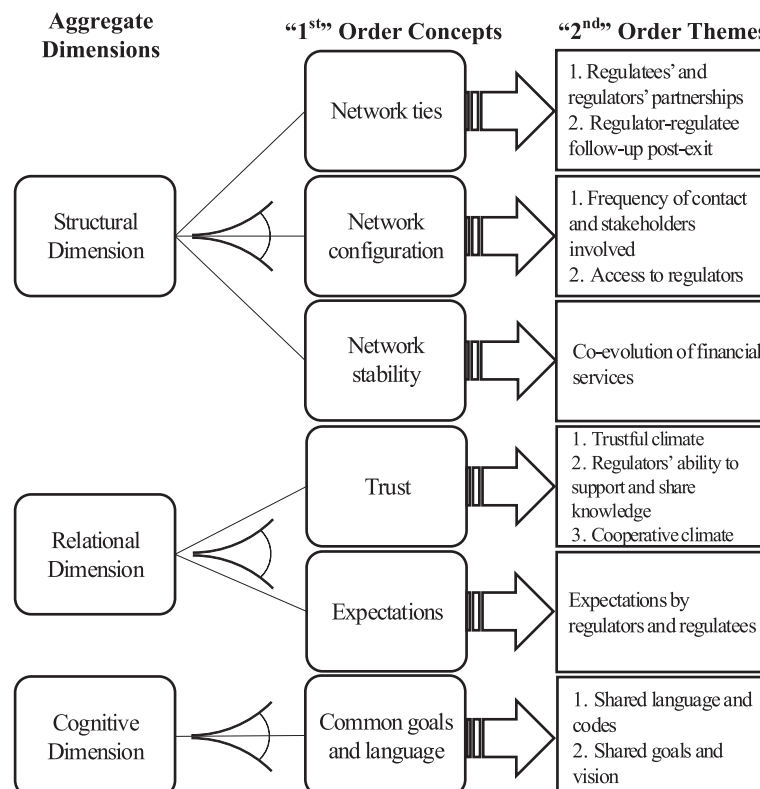


Fig. 2. Data structure.

indirectly, it can occur by improving the legitimacy of regulatees through press releases or when regulators showcase a sandbox participant as a case study during presentations to external audiences, all of which attracts more investors and facilitates access to other network ties. The following quote supports this finding: “By being in a sandbox, investors look at us in a friendlier way as it provides some assurance and guidance which helps with the fundraising process and reassures customers of the quality of our offering, hence having the ‘stamp of approval,’ from the regulator” (Sandbox participant [SP]-4). Theoretically, these findings reflect how social capital established in the regulatory sandbox context can help regulatees access external networks because they appear more trustworthy, thus reducing network entry barriers and influencing the order of social exchange (Nahapiet and Ghoshal, 1998). These findings accord with those observed in the existing incubation literature, which indicate that incubators provide intangible resources like added legitimacy (Bruneel et al., 2012; Tötterman and Sten, 2005). Hence, with respect to the regulatory sandbox context, these findings deepen our understanding of how regulators support sandbox participants in their validation efforts as they gain legitimacy and acceptance, making them more attractive for both investors and consumers. This is particularly important for certain types of FinTech firms such as blockchain-based crypto funds because they are generally less trusted by regulators and thus less appealing to investors.

Regulators also reported diverse formal ties with other regulators operating internally in different departments within the broader regulatory jurisdiction to discuss existing rules as a result of issues arising during their interactions with regulatees. This is reflected in the following: “We [regulators] involve the ministry of finance, and we also contact the European Commission, European Banking Authority, or European Securities and Markets Authority, to highlight if certain technologies used in a certain way that some type of rules might not be sufficient or that they did not fit very well to these new situations, that they might not be proportionate in certain ways” (Regulator [R]-3). These findings are significant to the overall study because they describe how regulators exchange knowledge about new technologies.

The second category, regulator-regulatees’ follow-up post-exit, represent an ongoing relationship in which regulatees benefit from access to regulatory advice and networking opportunities with both domestic and international regulators through cross-border collaboration agreements, allowing regulators to refer sandbox participants to other regulatory jurisdictions. From the regulatee perspective, this is reflected in the following: “Upon approving us with the full licensing, they [regulators] have been very cooperative assisting us with diverse reporting. They assisted us in a very positive manner, answering emails or phone calls in a timely manner. This also applies to all the regulatory departments that we dealt with. Also, along the way, we are required to report any incidents that happened in the company” (SP-8). At first, this finding seemed to contradict the suggestion in previous studies (e.g., Tötterman and Sten, 2005) that social relationships post-incubation gradually disappear, which is clearly not the case in the regulatory sandbox setting, where the longest relationship was reported to have lasted more than two years after exiting the sandbox. That said, one possible explanation for this finding is that relationships continue due to perceived mutual benefits and responsibilities. For instance, regulators might want to keep an eye on the activities of nascent market participants, as regulators are fundamentally responsible for the stability of financial markets. We found support for this explanation in the analyzed data, which indicated the importance of regulators’ continuing their engagement to monitor regulatee activities. One interviewed regulator put it as follows: “What we’re trying to do is, because during the testing period, we have continuous relationship, and during that period, the firm is restricted for example with the number of clients, number of transactions, and value of transactions that they can take. Once we give them the unrestricted license, they’re open to do everything else, we don’t just let them go without any supervision. We

try to still do some sort of continuous update, continuous meetings, to see how the firm is adapting with scaling up in their business” (R-6). Based on the above discussion, we suggest these two propositions:

P1a: Regulator-regulatee social interactions increase regulatees’ legitimacy among investors and consumers, thus positively affecting their validation practices.

P1b: Knowledge exchanged during regulator-regulatee interactions increases regulators’ understanding of the legal constraints and risks arising from enabling technologies, resultantly improving monitoring practices.

4.1.2. Network configuration

As to interaction patterns between network actors, two categories emerged from the data: (i) frequency of contact and stakeholders involved and (ii) access to regulators in financial markets.

In general, as a means of communication, most regulator-regulatee social interactions occur remotely, via email and the telephone, although some participants reported that regulators host face-to-face meetings or visit market participants at their offices. These engagements are for reporting, monitoring, guidance, or follow-up purposes on a routine or ad hoc basis and vary from case to case, depending on the approaches adopted in a given regulatory jurisdiction. The multiple facets of engagement with diverse sets of regulators were also made clear, with one respondent stating that, “we were meeting with different people on the regulator side, the innovation team, and the AML [anti-money laundering] compliance team” (SP-2).

In terms of frequency of contact and stakeholders involved, the analyzed data suggested that interaction frequency varied widely, depending on a regulatee’s testing progress, its FinTech classification, and—most importantly—which regulator was involved. For instance, we found evidence that proactive regulators would contact a regulatee on a weekly basis for follow-up conversations. In another case, conversations occurred once every quarter; there, the FinTech participant was testing a cryptocurrency fund. Interestingly, four regulators operating in other jurisdictions highlighted that they would normally closely monitor this type of FinTech due to the risks and consequences associated with cryptocurrency. Confirming that these interactions could vary in purpose as noted above, one regulatee reported the following: “Much of our engagements are for monitoring and following-up, and little or no guidance. We do bi-monthly reports on progress, on sales, on technology developments, etc. We give feedback to [the regulator] on how that’s gone. Then intermittently we will have meetings with them” (SP-5). Another experience from a graduated sandbox participant reflects a more dynamic relationship with the regulator: “We submitted a very limited sheet of information ... twice a month, and we also had 30 min call every two weeks just checking in on how things were going. However, towards the end we even moved these calls to a monthly catch up, because there was not that much happening in terms of customer traction” (SP-4). Building on this, from a regulatory perspective more clarity is provided about the frequency of social interaction and how it changes during the regulatory sandbox process: “Our interaction with the firm will be very high leading up to an issuance but might tailor off at the end of an issuance while they work on any findings from that activity, and then we’ll ramp up again. So, the way in which we approach the testing period is not standardized. There are key components, for example around AML [anti-money laundering] requirements, KYC [know your customer] and everything related to financial crime compliance that we take very seriously and monitor throughout, and then there will be certain components that will be tailored throughout the period” (R-7).

With reference to previous research, we now present a possible explanation for the above findings. From the SCT literature, we know that frequent and close interactions enable knowledge sharing and relationship building (e.g., Tsai and Ghoshal, 1998). While this study is

unable to clearly demonstrate whether trustworthiness between regulators and regulatees increases over time, we found from the analyzed data that, in cases with more frequent and direct interactions, regulatees perceived their engagements with regulators more positively than those who had fewer interactions. Frequent interactions may create stronger ties that allow regulators to understand regulatees' needs and challenges and enable regulatees to learn more about regulation and possible pitfalls to be avoided. These findings confirm and extend prior incubation work (Rice, 2002; Scillitoe and Chakrabarti, 2010).

For the second category of access to regulators in financial markets, we found that regulatees reported ease of contact with local regulators, whether prior to acceptance or after graduation. In the former case, regulatees reported positive reception and encouragement when they engaged with the regulator to understand the various regulations that they would need to observe and to understand the regulator's appetite for engagement. In addition, regulatees reported meeting regulators at industry conferences or FinTech-related events. Interestingly, most regulators reported the existence of multiple points of engagement that market participants could use to interact with the regulator, emphasizing that regulatory sandboxes are only one part of the overall regime. For instance, one regulator stated, "we are the regulator, but there's also [another] authority, and they run an accelerator program, and there's one other accelerator program that operates out of that authority. We engage with both of them. We also have a quite far-ranging internal innovation program; it looks at how we as a regulator can facilitate the wider ecosystem, not just by looking at regulated entities and not just through working as a sandbox" (R-7). Moreover, the empirical findings suggest that most participants at some point during the testing or immediately after graduation would initiate conversations with regulators in other countries. The findings presented here are consistent with seminal social capital research (e.g., Nahapiet and Ghoshal, 1998) indicating that the number of channels determines the time and expenses associated with gathering information. Building on this, a possible explanation for these findings may be due to financial market innovators having high level of contact and access to these networks from diverse points, which means better accessibility and easier knowledge sharing. However, we further argue that, with the increase in market participants, resource constraints will limit the ability of regulators to provide timely support, which could encourage market participants to find more accessible networks elsewhere. We found support for this explanation in the data, as one regulatee put it: "At the end, we decided actually ... [to] go through a regulatory partner to basically rent a license ... helping us in terms of regulations, how to do compliance" (SP-7). It can thus be suggested that:

P2: The frequency of regulator-regulatee interactions positively affects regulators' understanding of regulatees' support needs and regulatees' understanding of regulatory frameworks.

4.1.3. Network stability

With respect to changes in networks, the findings fell into a single category: the co-evolution of financial markets. The findings suggest that regulator-regulatee social interactions contribute to regulators' and regulatees' understanding of how new technologies function and how they fit into or link with existing regulations. Additionally, engagement between regulators and ecosystem actors revealed the role of regulatory sandboxes in ecosystem building, which could result in broader changes to legal systems and financial market stability. Based on comments from a graduated FinTech start-up that shared its role in changing regulations, our findings suggest the transformation of existing regulatory frameworks and related policies. According to the informant, a change in regulation was required to overcome obstacles that arose when the firm wanted to extend its operations across multiple jurisdictions, including Vietnam and Japan: "In the case of Japan, we developed a new mechanism that is electronic for identity verification. We presented a

proposal for them [the regulator], to consider it equivalent to the current method [prescription based, specifying 'how' regulations should be achieved rather than 'what' in the case of countries like the UK]. We needed both the police and the regulator to agree. To achieve that infusion of that new technique into the current setting, they [the regulator] created a regulatory sandbox to allow that to be tested. But the regulatory sandbox formation required a new law. That was prepared, and we were consulted several times on preparation of that new law. So, that required a different type of change; it required a new law" (SP-2). Conversely, we learned of cases in which the regulators were less willing to make regulatory changes. According to one regulatee, "there are a lot of regulatory rule books that were written decades ago, which are in part outdated and could use a refresh, but they [regulators] don't do that easily ... instead they [regulators] are writing up a report every now and then highlighting lessons learned" (SP-4). Notably, however, our findings suggest more powerful implications for regulators from sandbox participants: "We were telling them [the regulator], for us to be effective and for you to be effective in achieving your goals ... we need you to talk to other regulators. Play cross-border scenarios. Because trade is cross border. So, we need to define the rules of engagement with other regulators. It took a while, but they set up a global sandbox; this is the example of how they [regulators] evolve based on the feedback they get from the industry" (SP-2).

Moreover, all informants stated that they learn about technology, regulatory frameworks, and the risks involved, providing growth opportunities to financial markets. Specifically, these social interactions allow regulators that are not up to date on technological developments to understand the risks and opportunities associated with new technologies. For instance, one informant stated, "the officials on the regulator side are all experienced people ... in the sense that they are quite old and very confined to the normal way of transferring money of what they have been auditing of all these bricks-and-mortar companies. When it comes to us being a sandbox player, they learned how we try to conduct a transaction without having to see the customer via face-to-face, and what departments and skillset we have in the company to make sure a seamless process can be done.... They [the regulators] can't see this in the bricks-and-mortar companies" (SP-8). Our findings show that regulators benefit from interactions in diverse ways: "We are able to see how this technology affects preexisting business models.... That allows us to become comfortable and to assess what risks are emerging and which are diminishing, because typically what we tend to find is that if you come out and you're using smart contracts, that use of smart contracts means that maybe there's less of a legal risk or an execution risk on certain activities, but equally, then there's a new operational risk because you have to account for the smart contract technology and how that works. We look at how that shifts the risks that the market would be exposed to. This allows us to have firsthand knowledge that helps inform our policies going forward" (R-7).

Further, our evidence indicates that regulatory sandboxes operate as a catalyst for the development of both local and non-local ecosystems. Locally, regulators engage with ecosystem actors like academic institutions, industry partners, and FinTech hubs to design and develop new approaches that facilitate sandbox practices. An example of engagement with academic institutions is reflected by one regulator: "We have a strong relationship with the Technical University ... to work on certain blockchain experiments ... these experiments show how and what the technical barriers or the incapability of blockchains still are. So that helps us with our technical knowledge on these topics" (R-3). Notably, these engagements can also lead to the creation of regulatory roadmaps and legal requirements as a way to cope with the novel application of enabling technologies. For instance, one regulator from the MENA region said that crowdfunding regulation frameworks and requirements were recently developed for investment-, equity- and loan-based crowdfunding platforms, after engaging members of the FinTech ecosystem that operate in this niche area to understand their market needs and strive to meet them. Another regulator added that "what a lot

of the time will happen is that we give additional guidance; let's say I have 50 requests from market participants, and they all look very similar. What we will do is provide additional information sheets or develop policy in a particular area, for instance on cryptocurrencies. Simultaneously, we might update our existing public guidance based on advice questions received" (R-4). Our findings also reveal regulators' engagement with non-local ecosystem actors, as is demonstrated in the following statement: "We are very active in the international regulatory sphere. We sit on the Coordination Group, which is the board of GFIN [a global sandbox initiative] ... and we are involved in cross-border testing. We also do bilateral work with developed and emerging economics to discuss how our regulatory sandbox experience has been and share thoughts on different challenges that we're facing with FinTechs or solutions we've found" (R-7).

In reviewing the social capital literature, little evidence was found on network stability. That said, prior research indicates that higher degrees of network instability (i.e., changes in membership) might constrain social capital creation opportunities (Inkpen and Tsang, 2005). In regulatory jurisdictions that have established new regulations or initiatives like the Global Sandbox, we may argue that networks are highly stable because actors are joining the network, which increases rather than limits networking opportunities. For instance, when the Global Sandbox was proposed in mid-2018, 11 regulatory jurisdictions were involved. A few months later, after its establishment, the number of members in regulatory and observer roles had more than doubled; as of mid-2019, the network had 38 members. In addition, eight global sandbox participants are part of a cross-border pilot project (FCA, 2019b). More broadly, we may also argue based on the analyzed data that, given the level of regulators' commitment to stimulate innovation, regulator-regulatee networks are stable, offering opportunities for social interaction, as barriers to network entry are lowered through supportive policies and regulatory instruments. In addition, our findings demonstrate how regulators' engagement with ecosystem actors like sandbox participants, industry actors, and international regulators enables them to develop more effective approaches for the FinTech community, to become more informed about risks associated with new technologies, and to craft ways to change existing frameworks or create new ones. Regulatory sandboxes thus play an important role in nurturing local and non-local FinTech ecosystems. However, as the FinTech phenomenon remains in its nascent stages, there is insufficient evidence regarding how the stability of these networks will evolve, which provides opportunities for future research. Based on the discussion above, we offer the following proposition:

P3a: Regulator-regulatee interactions positively affect regulators' access to regulatory innovations.

4.2. Relational dimension

4.2.1. Trust

As to regulators' and regulatees' willingness to share knowledge during their interactions, three categories emerged from the analyzed data: (i) trustful climate, (ii) regulators' ability to support, and (iii) share knowledge and cooperative climate.

For the first category, the empirical findings reveal that the regulator-regulatee relationship may be trust-based, allowing sandbox participants to test their business models without fear of sanction. We found support for this statement in the following: "We're able to test out any kind of system, but we are not bound to be fined or imprisoned because we are meant to make mistakes" (SP-8). Building on this, we found another example in which regulators entrusted sandbox participants with freedom in testing and partner selection: "It's more a sense of they're saying, here's the framework that you all should operate in, now get techy and get on with it, rather than specifically handholding to particular types of solutions, processes or encouraging certain collaborations" (SP-5). Surprisingly, another regulatee shared concerns

about the regulator sharing knowledge with other sandbox participants: "They probably shared our advice with other asset managers who've come to them. We've been the longest in this field, so a lot of it is that they have gone through a whole bunch of information from us" (SP-9).

Our findings do not consistently show support for trust among regulators and regulatees or a willingness among regulatees to share knowledge. One informant felt less encouraged to share information with regulators because they might pass it on to other sandbox participants. As it is important to bear in mind the possible bias in this response, we found other instances that indicated how regulators were able to pave new paths based on gained knowledge. For example, one participant said, "our case manager ... got promoted as a result of successful testing with us. He then started a series of blockchain projects with other start-ups.... He understood enough, he learned enough, he was trusted enough because we succeeded in creating a trusted process" (PS-2). Put differently, such evidence may suggest that regulators might share best practices with future sandbox participants. At first, these findings appeared to accord with McAdam and Marlow (2007), who found privacy issues like theft of intellectual property and consequent secretive behavior to emerge in business incubator networks. However, incubation studies (e.g., McAdam and Marlow, 2007; Tötterman and Sten, 2005) have not previously demonstrated that incubator staff are perceived as less trustworthy by incubatees; on the contrary, tenants are normally willing to share information with and receive support from incubators. Given this contrast, our empirical findings are unexpected and may have profound importance for the issue of trust among regulators and regulatees and its effect on knowledge sharing (e.g., Inkpen and Tsang, 2005). Another possible explanation for these findings is that regulatees are more prone to become secretive and reluctant to share knowledge when they are unable to benefit from regulators. We thus suggest the following:

P4a: Asymmetrical regulator-regulatee interactions negatively affect regulatees' willingness to share best practices.

For the second category of regulator support, the evidence reveals cases of the regulator's ability to support market participants through legal or non-legal actions, which reflects the commitment of regulators. We first explore the role of the regulator from the perspective of sandbox participants. Our findings suggest that regulators employ a diverse set of tools to support market participants. For instance, one regulatee said, "they have a tool called informal student. As part of the sandbox, we can send them a copy of questions and request informal information, some guidance from an expert. And that's really helpful because we didn't know or didn't consider a couple of things in our risk management on how to treat customers, which at the end really improved our technology" (SP-7). More interestingly, we found that, because regulators are experienced with regulating traditional financial market participants, they are able to support sandbox participants by identifying gaps and providing regulatory nudges in advance, which helps regulatees avoid both compliance and operational issues later on. According to a regulator, these interactions are win-win situations, as the regulatee is developing risk mitigation and the regulators are gaining learning experience. Financial benefits also emerged from the analyzed data; for instance, one regulatee said, "the sandbox period allows me to waive the full broking license investment until the end of the sandbox period when we can either put that money in by then, if I've got the right level investors" (SP-5). Along these lines, several regulators indicated that sandbox participants are also able to reduce current and future operational costs because more sustainable businesses are created thanks to the support provided by regulators and the ability to experiment in the sandbox.

The social capital literature (e.g., Nahapiet and Ghoshal, 1998) holds that network actors offer access to resources; our findings show that most regulatees have received legal and non-legal support that assisted their FinTech firms, possibly giving them an advantage over actors in other networks. Specifically, we found support that regulators

provide nudges on operational and compliance issues that improves participants' risk management, which in turn allows regulatees to reduce their expenses and improve the sustainability of their businesses. However, it remains unclear how direct ties with regulators provide regulatees with unique resources that may not be accessible outside regulatory sandboxes, as we received contradictory accounts from two informants, who noted that the disadvantages in terms of longer time to market and lack of regulatory support outweighed the possible advantages from regulators in different jurisdictions. There may be several reasons for this difference in views, including variations in regulatory mandates in different jurisdictions, a lack of technical know-how among regulators, and regulatees' differences in expectations and knowledge of regulations. Consistent with our findings, we offer the following proposition:

P4b: Regulator-regulatee interactions positively affect regulatees' risk management capabilities.

As to the third category, a cooperative climate is found in regulator-regulatee networks. From the perspective of regulatees, our evidence reveals how sandbox participants promote collaboration among several stakeholders: "We've been part of bringing together quite a few industry bodies to look at digital identity. We've encouraged the FinTech delivery panel, Open Identity Exchange, Department of Culture, Media and Sports, and government digital services to come together and collaborate" (SP-6). We also found evidence suggesting that sandbox participants are encouraged by regulators to collaborate and share knowledge: "We were requested [by the regulator] to share our journey to companies in the sandbox in a recent FinTech symposium, which was organized by the Central Bank. We were called upon to talk about how we graduated, what are the difficulties that we went through, how we mitigated all these issues, and how we graduated" (SP-8). Interestingly, the same participant shared the experience of bringing in two partners to support a technical solution; the regulators, based on this learning experience, became convinced that other market participants should consider these new cost-effective providers. Another aspect worth mentioning is regulatory engagement with the FinTech community, where regulators seek knowledge from market actors and other regulators, as an example of regulators' collaborative approach to develop new policies: "When we started developing policy materials, we did have post interactions with members of the society, companies that were specifically dealing in this area, in order to ensure that what we're developing is fit for that purpose. These companies had a say in how the regime can be created. Of course, we do our own benchmarking, we see what other regulators are doing, and we put certain rules in place, but we also take into consideration the market in our jurisdiction; what do they have to say about it, and then if necessary where we see it is suitable" (R-6).

The above findings indicate that cooperative behavior emerge when trust exists, making network actors more willing to engage in social exchange (e.g., Tsai and Ghoshal, 1998). Specifically, our empirical findings reveal cooperative interactions between regulators and diverse stakeholders, which illustrates their willingness to engage in social exchange to learn about market needs. We believe that such cooperative behavior has profound meaning for the level of trustworthiness among regulators and network members. Previous studies also support this interpretation (e.g., Nahapiet and Ghoshal, 1998). The findings also show an association between the relational and cognitive dimensions; prior research reports a similar association, but it links having a shared vision and common values to the level of perceived trust (e.g., Tsai and Ghoshal, 1998). In our scenario, by contrast, shared narratives are related to levels of trust and transparency, so our findings have discrepancies with the extant literature examining interactions between social capital dimensions (e.g., Al-Tabbaa and Ankrah, 2016). We thus suggest the following:

P4c: Regulators' encouragement of graduated sandbox participants

to share narratives to current participants positively affects knowledge sharing among regulatees.

4.2.2. Expectations

Within the relational dimension, the analysis also shows evidence of expectations from regulators and regulatees. A single category emerged: expectations of regulators and regulatees.

Regulators expect that sandbox participants will conduct the tests they set out to do, indicating that regulators may have questions about the suitability of the sandbox for some participants. This is articulated in the following: "We had to quite hard-sell [the regulator] that we want to drive these things forward, but the reality has been that it's quite hard for us to deliver these things. The [regulator] is scrutinizing us quite closely to see whether we can, whether we will ... we need to be able to show that we're doing some of these things. Otherwise it questions our suitability for the sandbox in the eyes of the [regulator]" (SP-5). We also found evidence suggesting that regulatees expect regulators to lack knowledge of the technologies they adopt: "The habits of the compliance officers don't change overnight, despite the regulator saying that they do adopt and review new technologies, they take a risk-based approach. But it still takes time. That's why for us the sandbox was a good value. Because it was part in education process towards the regulator" (SP-6). Notably, as one informant stated, during the testing period, "the regulators performed an audit on compliance to see how the process has been taken toward the customer, how does it process, what are the reports we've done, and how the risk assessment takes place. Post the audit, the regulators highlighted several gaps that needed to be addressed to be able to get the full-license bandwidth. The regulators also provided recommendations" (SP-8). Another important experience shared by a regulatee reflects a performance-driven culture among regulators: "You can feel that the underlying KPIs [key performance indicators] for the regulators are much more driven by how many companies can get through. They accepted us at the end, obviously, only because we do machine learning for credit risk assessments in a way that nobody had done it before. So, they just want to tick all these boxes and at the end have a big summary that can be press-released" (SP-7).

Our findings consistently indicate that regulators' expectations revolved around clarifying expectations, meeting time targets, and maintaining a regulatory focus. For instance, one regulator reported the following: "We commit the time and we do very extensive presentations for them that explain what it means to be regulated, how regulators work, what our objectives are, what we're looking for, and to make it absolutely clear to them that our job is to make sure that their risks are accounted for and that we are meeting our regulatory objectives by allowing them to test" (R-7). The same regulator added: "We found that the cohort approach is not just about resourcing on our side, but it's about setting expectations and timelines for the firms. It's also partially about driving the firms. And that's in recognition of the fact that the firms are typically start-ups that come in, they have a sort of dual purpose; they want to become regulated, but mainly they want to make money by getting their product out to the market. And when they're going through that, they typically will go out into the market and try to sell the product already—or the idea—and get investors, and they can sometimes not have as much focus on the regulatory side" (R-7). The analyzed data also reveal regulators' expectations as to satisfying requirements, emphasizing that most entrepreneurs provide insufficient detail about what they are doing, in which case the regulator has to seek further clarification.

The above findings indicate that both regulators and regulatees develop expectations during their social interactions that might affect their trust levels and consequent motivation to exchange knowledge, as has been reported in the literature (e.g., Coleman, 1988; Nahapiet and Ghoshal, 1998). For instance, we found empirical evidence that regulators might conduct unplanned audits, which may support the view

that regulators are less than fully confident that regulatees will act in accordance with regulators' expectations and norms. While this could have negatively influenced the relationship between regulators and regulatees, the latter group did not perceive it as negative. On the contrary, they were satisfied to receive recommendations from regulators that helped them become more compliant with regulatory frameworks. In this case, it may thus be suggested that regulators and regulatees established stronger bonds that positively influenced the relational dimension. Furthermore, the empirical evidence describes how regulators define their expectations to ensure that future obligations are met, which is consistent with earlier studies (e.g., Nahapiet and Ghoshal, 1998). However, we also found evidence that regulators are not necessarily motivated to understand regulatees' needs and wants; rather, they seek to satisfy their own goals, which reveals an opportunistic attitude. Similarly, regulators reported opportunistic behavior by sandbox participants who may have been preoccupied by financial outcomes. We thus suggest the following:

P5: The existence of tacit goals negatively affects knowledge sharing and practices for both regulators and regulatees.

4.3. Cognitive dimension

4.3.1. Common goals and language

Lastly, the analyzed data revealed perceptions about how regulators and regulatees work towards shared goals with a common understanding. Specifically, two categories emerged: (i) common goals and vision and (ii) common language and codes.

For the first category, our findings reveal that regulators in certain jurisdictions may share a similar vision with FinTech firms, whereas other regulators may be pressured to follow, specifically in crypto networks: "Over time, as other countries innovate, the regulatory arbitrage creates an interesting pressure on other countries. So, when smaller countries like Malta and others start thinking out of the box and creating regulatory frameworks suitable for crypto, it has a big change in a world of finance, operating now out of Malta and generating revenue in taxes and seemingly operating within the white side of the market, instead of pushing everything to the gray or dark in the market" (SP-2). Similarly, we found evidence of regulatees working with regulators and a diverse group of governmental bodies to achieve common goals like a better understanding of how digital identity can help in innovation. This is articulated in the following quote: "The interesting thing with the [regulator] was that they are fully aware that identity and digital identity goes across every sector of the economy. So, that they knew that a lot of their fellow regulators and other sectors—be that Information Commission, Bureau of Film Classification Department, Culture of Media and Sport, Competition and Markets Authority—had strands on identity. And digital identity was a fundamental game changer across many different sectors" (SP-6). We also found an example indicating regulators' motivation to network with a sandbox participant sharing a vision of improving financial markets by disrupting the way traditional financial providers function: "They [the regulators] wanted to eliminate having many branches because it poses lots of risks in terms of exposure to fraud by employees (and robbery as well). So, the regulators were eager to get us to come up with this system to disrupt the money services business so that they will be able to operate without having branches. That was the fundamental wish by the regulator" (SP-8). Conversely, one sandbox participant stated that regulators provide "guidance not to violate existing legal framework and regulatory rules ... regulators advised us to frame what we were going to test in a way that changes best practices but does not require changing the regulations, because we were supposed to work within the existing regulatory framework" (SP-2).

The above findings may be argued to agree with previous research that found "shared goals represent the degree to which network members share a common understanding and approach to the

achievement of network tasks and outcomes" (Inkpen and Tsang, 2005, p. 153). However, our findings deepen the understanding of social aspects in the incubation literature, which remains limited (e.g., Scillitoe and Chakrabarti, 2010). The examples of regulators and regulatees working together on common goals like digital identity or eliminating branches in financial markets demonstrate how common goals can shape network interactions. Unexpectedly, however, we found evidence of regulators who were not willing to change and develop regulations; instead, they asked regulatees to frame their testing activities within existing regulations. This finding shows conflicting goals among regulators, given that regulatory sandboxes' very reason for existence is to allow eligible market participants to test new business models that are not necessarily compliant with existing regulations. This raises a troubling question: if regulatees are not able to test innovative solutions that can later be employed in real-world financial markets, then how are regulators promoting innovation when they overlook lessons learned from regulatees' testing experiences? This might signal an underlying lack of willingness among regulators to change the existing framework. Although this contradictory finding may result from differences in regulatory mandates or conflicting intentions of establishing regulatory sandboxes without forcing change upon regulatory systems, the same participant (SP-2) also reported that regulators in other jurisdictions like Vietnam and Japan had indeed made changes in existing regulations. As a result, we offer the following:

P6a: Regulators' unwillingness to make regulatory changes negatively affects regulatees' testing maneuverability.

As for the second category of common language and codes, our findings provide an example of how regulators support market participants by confirming and interpreting existing legal frameworks: "In Vietnam, we said to the regulator, 'We will submit a number of questions on the way we understand your legal system, can you answer those questions for us? ... They provided all the legal interpretation. Basically, legal opinion for us.... They said, 'In this paragraph in this particular law we can do this but not this because of this legal statute, you can do this but not this' and other things. That allowed us to understand the system, adjust our processes, submit a different proposal to them" (SP-2). Another example of how regulators ensure that sandbox participants understand them is by finding a common language: "We try to enter those conversations from a technical point of view, rather than just focusing on the legal aspects. If we just start with the legal aspect, the conversations will be quite complicated because the regulatory framework in certain ways is very restrictive and you don't get them to the essence of how things technically work" (R-3). This approach is presented by regulators as an enabler of learning experiences for sandbox participants. The above findings extend evidence from other studies to the incubation literature stream in which shared language is described as an enabler for accessing information (e.g., Nahapiet and Ghoshal, 1998). Specifically, the findings reveal the role of regulators in establishing a shared language. This has profound meaning in the context of regulatory sandboxes, as regulatees may not have a legal background or knowledge of regulatory frameworks, which might make it challenging for them to interact effectively with regulators. On this basis, we suggest the following:

P6b: Regulators' ability to create conversations that use a common language positively affects knowledge sharing between regulators and regulatees.

5. Concluding comments

Regulatory sandboxes have a prominent role in supporting entrepreneurship and innovation in the FinTech context. However, given the novelty of the sandbox concept, there is a lack of research on the social aspects of regulators and regulatees. Through the theoretical lens

of SCT and with reference to the prior incubation literature, this paper explores the influence of interactions among regulators and sandbox participants on the practices of both regulators and regulatees. On one hand, this study has shown that regulator-regulatee social interactions increase regulatees' legitimacy, risk management capabilities, and familiarity with regulatory frameworks, all of which may positively influence regulatee practices. It was also shown that regulators benefit from these interactions by increasing their understanding of regulatory constraints and the potential risks from enabling technologies, better informing them of regulatees' support needs, and by offering them early access to regulatory innovations. These advantages will in turn promote financial markets that welcome innovation while protecting stability. On the other hand, less positive discoveries were made in our empirical investigation. For example, we found that regulatees may anticipate regulators as less trustworthy, making them reluctant to share information. Additionally, regulatees might be discouraged from innovating if regulators limit their testing practices to the boundaries of existing regulatory systems. Taken together, these findings provide additional evidence with respect to importance of the social dimensions of incubation, illuminating social interactions among regulators and FinTech innovators in the context of financial markets, which is heavily regulated because financial stability is nothing less than crucial. Thus, providing interesting insights of a niche but worthwhile topic.

5.1. Theoretical and practical implications

Overall, this study provides important implications for both research and practice by exploring how regulators support FinTech innovators, particularly with respect to testing and validation practices that are essential at the incubation stage. Thus, we inform regulators and FinTech innovators about win-win situations. At the meso and micro levels, this study contributes to the growing debate in the incubation literature on the role of technology transfer instruments (e.g., Cunningham and O'Reilly, 2018; Grzegorzczak, 2019; Tsai et al., 2009), including regulatory sandboxes, through which the role of individual actors like regulators is to support FinTech innovators while also paying close attention to their practices. Along these lines, the findings of this study provide novel insights that deepen our understanding of how knowledge exchange takes place among regulators and regulatees in regulatory sandboxes, a context characterized by escalating numbers of market participants and increasing focus on financial innovation and technological transformation (Diaz-Rainey et al., 2015; Palmié et al., 2019). These interactions inform regulators about the use of enabling technologies and new ways of complying with regulatory frameworks, both of which enable regulators and policymakers to develop financial markets that reflect the latest technological and economic developments. This study also builds on contributions in the extant incubation literature by advancing our understanding of the social capital dimensions that facilitate incubation efforts in the context of FinTech. We further contribute to recent management studies confirming that supportive regulatory initiatives have a positive impact on firm formation (Haddad and Hornuf, 2019), emphasizing the role of financial regulators (Lee and Shin, 2018). We also contribute to the emerging FinTech literature, which has been criticized for lacking a theoretical basis, by conceiving our study and discussing our findings through the lens of SCT (Gai et al., 2018; Gimpel et al., 2018; Puschmann, 2017).

Additionally, we contribute to the growing academic debate about entrepreneurial finance (e.g., Block et al., 2018; Cumming et al., 2019, 2019; Cumming and Schwiendbacher, 2018) by elucidating the potential of regulatory sandboxes to help innovative FinTech ventures raise

capital in two important ways. First, social interactions in regulatory sandboxes enable the supply side of entrepreneurial finance by providing FinTech participants with regulatory knowledge and, in some instances, creating new regulatory frameworks and requirements to facilitate crowdfunding platforms. These regulatory changes may encourage greater access to capital through financing approaches like crowdfunding platforms and ICOs. Additionally, regulators can better protect market participants from problems like financial fraud. Second, our empirical investigation reveals how regulatory sandboxes provide intangible resources that have important financial implications. This includes providing regulatees with the following: 1) a quality seal, making them more attractive to investors and consumers; 2) hints on operational and compliance issues that support them in developing operationally and legally sustainable businesses; and 3) enough time to postpone making a significant investment at an early stage, since regulatory sandboxes provide exemptions from financial licenses.

5.2. Limitations and future research

There is no research without limitations. In this last section, we suggest a future research agenda to extend the scholarship on regulatory sandboxes. As the current investigation was limited in terms of sample size and context, we suggest theoretical propositions that future research can investigate to examine the significance of highlighted relationships and make generalizations that apply to the incubation and entrepreneurial finance literatures. Additionally, the increasing number of regulatory sandboxes around the globe raises the crucial question of how effective these instruments are, given the financial and human resources allocated to their operation. Hence, future studies can investigate whether the presence of regulatory sandboxes in a given jurisdiction (or group of jurisdictions) increases the amounts of risk and venture capital or other funding sources over jurisdictions without a regulatory sandbox. That said, this study only investigated social interactions that occur within established regulatory sandboxes, limiting the empirical investigation to one of many important regulatory change stages that typically unfold when setting up these instruments. These may include 1) calls for input (public consultations), 2) engagement with industry actors and/or international regulators through roundtable discussions, and 3) responses in the form of published regulatory guides. There is thus ample room for further research, particularly to investigate how social interactions differ across the regulatory change stages from a longitudinal perspective, both nationally and across jurisdictions, as advocated by Cumming et al. (2019).

Declaration of Competing Interest

None.

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Appendix

Appendix A - Illustrative quotes of SCT

Table

Table
Concepts and categories that emerged from the data analysis.

Aggregated Dimensions	1st Order Concepts	2nd Order Themes	Illustrative Quotes	
Structural Dimension	Network ties	Regulatees' and regulators' partnerships Regulator-regulatees' follow-up post exit	"we partner with universities and with a regulatory partner apart from investors or mentors who help us." (SP-7). "in addition to having unofficial alumni calls every two months, there are also times when I need something from the regulators as we are being approached frequently by insurance companies across the globe asking if we could bring our services to country X or Y? And very often I would write the [home country] regulator to ask ... can you please make the introduction?" And then comes a friendly warm introduction from the [regulator]." (SP-4).	
	Network configuration	Frequency of contact and stakeholders involved Access to regulators	"We actually met a number of times with them [the regulator], where we presented progress on how testing was going on, what parameters we were testing, what were our preliminary results, we demonstrated the product to them as it was being used by the consumers. We were also meeting with different people on the regulator side, e.g., the innovation team, the AML compliance legal people." (SP-2). "What I find during our interaction with people who want to access the sandbox to do some sort of testing is that they may not be able to use the sandbox, however within the established or open relationship with them, we can give them some regulatory nudges, where they can potentially take a commercial solution that would work." (R-4).	
	Network stability	Co-evolution of financial services	"In Vietnam, the legal framework that exists today requires paper-based signature, which is done remotely. So, we have to adjust our innovation in a way that would allow finger-based signature on screen, accompanied with a paper-based signature in the branch. This certification of identity then creates a significant enough record that would allow it to be used later on in engagement with the same financial institution or others. For that, the Vietnamese Central Bank needed to issue a circular, not a change in the regulation, but change in the regulatory application for this to happen." (SP-2). "the most fruitful advantage for a sandbox license was that we're able to test out any kind of system, we are not bound to be fined or imprisonment because we are meant to mistake. Along the way, there's a lot of mistakes that have happened, but we are not being fined because of that." (SP-8).	
	Relational Dimension	Trust	Trustful climate Regulators ability to support and share knowledge Co-operative climate	"the firms that come into the sandbox will have less mature risk management systems, and we do provide them with waivers and modifications to the preexisting rules, that allow firms flexibility in how they mitigate the risk. For example, they can outsource certain things, or combine certain functions into one in recognition of the fact that they are a new start-up. But the risk still needs to be managed." (R-7). "We managed to collaborate with a system provider from the UK to do electronic KYC through the system. To get Central Bank regulators convinced ... we had a few rounds of tests and then they requested to come with a full-fledged presentation of how that provider is working in the back-end." (SP-8).
Expectations		Expectations by regulators and regulatees	"we often have to go back and ask for some clarity. An example might be providing financial advice, but we can't work out their system, is it general or personal advice or the other alternative which is more common in the advice space or is that they are collecting a lot of information? they [regulatee] say they are only providing general advice, but it's clearly not general advice. There's a bit of an expectations gap, and sometimes it takes a bit longer to bring them across the line and say, well, you collected a lot of information." (R-4). "the habits of the compliance officers don't change overnight, despite the regulator saying that they do adopt and review new technologies, they take a risk-based approach. But, it still takes time. That's why for us the Sandbox was a good value. Because it was part in education process towards the regulator." (SP-6).	
Cognitive Dimension		Common goals and language	Shared language and codes	"we get firsthand sort of knowledge of exactly how that technology works. So typically, during the testing period, we work very closely with firms and we sit in on tests and we often will look through the backend. Sometimes we'll even go through the code and do audits. We will crawl all over the new technology. For us it's excellent because we get to understand what's coming out into our market." (R-7).
			Shared goals and vision	"I don't think the FCA was dramatically nervous about how the sandbox would work in practice, they had a rough idea and they decided to go for it and test it and tweak it. That's were, I think, the most benefits of a sandbox are, just doing something, trying it, maybe failing but learning from the failure, and working towards the optimal framework." (R-1).

Appendix B – Interview guides

Interview guide: Regulators

- (1) Please tell us about your background and current role.
- (2) Please tell us about the recent changes in the regulatory sandbox practices.
- (3) Based on examples, please tell us how regulators engage stakeholders from the FinTech community to shape regulatory sandbox practices? Who are the main actors, what is their role, if there are any obstacles regulators face?
- (4) Based on examples, please describe the interactions that occur in sandboxes with innovators prior to acceptance? What are the obstacles regulators face during such interactions? How long are the periods prior to acceptance?
- (5) Once a FinTech has started testing in the sandbox, please describe how and for what purpose do regulators interact with sandbox participants, using examples.

- (6) Based on examples, please describe what knowledge/ideas are exchanged in the interactions between regulators and sandbox participants?
- (7) Can you please, based on examples, describe instances of regulator-regulatee interactions that have influenced the way regulators work?
- (8) Please describe instances of regulator-regulatee interactions that have possibly influenced sandbox participants directly or indirectly?
- (9) After graduation/exit of participants, please describe the nature of interaction with graduated participants?
- (10) According to your view, what are the advantages that sandbox participants may provide regulators? Similarly, what are the advantages that regulators provide to sandbox participants?

Interview guide: Sandbox participants

- (1) Please tell us briefly about your background and current role in your FinTech firm.
- (2) Please tell us about your previous/current journey in/out of a regulatory sandbox (Why regulatory sandbox to begin with?)
- (3) Can you, based on examples, describe interactions that occur with regulators, prior to accessing the sandbox/start validity period?
- (4) Please describe how and for what purpose has your FinTech interacted with regulators, or vice versa, after accessing (i.e. during testing) the sandbox?
- (5) Can you please describe an example in which knowledge/ideas were exchanged in the interactions with regulators and how was this of support in testing and validating your business model?
- (6) After graduation/exit, please describe whether your FinTech interacts with regulators and for eventually what purpose?
- (7) Lastly, according to your view, what are the advantages that sandbox participants may provide regulators? Similarly, what are the advantages that regulators provide to sandbox participants?
- (8) If you think back at your experience: how has your knowledge developed?

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