

WORKING  
PAPERS IN  
RESPONSIBLE  
BANKING &  
FINANCE

**Mission-Oriented or Mission  
Adrift? A Critique of Plans for a  
Mission-Oriented Scottish  
National Investment Bank**

By *Ross Brown*

**Abstract:** This article provides a critical examination of the rationale for, and validity of, mission-oriented innovation and industrial policies. It does so by providing a case study critique of the “mission-oriented” approach espoused for the new Scottish National Investment Bank (SNIB). The central contention put forward in this paper is that its mission-oriented approach constitutes “fuzzy” policy making which is highly opaque, lacking sufficient detail and fails to align itself properly with the demand conditions within the Scottish innovation system. A mission-oriented approach is likely to foster significant policy path dependencies which could further perpetuate underperformance within the Scottish economy. The paper outlines an alternative “diffusion-oriented” approach which seems better equipped at overcoming the entrenched “low productivity, low innovation equilibrium” evident in Scotland. The paper concludes that policy must be properly customised to ensure new funding agencies are effectively tailored and aligned to the demand conditions within their local innovation and entrepreneurial ecosystems.

WP N° 19-020

4<sup>th</sup> Quarter 2019



# Mission-Oriented or Mission Adrift? A Critique of Plans for a Mission-Oriented Scottish National Investment Bank

Ross Brown

Centre for Responsible Banking & Finance, School of Management, University of St  
Andrews, Scotland

Email: [Ross.Brown@st-andrews.ac.uk](mailto:Ross.Brown@st-andrews.ac.uk)

## Abstract

This article provides a critical examination of the rationale for, and validity of, mission-oriented innovation and industrial policies. It does so by providing a case study critique of the “mission-oriented” approach espoused for the new Scottish National Investment Bank (SNIB). The central contention put forward in this paper is that its mission-oriented approach constitutes “fuzzy” policy making which is highly opaque, lacking sufficient detail and fails to align itself properly with the demand conditions within the Scottish innovation system. A mission-oriented approach is likely to foster significant policy path dependencies which could further perpetuate underperformance within the Scottish economy. The paper outlines an alternative “diffusion-oriented” approach which seems better equipped at overcoming the entrenched “*low productivity, low innovation equilibrium*” evident in Scotland. The paper concludes that policy must be properly customised to ensure new funding agencies are effectively tailored and aligned to the demand conditions within their local innovation and entrepreneurial ecosystems.

**Key Words:** Innovation Systems

State Investment Banks

Mission-Oriented

Diffusion-Oriented

Entrepreneurial ecosystems

## Acknowledgements

The author is extremely grateful to a number of people who kindly commented upon various versions of this manuscript. In particular, thanks are due to the highly instructive comments received from Neil Lee, Suzanne Mawson, Bert Scholtens and John Wilson. The author also wishes to acknowledge the numerous policy makers who participated in the interviews during the study. The views expressed in the paper remain those of the author alone however. The usual disclaimer applies.

## 1. Introduction

This article provides a critical examination of mission-oriented innovation and industrial policies. The planned creation of a new “mission-oriented” Scottish National Investment Bank (henceforth SNIB) signals a major policy innovation in terms of Scotland’s existing economic development apparatus (Mazzucato and MacFarlane, 2019). The Scottish Government has earmarked a considerable sum of money (£2bn capitalisation over the first ten-year phase) and invested considerable political capital in this major new policy initiative<sup>1</sup>. This paper’s key intended contribution is to critically examine the rationale for, and validity of, mission-oriented innovation policies by examining the very real problems associated with their practical application via a new body such as SNIB.

While the precise origins of the bank are unclear, as is often the case with innovation and enterprise policies (Arshed, 2017),<sup>2</sup> Mariana Mazzucato claims to have played a pivotal role in developing the proposals for SNIB (Mazzucato and MacFarlane, 2019). Drawing on her “path-breaking” research on innovation policy (Mazzucato and MacFarlane, 2019, p. 29), the central ethos underlying the proposed bank is that it will be infused with a “*mission-oriented*” focus to help steer its investments. The realisation of the limits of a narrow conceptualisation of system failure in innovation policy coupled with a renewed interest towards greater ‘challenge-orientation’ in innovation policy has led increasing prominence given to mission-oriented policies (Mazzucato, 2018; Schot and Steinmueller, 2018). These policies are loosely and rather vaguely defined as “systemic public policies that draw on frontier knowledge to attain specific goals” (Mazzucato and Semieniuk, 2017, p. 33). Some have labelled these “moonshots” because they draw inspiration from

---

<sup>1</sup> The First Minister, Nicola Sturgeon, herself has become a vocal proponent of the need for this “truly transformative” project to help revitalise the Scottish economy.

<sup>2</sup> Indeed, various think tanks and academics have similarly advocated the need for UK regional and state-owned investment banks (Doplin and Nash, 2012; Lee and Brown, 2017).

the US National Aeronautics and Space Administration's (NASA) famous Apollo programme (Bloom et al, 2019).

Following Schumpeter, finance is viewed as central to the innovation process (King and Levine, 1993), yet small and medium-sized enterprises (SMEs) often encounter endemic funding constraints to support their innovative activities (Hall and Lerner, 2010; Lee et al, 2015; Cowling et al, 2018). This has resulted in a plethora of policy initiatives to alleviate these credit constraints such as regional investment banks (Hyytinen and Toivanen, 2005). While many European countries have deployed such banks (Mazzucato and Penna, 2016; Mertens and Thiemann, 2019), such a step marks a bold departure within the UK context in terms of regional economic development policy<sup>3</sup>. State-owned investment banks are heterogeneous organisations performing three main roles i) a counter-cyclical role; ii) a capital development role; & iii) a new venture support role (Mazzucato et al, 2018)<sup>4</sup>. The intended focus of SNIB suggests it's likely to be focused on capital development and finance for new ventures by providing "innovative, high growth Scottish firms" with long-term patient finance (Scottish Government, 2018a, p. 11). Given its wide-ranging remit, it is hard to precisely pigeon-hole this new body as either an instrument of enterprise policy or innovation policy. On the face of it, SNIB intends having a "systemic" remit, simultaneously fostering innovation and supporting funding for SMEs. While systemic policy instruments are integrated tools designed "for a specific innovation system (or part of a system)" (Wieczorek and Hekkert, 2012, p. 86), the choice of such a "policy mix" is often crucial for the effective formulation of innovation policy (Flanagan et al, 2011; Borrás and Edquist, 2013).

The Scottish Government claims that a mission-oriented approach for SNIB will provide transformative solutions to "problem specific societal challenges" and the missions set for the bank

---

<sup>3</sup> State-owned credit guarantee banks are also common in EU countries but absent in the UK (Hennecke et al, 2019).

<sup>4</sup> The specific policy instruments deployed by these banks are also varied and include grants, soft loans, credit guarantees and equity co-investments (Mertens and Thiemann, 2019).

will “provide a focus for its investment strategy” (Scottish Government, 2018a, p. 11). Given state-run investment banks guided by specific missions “tend to be more effective” than those focusing purely on promoting growth or competitiveness (Mazzucato and MacFarlane, 2019, p. 19), it is perhaps unsurprising that the Scottish Government chose a mission-based approach for SNIB despite the lack of evidence to substantiate this claim (see Bloom et al, 2019)<sup>5</sup>. While to date there has been considerable interest in this “normative turn” within innovation policy (Uyarra et al, 2019), as yet there has been little academic scrutiny of how mission-oriented policies are actually operationally enacted by organisations such as SNIB.

To address this gap, this paper aims to make a novel contribution to the innovation literature by examining how mission-oriented policies are actually enacted. We aim to demonstrate the very real problems associated with its application in practice. This focus is important because in many cases it may be hard to “articulate and economic rationale behind these moonshots” (Bloom et al, 2019, p. 20). Plus, in contrast to most policy analysis which typically examines policies *ex post* after their deployment, this paper examines policy formulation phase of the policy making process. This innovative approach enables the opportunity for the research to influence the nature and direction of future policy making as it moves into the policy implementation phase. While primarily a debate article, the paper draws on a range of empirical evidence sources such as the bank’s academic blueprint, Scottish Government documentation, secondary innovation and productivity data and interviews with policy makers charged with implementing the bank.

The central contention put forward in the paper is that mission-oriented policy constitutes “fuzzy” policy making which is highly opaque, lacking sufficient detail and fails to align itself with what the nature of the country’s innovation and associated entrepreneurial ecosystem (Markusen, 2003). How such a bank is structured, what types of innovation it supports, what products it offers

---

<sup>5</sup> Despite this ambitious assertion, during a review of 8 state-owned investment banks conducted by the same authors as part of the scoping work for SNIB there is no proper attempt to assess their perceived effectiveness compared to those focused purely on promoting growth or competitiveness (MacFarlane and Mazzucato, 2019).

and how it targets potential customers are crucial issues confronting policy makers. When devising appropriate policy interventions, the devil is very much in this kind of detail. If the bank is to select projects effectively it will have to have a thorough knowledge of the marketplace and have extant local knowledge and networks to mitigate against the risk of loan defaults. Importantly, therefore, we also wish to argue that developing effective innovation policies is a demanding task and one that needs to be deeply rooted in a close understanding of the specific context in which they are introduced (Tödting and Trippel, 2005; Edler and Fagerberg, 2017; Kitson, 2019). Clearly, the pervasive growth of mission-oriented innovation policies means the implications of these arguments extend well beyond the Scottish context.

The remainder of this article is set out as follows. The paper begins with an outline of different policy approaches towards innovation. It then undertakes a critique of the so-called “mission-orientation” conferred on SNIB by scholars. The nature of the Scottish innovation system is then highlighted. In the penultimate policy section, the paper discusses how a “diffusion” orientation for SNIB may be better aligned to the nature and requirements of the Scottish economy. Finally, the paper ends with brief conclusions.

## **2. Varieties of Innovation Policy**

It has become something of a “stylized fact” that institutions are crucial for economic growth and development (North, 1991; Rodrik et al, 2004; Feldman et al, 2016). This is especially applicable for how economies harness and translate the process of innovation and technological development into commercial and societal benefits (Block and Keller, 2011). At the same time, the innovation literature is replete with empirical evidence strongly demonstrating how the design of institutions strongly conditions their “effectiveness” (Breznitz et al, 2018, p. 883). In other words, what goals institutions adopt, what activities they focus upon and how they operate all acutely matter (Borrás and Edquist, 2013).

Obviously, a crucial issue affecting the design of innovation policies is their intended aims and “types” of innovation they aim to foster. Broadly speaking, much of what falls under the rubric of technology and innovation policies can be categorised as either “mission” (or challenge) or “diffusion” oriented models (Ergas, 1987). See Table 1 for a delineation between these different innovation models. These are aligned to the two main different forms of knowledge and modes of innovation depicted by Jensen et al (2007). This important distinction has quite far-reaching implications for the operation of innovation and enterprise policy frameworks under these different approaches (Brown and Mason, 2014).

**Table 1: Delineating Mission Oriented and Diffusion Oriented Approaches**

<b>Mission-Oriented Approaches</b>	<b>Diffusion Oriented Approaches</b>
Linear	Interactive/Adaptive
Supply-focused	Demand-oriented
Sources of knowledge dominated by Science, Technology and Innovation (STI)	Sources of knowledge dominated by doing, using and interacting (DUI)
Funding dominated by VC/angels	Funding dominated by bank finance and entrepreneurial bricolage
Sectoral focus on science and high-tech	Sectoral focus oriented towards territorial embedded actors and “economic gardening”
Policy focused on innovative disruptive start-ups	Policy focused on existing SMEs or networks of SMEs
Flagship Policies such as state-led disruptors (DAPRA)	Agencies often act as productivity facilitators (GTS Institutes in Denmark)
Focus of policy top-down and centralised	Focus of policy bottom-up and regionally oriented

Under a mission-oriented approach, innovation policy is associated with major scientific projects which aim to reap major technological discoveries. Typically, in mission-oriented economies a “few bets are placed on a small number of races” (Ergas, 1987, p.194) with NASA’s attempts to put a man on the moon being an “archetypical historical mission” (Mazzucato and Semieniuk, 2017, p. 33). The creation (and eventual demise) of Concorde is offered as an example of an ill-fated mission-oriented approach (Mustar and Larédo, 2002). Embedded in these approaches is the desire by policy makers to promote radical technological development which can address specific challenges high on the political agenda (Edler and Fagerberg, 2017).

Recently, the adoption of this mission-oriented policy framework has seen the locus of innovation policy become focused on projects supporting major transformative societal change such as demographic and climate change (Schot and Steinmueller, 2018). Mission or challenge oriented innovation policy is often driven by political and normative goals (e.g. UN Sustainable Development Goals) which have a very broad scope (Boon and Edler, 2018). While most frequently associated with innovation agencies, other types of institutions, such as state-owned investment banks and energy agencies, are similarly tasked with a mission-orientation remit (Mazzucato and Semieniuk, 2017; Geddes et al, 2018). Research shows that the so-called “missions” some national investment banks have adopted include climate change and the environment, food security, globalisation and technological progress and demographic change (MacFarlane and Mazzucato, 2019).

Mission oriented countries often heavily prioritise a linear science and technology based approach to innovation (STI) (see Jansen et al, 2007). Under this model new technology-based start-ups are seen as a crucial part of the radical or “breakthrough” approach to innovation. Spurred on by the success of Silicon Valley, mission-oriented countries have increasingly focused on promoting the model of innovation often associated with a “patenting-seed/angel/venture fund-incubator” model of business growth often underwritten by considerable non-repayable public research grants (Cooke, 2016, p. 192). Within these economies state-funded innovation agencies such as DARPA in the US often play a crucial role (Block, 2008; Weiss, 2014). Its mission was to define cutting-edge defence technological problems and then build up a network of researchers from academia and industry to explore new technologies (Breznitz et al, 2018). The varietal types of capitalist economies most commonly associated with this model are the UK, France and US (Ergas, 1987).

A “diffusion” oriented approach, on the other hand, takes a markedly different approach. Within these contexts, there is a more experimental and relational approach towards innovation development (Brown and Mason, 2014). Sources of knowledge arise from doing, using and interacting (DUI) processes which typically arises from inter-firm collaboration. DUI is based on a

series of iterative, recursive form of learning which arises from a bricolage approach (i.e. ad hoc, make do with what you have got, experimental etc.) towards innovation (Baker and Nelson, 2005). This is a fundamentally interactive or open process involving firms and intermediaries which involves “knowledge recombination among diverse knowledge and practice sets” (Cooke, 2016, p. 192). Within diffusion-oriented contexts such as Scandinavia and Germany (Ergas, 1987), the primary goal of innovation policy is “to provide a broadly based capacity for adjusting to technological change throughout the industrial structure” (Ergas, 1987, p. 205).

The main strategic rationale for diffusion-oriented policy making is more prosaic and practical, with a strong focus on productivity enhancement and competitiveness. Instead of a focus on radical innovation development policy often focuses on incremental innovation such as competency enhancing human resource practices (Casper and Whitley, 2004). In diffusion economies, much greater emphasis is placed on developing existing firms and fostering networks of SMEs and creating linkages between these firms and public technology-transfer institutions. This type of innovation development is very akin to how the so-called Mittelstand has developed through dedicated family businesses and localised institutions such as the Fraunhofer Institutes and regionalised banks (De Massis et al, 2018; Pahnke and Welter, 2019).

In diffusion-oriented contexts, policy typically emanates from decentralised and localised institutions focused on enhancing productivity within existing organisations (i.e. economic gardening) and fostering interactive learning in networks of SMEs. Often a core aspect of policy is on productivity enhancement via organisations labelled “productivity facilitators” (Breznitz et al, 2018). As Cooke (2016) notes parts of Scandinavia such as Denmark and Norway have several of these types of organisations which help nurture DUI type innovation across networks of SMEs. Often such organisations like the GTS Institutes in Denmark and the Fraunhofer Institutes in Germany have very strong links to the private sector and sell their services on a commercial basis, ensuring research is customised to the needs of industry (Intarakumnerd and Goto, 2018). This local embeddedness and

local orientation discourages longer-term “blue-skies” research and precludes them from “getting involved in the creation of start-ups” (Breznitz et al, 2018, p. 887) which is often risky and problematic for the public sector (Brown and Mawson, 2016).

### **3. Mission Impossible? A Critique of a Mission-Oriented Policy Approach**

Having delineated mission and diffusion oriented varieties of innovation and associated policies, our attention now turns to a discussion and critique of the former approach by examining SNIB’s anticipated *modus operandi* as delineated by the Scottish Government (Scottish Government, 2018b). Below we take issue with three main factors which the bank’s blueprint fails to adequately address: types of mission, types of innovation and types of instruments.

#### *3.1 Types of Mission*

Mazzucato and MacFarlane’s (2019) blueprint for the bank rather disappointingly fails to delineate a cogent case for specific or transparent missions appropriate for a state-run investment bank. It therefore becomes very unclear what missions the bank should coalesce around. The authors discuss the fact that the UN’s 17 sustainable development goals are useful but remain for the most part “too broad to be actionable” (Mazzucato and MacFarlane, 2019, p. 10). Vague reference is also paid to the 81 economic, social and environmental performance indicators adopted by the Scottish Government under its National Performance Framework. They acknowledge that translating missions into concrete actions is problematic by stating that the “granularity” of missions “sits between broad challenges and concrete solutions” (Mazzucato and MacFarlane, 2019, p. 11). They also claim that selecting missions should be an open and inclusive process whereby “public participation in the selection of missions is essential” (Mazzucato and MacFarlane, 2019, p. 25), yet fail to offer a practicable mechanism for achieving this democratic objective.

They do however offer a number of very opaque overarching recommendations for the bank. For example, they propose the bank will not simply seek to fix market failures but instead will

“create and shape new markets aimed at tackling modern societal challenges” (Mazzucato and MacFarlane, 2019, p. 5). In order to achieve this indeterminate goal, they then offer a fourfold schema of what a mission-oriented organisation should resemble. They claim it should “pick the problem, not sectors”; “focus on societal relevance”; “no one size fits all”; and “foster experimentation”. These vague heuristics are fine as high level guiding principles but they fail to outline what they mean in terms of the operating procedures for a state-run investment bank.

The implementation plans outlined by the Advisory Group set up to advise the government also offers fairly vague advice in terms of the specific missions applicable for the bank. They claim the bank should focus its investment strategy on support for innovative, high growth Scottish firms irrespective of sector. Rather than a democratic process advocated above, they claim that Scottish Government should be responsible for “setting the missions for the Bank on a pre-determined timeframe and aligned to policy priorities” (Scottish Government, 2018b, p. 12). However, they do elaborate further by suggesting that the following core objectives for SNIB could entail focusing on the following three societal challenges: transitioning to a low carbon economy; responding to demographic changes; and promoting inclusive growth (Scottish Government, 2018b). Implying the need for complementarity with other Scottish Government policies, they claim that regulation and alignment with other agencies is deemed necessary to achieve these missions.

While it would be very hard to disagree *per se* with the merits of the missions conferred upon the bank outlined above, it does raise some thorny issues in terms of their practical implementation. While Mazzucato and MacFarlane (2019) recognise that it will be difficult to make these missions “actionable” they rather skirt around the types of contradictions which a mission-orientation may conjure up for SNIB. Below we highlight two main issues (focus and implementation) which help shed important light on some of the potential problems and tensions confronting a mission-oriented bank.

Firstly, in terms of *focus*, proponents of mission-oriented policies tend to downplay the complexity of the missions in question. This stems from the fact that academics rarely confront the sometimes intractable difficulties of operationally implementing mission-based policies. Boon and Edler (2018) make the very important point that the objective of getting “a man on the moon” had a narrow and well-defined objective and end goal. Societal challenges, on the other hand, such as climate change or alleviating poverty are systemic multi-faceted so-called “wicked” problems involving a wide array of stakeholders, interests, and institutional levels (Boon and Edler, 2018; Elia and Margherita, 2018). In other words, the solutions for these complex issues are not clear from the start which makes the operationalisation of these goals ever more difficult for a single organisation to enact which “point towards the immense normative, discursive, and operational difficulties of challenge-oriented policies” (Boon and Edler, 2018, p. 443). To address these types of fundamental challenges, policy makers will require the assembly of a much wider constellation of actors and stakeholders to be able to tackle these types of systemic problems (Kuhlmann and Rip, 2018; Schot and Steinmueller, 2018).

Economists are also often sceptical of such mission-oriented policies because political decision-making may be more likely to favour certain sectors, especially those who engage in lobbying (Bloom et al, 2019). Indeed, owing to the political imperatives facing the Scottish Government some commentators have suggested SNIB could be used as a “hobby horse” for propping up lame ducks rather than promoting fast growth firms (Jamieson, 2019). This is all the more salient as the Scottish Government has a track record of being very interventionist in terms of industrial policy. According to the Advisory Group, any missions set for the bank would provide a focus for its investment strategy “but not constrain the Bank’s activity” (Scottish Government, 2018p. 12). Implicit in this statement appears to be considerable “wriggle room” given the opaqueness of some of the parameters set for the SNIB. This may be especially true as the allure of SNIB’s mission-oriented approach appears to have been strongest for Scotland’s politicians rather than those actually charged with the precarious task of implementing this complex new policy

intervention. Indeed, “insulation from policy pressures” often invites the adoption of “fuzzier concepts” such as the one examined herein (Markusen, 2003, p. 713). This seems likely to lead to “mission drift” as political priorities become reactive and “issue-based” rather than mission-driven<sup>6</sup>.

Regulatory capture is another possible downside affecting the focus of a mission-oriented approach within innovation policy. This is especially prescient given that certain sectors such as defence-related activities represent a significant share of most OECD governments’ R&D budgets. As a powerful lobbyist, military-based R&D organisations may prove a powerful force ensuring they remain a core constituent of funding programmes across innovation expenditure. Plus, research has shown that defence-related R&D may not be a useful model for mission-oriented R&D in other technological fields such as climate change (Mowery, 2012). Consequently, scholars have argued that popular analogies of the Manhattan and Apollo projects are “at best inaccurate and at worst misleading” as models for the design of public R&D programmes in this area (Mowery et al, 2010, p. 1022).

As well as the potential for this type of path dependence, mission oriented policies may be susceptible to “policy capture” by other incumbent anchor organisations such as Universities. Research has shown that in some weaker peripheral innovation systems universities often play a disproportionate and dominant role in shaping the nature of the entire innovation system and funding mechanisms (Kempton, 2019). Despite this form of funding often having a fairly low level of effectiveness (Bloom et al, 2019), these bodies are extremely effective at extracting significant volumes of funding from various sources of public sector funding. Again, this vulnerability is especially pertinent in Scotland given that very low levels of R&D undertaken by most existing Scottish SMEs often prompts policy makers to activate university-oriented public policies (Brown, 2016).

---

<sup>6</sup> For example, when Prestwick Airport went into administration in 2013 the Scottish Government decided to acquire it and have since pumped in almost £50m despite the fact that it continues to run at an operating loss (Jamieson, 2019).

A further set of issues concerns problems linked to *implementation*. The fact the bank will be operationally and administratively independent of the Scottish Government (Scottish Government, 2018b), could give rise to “agency problems” if SNIB (i.e. the agent) is a variance with the principal (i.e. the Scottish Government). When a gap exists between policy aspirations and the implementation of appropriate instruments we speak of “implementation failures” (Uyarra et al, 2016). An example of such inconsistencies is what an environmentally-oriented bank would do when faced with requests for funding which do not easily “sit” with a mission such as climate change mitigation.

This could arise in a number of ways. The bank may de-emphasise the missions selected and concentrate their activities towards investable companies, irrespective of how align to the principal’s missions. The fact the bank aims to make a positive financial return and become financially self-sustaining (Scottish Government, 2018b), could push it towards such a risk averse approach. Plus, what would it do if traditionally high carbon emission companies (e.g. oil and gas or automotive) companies were to seek finance to make them become more carbon efficient? Would the bank ignore requests for funding from these types of projects and only fund renewable energy firms instead? Furthermore, it could prove very hard to operationalise a vague mission like decarbonisation on a project by project basis, especially as many investments facilitate product/process innovations which could ultimately lead to productivity improvements which in turn could reduce a firm’s carbon footprint. Indeed, in theory almost any investment project could be justifiable under this overarching mission by the agent.

Another potential conflict in its mission-oriented approach is the latitude for goal incongruence between the bank’s missions and a firm’s objectives. For example, if a firm wishes to make very long-term investments in companies for periods of 10-15 years, a firm’s objectives could markedly change over such a long period of time. In theory, as a manufacturing firm grows and expands over time, in order to expand production it could off-shore production to lower cost

locations with lower environmental standards. Another example could see tensions emerging between a mission-orientation towards inclusion and the end goals of the recipients firms'. The promotion of economic inclusion would probably wish to promote stable employment conditions for workers. However, many new innovative practices could in turn increase capital investment and hence displace or erode employment levels within recipient firms, especially for many service sector employees (Frey and Osborne, 2017). So while these investments are good for a single company's productivity they may end up thwarting the overall goal of producing employment stability within the workforce and promoting inclusion.

Having a mission orientation may also undermine SNIB's desire to be a-sectoral. Mazzucato and MacFarlane (2019) offer the advice that policy makers should "pick the problem, not the sector". While on paper this seems a sensible suggestion, such a vague heuristic may offer a false dichotomy in certain respects. Missions like focusing on decarbonisation and responding to demographic changes have clear and inherent sectoral implications. By emphasising their importance of these missions it could inadvertently lead to preferential treatment being given to renewable energy and sectors such as life sciences. In other words, selecting missions may have the unintended consequence of preferentially benefiting certain sectors over others, which goes against the bank's principle of supporting firms in "whatever sector they appear" (Scottish Government, 2018b, p. 12).

### *3.2 Types of Innovation*

From an innovation perspective, what is probably of even greater concern is the lack of detail in the blueprint surrounding what types of innovation and types of firms should be supported (Scottish Government, 2018b; Mazzucato and MacFarlane, 2019). Targeting the right types of innovation and type of firms is crucial to ensure the design of policy instruments is appropriate to the contextual setting in which firms operate. This is especially important as R&D is not the only method of producing innovation. As Isaksen and Nilsson (2013) rightly point out, most SMEs have

minimal in-house R&D which not only affects their ability to produce innovation but also their absorptive capacity. Other DUI methods of innovation include open sources of innovation from suppliers/end users, technology adoption, incremental changes, imitation and combining existing knowledge in new ways (Kitson, 2019).

As previously noted mission-oriented policies and organisations are traditionally associated with certain types of innovation (STI) and certain types of firms (start-ups). The focus within this approach to innovation favours the promotion of breakthrough R&D type innovation which is traditionally associated with *de novo* start-ups and high-tech SMEs, many of whom are university spin-outs (USOs) (Brown and Mason, 2014). Indeed, the inference within the blueprint for SNIB would seem to align with a strong focus on radical or breakthrough innovation with the potential to disrupt and “create new markets” rather than a more prosaic focus on DUI type innovation which is more linked to productivity enhancement. In terms of the types of firms to target for support, the bank’s explicit focus is specifically on the provision of growth capital for innovative “high growth Scottish firms” with the primary focus being on SMEs (Scottish Government, 2018a, p. 11). The implementation plan strongly suggests that it these businesses who can “accelerate new innovation” and those driven by “knowledge and ideas” rather than those with a strong base of fixed and tangible assets are those who merit support.

Given the well-established funding problems encountered by smaller innovative firms (Hall and Lerner, 2010; Lee et al, 2015), focusing support for high growth firms with innovative potential seems, on the face of it, a legitimate policy focus (Grilli et al, 2018). Plus, innovation and business support policies are often most effective when targeted towards smaller rather than larger firms (Crisuolo et al, 2019). That said, identifying SMEs with “high growth” potential has proven extremely elusive and akin to the “holy grail” for enterprise policy makers. This is perhaps unsurprising given the fundamentally unpredictable nature of firm growth which has led some scholars claim it is “predominantly a random phenomenon” and liken the chances of predicting

successful firms as akin to a “coin toss” (Coad et al, 2013, p. 628). Correspondingly, predicting success is likely to prove extremely difficult for policy makers (Freel, 1998).

Plus, Mason and Brown (2013) claim that policy makers are prone to “look in the wrong places” when trying to identify high growth firms by focusing almost exclusively on high-tech start-ups. Indeed, policies targeting high growth firms generally heavily focus support on high-tech SMEs which constitute a very small part of the business population. Indeed, recent work discovered that in Scotland only 10% of the country’s high growth firms were technology-based firms, a lower proportion than all UK regions bar Northern Ireland (Brown and Mason, 2014). Although this is a very small part of the Scottish business population, this cohort of firms already receives the lions’ share of publicly-funded assistance within Scotland. Indeed, the predecessor of SNIB -the Scottish Investment Bank (SIB)-already provides substantial equity finance via co-investments with VCs and business angels to high-tech start-ups in Scotland. All in all, from its outset the bank appears to be taking a strong technology rather than a purely innovation focus. It would also appear that the types of firms targeted by SNIB are likely to be the same high-tech start-ups and SMEs undertaking radical product innovation which already dominate the financial support landscape in Scotland.

### *3.3 Types of Instruments*

Another key omission within the blueprint for the new SNIB is a lack of a proper examination of the types of factors shaping credit constraints in SMEs and the types of financial instruments they can offer prospective customers. Mazzucato and MacFarlane (2019) fail to properly address the nature of the funding gap in innovative SMEs and merely claim that SNIB should have a wide range of instruments at its disposal. The other main piece of advice proffered by these authors is that equity investments may be better suited to for “radical innovation” whereas debt instruments such as long-term loans may be more applicable for “lower risk activities”. Again, this is not elaborated upon. More helpfully, they suggest the bank could potentially follow other state-run banks and offer

advisory services such as strategic planning, capacity building and training programmes (Mazzucato and MacFarlane, 2019).

More detail about how the bank could potentially be operationalised is explicated by the Scottish Government in its implementation plan. This identifies two main funding gaps: a debt gap for microfinance (£500-£25,000) which extends up to £1-2m; and an equity finance gap at the £2m to £10m level. It claims that there is now an acute and growing funding gap for “innovative, growing companies seeking to scale-up” (Scottish Government, 2018b, p.11). To address these funding gaps the banks initial product offering could include provision of the following:

- I. Access for SMEs to micro loan finance up to £100k
- II. Medium-term loans finance in the range £100k-£2m
- III. Early stage risk capital up to £2m
- IV. Equity and mezzanine investment models by way of equity and loans up to £10m

There are also significant weaknesses within this rather partial assessment which need highlighted. What seems immediately surprising is that no new research was conducted (to the best of our knowledge) about the nature of the funding gaps across innovative Scottish SMEs. This is crucially important because recent research suggests that there is a second crucial funding gap appearing which faces older and larger businesses beyond the initial start-up revenue generation phase where policy initiatives are typically targeted (Aernoudt, 2017). Similarly, Wilson et al (2018) detected that there is evidence of an increase in the need for growth funding for deals in the £2-10m bracket, with some estimating this to be as high as £5m (North et al, 2013). However, given equity gaps are often spatially mediated (Mueller et al, 2012), more evidence about the situation in Scottish firms is needed. Aside from funding gaps, such analysis could also have helped to properly examine the problems rapid growth firms face when trying to scale-up. Often research suggests that the problems firms encounter scaling-up are about access to non-pecuniary forms of information, support and advice (such as peer-based management development) rather than purely transactional

forms of support such as funding (Scale-up Manifesto, 2016). Given the universally accepted mantra about the need for greater evidence-based policy making across the policy world, this lack of bespoke analysis seems remiss (Davies and Nutley, 2000).

Another notable feature of the bank's plans is the continued strong focus on equity sources of finance which is a recurring feature of the existing support system in Scotland under the auspices of the existing Scottish Investment Bank. The blueprint does not contain an explicit discussion of the interaction between debt and equity finance and the rationale for pursuing different type of finance by SMEs. It does outline that there is a need for debt microfinance (<£100k) and more sizeable medium-term loans for SMEs (£1-2m). However, it appears to suggest that the major larger scale (i.e. £2-10M) funding gaps for innovative firms occur in terms of equity finance. Yet, important emerging evidence on the capital structure within high growth UK SMEs attests to the fact that only a tiny proportion (<5%) use equity sources of finance (Brown and Lee, 2019). In other words, most high growth firms seek and utilise debt finance in the form of loans and overdrafts to meet their external capital requirements. Some claim that this overwhelming focus in UK SME policy frameworks on providing equity finance may be preventing the vast bulk of SMEs from reaching their full innovation potential (Brown and Lee, 2019).

Finally, there also remains various omissions in the bank's plans regarding the institution's role in the existing funding ecosystem operating in Scotland. This is odd for a number of key reasons. First, there is no proper delineation of the current funding landscape facing Scottish innovative firms and how SNIB will work with and augment this ecosystem. This is surprising as new policy instruments are rarely parachuted onto an "empty stage" (Flanagan et al, 2011, p. 708). For example, lending to SMEs in Scotland is dominated by just three main high street banks: the Royal Bank of Scotland, the Bank of Scotland (now owned by Lloyds Group) and the Clydesdale Bank.

Together these organisations account for 80% of lending to Scottish SMEs<sup>7</sup>. Despite their dominance within the funding landscape, they do not feature within the SNIB’s implementation plans. Yet, how the bank interacts and aligns with the current funding ecosystem will be crucial to prevent the potential for “crowding out” existing lenders. Equally, this oversight also neglects the potential role SNIB could play as a potential co-funder with existing funders.

Second, given that SNIB is assuming full responsibility for the existing investment portfolio made under the auspices of its predecessor (i.e. SIB) it seems that a focus on early-stage equity finance will become an enduring feature of SNIB. Typically, its predecessor has co-invested purely with local business angels and smaller scale VCs. There is no discussion of whether or not these types of private co-investors will continue to form the mainstay co-investment partners for SNIB. This would appear incongruent with the fact Scotland lacks the scale of VC funding to make co-investments in larger size categories (£2-10m) identified by the blueprint. Again, this potentially overlooks the potential role SNIB could play as a conduit for leveraging other larger external sources of VC which could help overcome these equity funding gaps (an issues we return to shortly).

Finally, there is very little discussion of the ramifications of SNIB’s work for existing financial instruments such as the main UK’s main loan guarantee scheme, the Enterprise Finance Guarantee (EFG). These traditional debt-based loan guarantee schemes have been shown to be very effective at producing superior performance in the form of improved sales, job creation and exports for assisted firms (Cowling and Siepel, 2013) and are adopted widely across Europe to stimulate access to finance in SMEs (Hennecke et al, 2019). These are popular methods of alleviating funding constraints in SMEs as they are market-oriented form of risk-sharing with existing financial providers (mainly banks) and hence reduce informational asymmetries such as “borrower discouragement” (Brown and Lee, 2018)<sup>8</sup>. Although the Scottish Government (2018a) has left the door open for SNIB

---

<sup>7</sup> A report by the Competition and Market Authority (CMA) into competition into SME lending in Scotland found that together these three banks account for 90% of loans to SMEs within Scotland (Scottish Government, 2015).

<sup>8</sup> This occurs when good borrowers do not seek finance for fear of rejection (Kon and Storey, 2003).

to undertake loan guarantee facilities, how this would complement or augment the work of SNIB goes unreported. Arguably, therefore, systemic policy instruments must be properly integrated and aligned with existing network actors such as the UK's British Business Bank who operate the EFG (van der Schans, 2015).

#### **4. Alignment of SNIB to the Scottish Innovation System and Entrepreneurial Ecosystem**

Over the last three decades, institutional theories combined with evolutionary theories have led to the systems of innovation approach which views innovation as both an individual and a collective act involving many key stakeholders (Hekkert et al, 2007). Innovation scholars were quick to recognise that innovation systems are often spatially mediated due to their pronounced regional specificities (Cooke et al, 1997). On the face of it, there appears a number of key features within the Scottish innovation system which may undermine the appropriateness of the strategic direction envisaged for SNIB.

For example, the Scottish innovation system is fundamentally lop-sided (Roper et al, 2006). Owing to its world class universities, Scotland has the fourth highest levels of higher education R&D (HERD) expressed as a percentage of GDP in the entire OECD (Scottish Government, 2018a). In stark contrast, with just 3.9 per cent of the UK total Scotland ranks in the bottom quartile of the OECD for business expenditure on R&D (BERD) (Brown, 2016). As shown in Table 2, the share of innovation active Scottish small businesses is below most advanced EU economies and this is even more marked for medium-sized firms which are significantly less likely to be innovation active than their EU peers. As a consequence, most of the major policy efforts expended in recent years have attempted to bolster the strong innovative performance of the HE sector via USOs and various technology-transfer schemes. Rather than helping bridge this chasm, this has resulted in the continued bifurcation between the highly innovative HE sector and a woefully underperforming corporate sector, which is best exemplified by the sustained and continued innovation underperformance of Scottish SMEs in terms of their very poor innovation and productivity track record (Harris and Moffat, 2017).

**Table 2: Share of Innovation Active Firms by Business Size, 2010-12**

	Small	Medium	Large	All
<b>Scotland</b>	<b>46.3%</b>	<b>48.2%</b>	<b>58.8%</b>	<b>47.1%</b>
UK	49.0%	56.8%	56.6%	50.6%
Germany	<b>63.3%</b>	<b>74.3%</b>	<b>92.2%</b>	<b>66.9%</b>
Denmark	<b>47.5%</b>	<b>57.5%</b>	<b>79.7%</b>	<b>51.1%</b>
Austria	<b>48.7%</b>	<b>70.9%</b>	<b>84.0%</b>	<b>54.4%</b>
Sweden	<b>52.8%</b>	<b>65.6%</b>	<b>81.9%</b>	<b>55.9%</b>
Finland	<b>48.1%</b>	<b>65.0%</b>	<b>77.7%</b>	<b>52.6%</b>
EU (28)	45.2%	60.5%	76.4%	48.9%

*Source:* Eurostat and Scottish Government analysis of the UK Community Innovation Survey (Scottish Government, 2015).

What this also reveals is a strong disconnect between research produced in universities and the innovation needs of local entrepreneurial actors. According to some scholars, low levels of entrepreneurship, weak absorptive capacity in SMEs and an inability to engage within complex technologies all combine to inhibit local technological spillovers from universities in peripheral regional economies such as Scotland (Brown et al, 2016). However, rather viewing this situation as a reason to enhance innovation performance within the business sector, the bank's implementation plan claims this represents a "missed opportunity to use the intellectual capital that Scotland has in abundance" (Scottish Government, 2018a, p. 5). A clear inference embodied in this statement is that STI and HE commercialisation offer Scotland the best chance of overcoming this "innovation

deficit” rather than trying to address the core problem of the country’s weak performance in the corporate sector.

Furthermore, the Scottish entrepreneurial ecosystem is characterised by a number of key traits which again make this policy focus incongruent with the indicative goals outlined for SNIB. Related to the low levels of business expenditure on R&D, is the country’s below average level of productivity, a fact reflected across much of the UK’s non-core regions<sup>9</sup>. In Scotland, the long tail of low productivity SMEs is particularly stark with total factor productivity (TFP) 16% below the rest of the UK (Harris and Moffat, 2017). Pinpointing the precise reasons for this poor performance is complex and relates to region specific factors which underlie productivity such as investments in physical and human capital, access to finance, innovation, exporting-orientation and so on. That said, innovation and TFP are often indivisible (Hall et al, 2009). Mohnen and Hall (2013, p. 61), for example, found that firms who access various types of innovation (e.g. product, process, organisational and marketing) overwhelmingly obtain “better productivity performance”. This would suggest that focusing purely on one type of innovation (i.e. radical or breakthrough innovations which entails the development of products new to market) is only one way of increasing TFP. Enhancements to other types of DUI innovative activities will therefore also have equally important positive spillovers for TFP.

Indeed, rather than just relying on one magic bullet (STI) to crack Scotland’s productivity problem, research suggests that the root causes of this malaise may lie elsewhere. Addressing rising concerns about poor productivity across UK firms means that interest is now shifting towards providing a deeper understanding of the productivity inhibitors operating in the less dynamic parts of the SME environment (McCann, 2018). Haldane (2018) holds that it is not a lack of high growth technology based “frontier” companies that hinders productivity growth but instead the so-called

---

<sup>9</sup> Indeed, McCann (2018) claims productivity differences between the UK core and non-core regions are so stark they are more reminiscent of a developing or a transitioning country than an advanced economy.

“long tail problem” of poor performing UK SMEs. He claims the upper tail of UK companies is large and thriving and holds its own relative to international competitors in terms of TFP. This is also true for frontier Scottish companies (i.e. the top 0.1%) who have above average levels of annualised productivity growth over a ten year period compared to the rest of the UK (see Table 3 below). Plus, the UK’s (and Scotland’s) relative performance on start-ups and unicorns is also above the EU and OECD average<sup>10</sup>.

**Table 3: Annualised Growth in firm-level productivity distribution (aggregate and by region) between 2004-2014**

Region	Top 0.1%	Top 1%	99% of firms
UK	12%	8%	1%
North East	7%	5%	0%
North West	6%	4%	0%
Yorkshire and Humberside	12%	3%	-1%
East Midlands	30%	15%	1%
West Midlands	19%	10%	0%
East of England	16%	8%	0%
London	9%	8%	2%
South East	11%	6%	1%
South West	23%	12%	1%
Wales	0%	4%	1%
Scotland	13%	7%	0%

Source: Adapted from Haldane (2018)

By contrast, the long tail of poorly performing companies (i.e. the bottom 25% of UK companies) most of whom are SMEs, have levels of productivity around 80% or more below the UK median, far exceeding our main international competitors such as France and Germany (Haldane, 2018). Indeed, across all of the UK the performance of the vast bulk of companies experienced virtually no productivity growth over the ten year period between 2004-2014 (see Table 3). So what explains this chronic underperformance? According to Haldane (2018, p. 7) the “UK does R well, as a world-leading innovation hub. But it does D poorly, where the D refers not just to development but

<sup>10</sup> “Unicorns” are privately-owned firms who are valued at over £1bn dollars who policy makers view as vital drivers of strong entrepreneurial ecosystems (Brown and Mason, 2017).

the diffusion and dissemination of innovation to the long, lengthening, languishing lower tail". In other words, the UK's long tail problem is largely a "diffusion" rather than an "innovation problem" (Haldane, 2018). By focusing its efforts on increasing the upper tail of high productivity firms, this could diminish the effectiveness of systemic policy instruments such as SNIB.

Finally, recent research has examined the importance of localised institutional and other key entrepreneurial actors which together coalesce to form key components of local entrepreneurial ecosystems<sup>11</sup>. Brown and Mawson (2019) propose a threefold taxonomy to delineate different archetypal entrepreneurial ecosystems: emergent, developing and advanced. Inevitably, the nature of the innovation process diverges markedly across these contextual environments. A mission oriented approach towards innovation seems aligned to regions which are rich in the types of entrepreneurial endowments synonymous with the "advanced" entrepreneurial ecosystem variant. In these types of economies such as London and Cambridge, entrepreneurship is plentiful, firm-level innovative is engrained, technological spillovers from universities abound and access to resources such as equity finance is abundant. However, in developing entrepreneurial ecosystems such as Scotland there is much lower levels of entrepreneurship, firm-level innovation processes are poorly entrenched, university commercialisation is weak and sources of entrepreneurial finance (especially equity finance) are very "thin" and patchy.

Given the sometimes fragile interdependencies underlying these complex organisms, policy makers need to make a concerted effort to avoid unintended consequences or disequilibria in their respective ecosystems when designing policy interventions. They cannot merely replicate policy approaches which function effectively in advanced economies such as London and transplant them to areas with completely different environmental conditions and entrepreneurial dynamics such as Scotland<sup>12</sup>. Indeed, in many respects, Scotland has much more in common with similar resource-

---

<sup>11</sup> Research on ecosystems has been undertaken in parallel by both innovation (Oh et al, 2016) and entrepreneurship scholars (Brown and Mason, 2017). Herein when we refer "entrepreneurial ecosystems" rather than "innovation ecosystems" which is primarily a spatial concept.

<sup>12</sup> Interestingly, both authors' of the bank's blueprint are located in institutions based in London.

based “diffusion” oriented economies such as Denmark and Norway than it has with other advanced entrepreneurial ecosystems in the UK, such London or Cambridge (Brown and Mawson, 2019). This is why policy makers are strongly advised by scholars to differentiate regional innovation policy to the needs and circumstances within different spatial contexts (Tödting and Tripl, 2005).

## 5. Policy Discussion

From the preceding debate a number of key issues appear to be emerging. It would be both premature and invidious to be too definitive about the suitability of bank’s precise *modus operandi* prior to its establishment. Clearly it is important to differentiate between *a priori* justifications derived from scholarly theories and the specific rationales or heuristics explicitly or implicitly used by policy makers to justify the design and use of particular policies (Flanagan et al, 2011). However, judging by this indicative analysis of both the blueprint and associated documentary analysis there does seem to be a number of key features mediating and shaping the body’s envisaged role which may be incongruent with the nature of the Scottish innovation system.

Table 4 below outlines how the “mission-oriented” role conferred upon SNIB may potentially translate into its activities in terms of how the bank is aligned, structured and operationally focused (see Table 4 below). By way of contrast, we also set out how a “diffusion-oriented” approach could potentially offer a different route for the bank. By setting out two contrasting models or policy frameworks, we seek to demonstrate to policy makers the considerable scope for different policy choices when designing these types of important systemic innovation policy instruments. While it is not our intention to offer normative policy prescriptions based on the proceeding analysis, we do offer a firm view suggesting the bank may be embarking on the wrong (or impossible) mission. Below we outline an alternative “diffusion” approach for SNIB which seems better attuned to help overcome Scotland’s enduring “*low productivity, low innovation equilibrium*”.

**Table 4: A Mission Oriented Framework versus a Diffusion Oriented Framework for SNIB**

	<i><b>Mission Oriented</b></i>	<i><b>Diffusion Oriented</b></i>
Overarching Objectives	Challenge-Oriented or normative objectives	Productivity-Oriented and pragmatic objectives
Systemic Focus	Promote the creation of more “frontier” high growth to up-scale into larger firms	Promote competitiveness and productivity. Address chronic levels of low productivity in SMEs. Enhance the functioning across the financial ecosystem.
Type of Innovation and Innovative Activity Funded	Knowledge created by Science, Technology and Innovation (STI), R&D focused, Patents	Sources of knowledge dominated by doing, using and interacting (DUI), incremental firm-level innovation, open sources of innovation, collaborative activity
Type of Informational Asymmetries and Problems Addressed	Informational opaqueness in innovative firms.	Low levels of collateral Discouraged bank borrowers Tackle “thin” equity markets in peripheral regions
Type of Firms Funded	Start-ups, New Technology Based Firms (NTBFs) and university spin-outs (USOs)	Existing debt-constrained SMEs and groups of SMEs
Type of Funding Gap Addressed	Equity gaps (sub £2m and £2-10m)	Debt funding gaps (sub £2m)
Alignment with Co-investment Partners	Local co-investment with business angels and VCs	Co-investment with local banks and other debt-based funding partners
Type of products provided	Equity and mezzanine investment models	Debt-based finance, credit guarantees, demand-stimulation informational initiatives
Non-lending Activities	Advisory services such IP protection	Increase “innovation readiness”, training programmes, productivity audits, competitiveness clauses
Structure and Spatial Focus	National	Decentralised and relational to take account for regionalised funding gaps and soft information collection

As noted by the previous discussion of different approaches towards innovation policy, these two models have quite stark differences in terms of their potential innovation outcomes. With regard to innovation policy, the STI mode calls for a supply-driven policy, typically aimed to commercialize research results, whereas the DUI mode suggests a more demand or user driven policy approach, such as supporting the development of new products or services to specific markets (Isaksen and Nilsson, 2013). The bank seems likely to be heavily focused on formal innovation and R&D promoted via the linear STI model. Under this technology-push approach a likely key beneficiary will be high-tech start-ups undertaking radical forms of innovation rather than existing mundane SMEs. Again, on the face of it, the type of finance gaps and funding instruments likely to feature strongly is long term “patient” funding in the shape of government-funded equity co-investments. In short, this suggests a strong level of path dependence rather than the potential for a radical departure from existing policy approaches adopted in Scotland.

Juxtaposed against this mission-oriented approach for the bank is a “diffusion” orientation approach. As depicted in Table 4, productivity enhancement within existing SMEs, incremental process innovation and debt finance are the dominant aspects under this model. There seems some strong suggestive evidence that a diffusion orientation for the bank may be better matched to the needs of the Scottish economy, especially given the need to rectify the chronically low levels of business innovation and associated productivity outcomes in Scotland outlined earlier. Under this model, the types of firms SNIB could target are more conventional SMEs (not R&D intensive high-tech start-ups) with unmet financial requirements across a range of different manufacturing and service sectors which often constitute the majority of high growth SMEs. Many of these firms targeted under this diffusion approach will be focused on more prosaic types of process innovation rather than product innovators. In terms of customer segmentation, export-oriented firms could be prioritised as they typically have the strongest growth ambitions (Mason and Brown, 2013).

Whilst a more diffusion-oriented approach for SNIB seems like a sensible way forward, we do however take the strong view that while making these kind of theoretical distinctions it is important to recognise that sophisticated modern knowledge-based economies cannot be simply shoehorned into one (or the other) simple all-encompassing model. In other words, the policy choices facing economies are not a simply a crude “either or” choice in terms two binary innovation approaches delineated. This seems particularly germane to Scotland. For example, some Scottish high-tech SMEs will continue to rely on and require equity finance to thrive and grow. While much has been done by the bank’s predecessor (SIB) to fertilise the Scottish early stage market for equity investments, especially involving business angel syndicates, there could be a fruitful new role for SNIB to target larger scale equity investments which are currently unavailable in the “thin” Scottish equity market (Gregson et al, 2013). Indeed, research suggests that equity investments in Scotland tend to be smaller than those in the rest of the UK and concentrated towards early stage growth new ventures rather than established companies (Mason and Harrison, 2015). Whilst previously the early stage gap funding gap confronting start-ups was the primary focus for policy makers, nowadays the later stage equity gap facing scale-ups has become the main concern for policy, especially in Europe where access to large scale VC is much less accessible for growing firms (Aernoudt, 2017).

Given the emerging evidence of a growing equity gap (circa £2-10m) for larger existing businesses seeking to upscale (Wilson et al, 2018), there could be a strong argument for the new bank to actively pursue co-investments with larger external VCs. While on the rare occasion domestic SMEs can raise finance further afield, most UK SMEs lack the ability to tap into overseas growth finance (Uyarra et al, 2016). The benefit of such external co-investment funding is to ensure recipient firms receive strategic advice which is often labelled “smart money”. This owes to the added value VCs and business angels confer on firms through their extensive business experience, relational connections and ability to access further sources of finance (Kerr, et al, 2011). Such a strategy has been undertaken by countries such as Israel with some considerable success via their famous Yozma Fund (Wonglimpiyarat, 2016). A dedicated large scale fund similar to the Yozma Fund

could then leverage the benefits of outside VCs to help upscale Scottish SMEs with serious levels of “smart money”<sup>13</sup>. The upside of this policy approach is that it could prevent the sell-out mentality in many growth-oriented Scottish firms who frequently opt to be acquired rather than attempt to grow and upscale their business often owing to insufficient growth capital (Mason and Brown, 2013). The downside of such a fund of course is the considerable risk entailed (i.e. most investments would fail), but only with sizeable levels of growth capital will future unicorns such as Scotland’s Skyscanner be able to grow.

Another potentially fruitful avenue for the new bank would be to offer innovative capacity building services above and beyond funding. One such approach would be to potentially replicate the work undertaken by the GTS institutes in Denmark or a similar productivity-focused innovation agencies such as IRAP in Canada which act as an important vehicle for technological diffusion across firms. These agencies specialise in fostering innovation and growth from the “aggregation of relatively piecemeal productivity improvements experienced by a large number of small firms” (Breznitz et al, 2018. 888). A key plank of these types of actors is their work with networks of SMEs and bespoke commercial services. For example, the seven GTS institutes in Denmark offer services such as technological advice and consultancy, tests, certification, competence training and standardisation activities. While on paper these activities may appear quite basic, cumulatively these types of services can fundamentally enhance the “innovation readiness” within low performing SMEs to enable future innovative activities. If SNIB is serious about increasing innovation across the Scottish business sector it will have to offer “more than money” to recipient

---

<sup>13</sup>This could occur in much the same way as SIB worked with the Scottish unicorn internet travel firm, Skyscanner, to leverage investment from the giant US VC, Sequoia Capital. Sequoia subsequently helped Skyscanner innovation processes. For example, Skyscanner was among the first travel companies to embrace automated customer support. (see <http://www.aberdeen-asset.lu/en/thinkingaloud/investment-clarity/skyscanner-a-venture-capital-case-study>)

firms. Clearly, this will need to be closely aligned with other business support agencies such as Scottish Enterprise, Scotland's main business development agency.

A further novel suggestion could see the bank attach "competitiveness clauses" (similar to traditional bank covenants)<sup>14</sup> to future loan funding tranches which are conditional on productivity improvements within funded businesses. Given that innovation is a means to and ends rather than a "goal in itself" (Borrás and Edquist, 2013, p. 1515) indicators of improved productivity and increased competitiveness such as increased exporting could be used to monitor the performance of recipient firms. This chimes with scholars who claim that policy makers must view innovation policy as an intermediate outcome in the context of achieving wider "competitiveness goals" (Freel et al, 2019). Relatedly, making future investments conditional on increased workforce training would seem another useful approach to tackle poor productivity.

A final suggestion is for the Scottish bank to augment the work of other existing multi-scaler institutional actors across the UK. One possibility would be to top-up the credit guarantee scheme offered by the British Business Bank's EFG specifically for innovative Scottish firms<sup>15</sup>. This is important as innovative SMEs often encounter an "innovation premium" in terms of bank loan agreements (Cowling et al, 2018). Policy enhancement such as this could potentially operate effectively to reinforce and bolster existing UK policies, much in the way US state governments enhance federal SBIR programmes (Lanahan and Feldman, 2015).

## **6. Conclusion**

This paper's primary aim to make a novel contribution to the innovation literature by examining how mission-oriented policies are actually operationalised and enacted by policy makers. This is line with scholars who call for newer approaches to innovation policy analysis which aspire to greater

---

<sup>14</sup> Bank covenants are an agreement that you make with the lender to abide by certain financial and operational measures until your debt is repaid (Scholtens, 1999).

<sup>15</sup> While the current EFG offers a 75% credit guarantee to banks, this could in theory be topped up by SNIB to 100% for firms undertaking riskier innovation-related projects.

context-sensitivity, experimentation and examination of “the role of agency in making and breaking policy path dependencies” (Flanagan and Uyarra, 2016, p. 183). Given SNIB’s focus on producing greater levels of scale-ups, the paper also yields important insights for the nascent literature surrounding high growth entrepreneurship policy. Given scarce resources it is important to have evidence such policies are “fit for purpose” (Autio and Rannikko, 2016, p. 42).

The (admittedly subjective) central contention put forward in the paper is that a mission-oriented policy approach constitutes “fuzzy” policy making which is likely to obfuscate rather than enlighten the policy implementation process. We argue that a mission-orientation for SNIB could be highly confusing and indeed counter-productive for policy makers charged with implementing the bank. Ascribing vague institutional missions to organisations alone will not yield good public policy. Perhaps, proposals for mission oriented innovation would have greater credibility if they articulated more comprehensive and detailed mechanisms for their operational deployment. Otherwise missions risk going “adrift” and becoming “an aerosol sprayed onto existing programmes, without much at stake” (Mulgan, 2018, p. 1).

On this detailed examination, it seems unlikely a mission-oriented approach conferred upon SNIB will help redress the chronic innovation and productivity underperformance in Scotland. A close look at the Scottish innovation and entrepreneurial ecosystem suggests that this approach is likely to prove both ill-fitting and ineffective, echoing others who claim mission or challenge-oriented policies often take insufficient consideration of important “demand conditions” within economies (Boon and Edler, 2018). Plus, this policy approach could result in significant policy path dependencies which could further reinforce (rather than reverse) the inherent weaknesses within the Scottish innovation system. To provide policy makers with an alternative framework for the bank, the paper sketched out an alternative “diffusion-orientation” mission for the bank which seems much better attuned to overcome the enduring “*low innovation equilibrium*” evident in Scotland. That said, one-sized fits all policy frameworks are unlikely to be sufficiently nuanced to fit

the specificities of complex economies such as Scotland which is why public policy makers are exhorted to assemble bespoke “holistic” solutions such as those mapped out in the policy discussion above (Edquist, 2019).

The rapid upsurge of mission-oriented innovation and industrial policies ensures that the implications of these arguments extend well beyond this specific context examined. A clear inference suggests the adoption of such mission-oriented innovation and industrial policies may prove equally problematic in other spatial and institutional contexts. Undoubtedly, more research is required to examine the operationalisation of mission-oriented policies elsewhere to corroborate (or reject) this supposition.

## References

- Aernoudt, R. (2017). Executive Forum: the scale-up gap: and how to address it. *Venture Capital*, 19(4), 361-372.
- Arshed, N. (2017). The origins of policy ideas: The importance of think tanks in the enterprise policy process in the UK. *Journal of Business Research*, 71, 74-83.
- Autio, E., & Rannikko, H. (2016). Retaining winners: Can policy boost high-growth entrepreneurship?. *Research Policy*, 45(1), 42-55.
- Baker, T., & Nelson, R. E. (2005). Creating something from nothing: Resource construction through entrepreneurial bricolage. *Administrative Science Quarterly*, 50(3), 329-366.
- Block, F. (2008). Swimming against the current: The rise of a hidden developmental state in the United States. *Politics & Society*, 36(2), 169-206.
- Block, J. H., Colombo, M. G., Cumming, D. J., & Vismara, S. (2018). New players in entrepreneurial finance and why they are there. *Small Business Economics*, 50(2), 239-250.

Bloom, N., Van Reenan, J., & Williams, H. (2019) A Toolkit of Policies to Promote Innovation, CEP Discussion Paper No 1634, Centre for Economic Performance, London School of Economics.

Boon, W., & Edler, J. (2018). Demand, challenges, and innovation. Making sense of new trends in innovation policy. *Science and Public Policy*, 45(4), 435-447.

Borrás, S., & Edquist, C. (2013). The choice of innovation policy instruments. *Technological Forecasting and Social Change*, 80(8), 1513-1522.

Breznitz, D., Ornston, D., & Samford, S. (2018). Mission critical: the ends, means, and design of innovation agencies. *Industrial and Corporate Change*, 27(5), 883-896.

Brown, R., & Mason, C. (2014). Inside the high-tech black box: A critique of technology entrepreneurship policy. *Technovation*, 34(12), 773-784.

Brown, R. (2016). Mission impossible? Entrepreneurial universities and peripheral regional innovation systems. *Industry and Innovation*, 23(2), 189-205.

Brown, R., & Mawson, S. (2016). Targeted support for high growth firms: Theoretical constraints, unintended consequences and future policy challenges. *Environment and Planning C: Government and Policy*, 34(5), 816-836.

Brown, R., Gregson, G., & Mason, C. (2016). A post-mortem of regional innovation policy failure: Scotland's Intermediate Technology Initiative (ITI). *Regional Studies*, 50(7), 1260-1272.

Brown, R., & Mason, C. (2017). Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems. *Small Business Economics*, 49(1), 11-30.

Brown, R., & Lee, N. (2018). The theory and practice of financial instruments for small and medium-sized enterprises. In *EC-OECD seminar series on Designing Better Economic Development Policies for Regions and Cities*. Paris: Organisation for Economic Co-operation and Development (OECD).

Brown, R., & Lee, N. (2019). Strapped for cash? Funding for UK high growth SMEs since the global financial crisis. *Journal of Business Research*, 99, 37-45.

Brown, R., & Mawson, S. (2019). Entrepreneurial ecosystems and public policy in action: a critique of the latest industrial policy blockbuster. *Cambridge Journal of Regions, Economy and Society*.

Casper, S., & Whitley, R. (2004). Managing competences in entrepreneurial technology firms: a comparative institutional analysis of Germany, Sweden and the UK. *Research Policy*, 33(1), 89-106.

Coad, A., Frankish, J., Roberts, R. G., & Storey, D. J. (2013). Growth paths and survival chances: An application of Gambler's Ruin theory. *Journal of Business Venturing*, 28(5), 615-632.

Cooke, P. (2016). Nordic innovation models: Why is Norway different?. *Norsk Geografisk Tidsskrift-Norwegian Journal of Geography*, 70(3), 190-201.

Cowling, M., & Siepel, J. (2013). Public intervention in UK small firm credit markets: Value-for-money or waste of scarce resources? *Technovation*, 33(8-9), 265-275.

Cowling, M., Ughetto, E., & Lee, N. (2018). The innovation debt penalty: Cost of debt, loan default, and the effects of a public loan guarantee on high-tech firms. *Technological Forecasting and Social Change*, 127, 166-176.

Criscuolo, C., Martin, R., Overman, H. G., & Van Reenen, J. (2019). Some causal effects of an industrial policy. *American Economic Review*, 109(1), 48-85.

Davies, H. T., & Nutley, S. M. (Eds.). (2000). *What works?: Evidence-based policy and practice in public services*. Policy Press, Bristol.

De Massis, A., Audretsch, D., Uhlaner, L., & Kammerlander, N. (2018). Innovation with Limited Resources: Management Lessons from the German Mittelstand. *Journal of Product Innovation Management*, 35(1), 125-146.

Doplin, T., and Nash, D. (2012) Investing for the Future: Why we need a British Investment Bank, Institute for Public Policy Research, London.

[https://www.ippr.org/files/images/media/files/publication/2012/09/investment-future-BIB\\_Sep2012\\_9635.pdf](https://www.ippr.org/files/images/media/files/publication/2012/09/investment-future-BIB_Sep2012_9635.pdf)

Edler, J., & Fagerberg, J. (2017). Innovation policy: what, why, and how. *Oxford Review of Economic Policy*, 33(1), 2-23.

Edquist, C. (2019). Towards a holistic innovation policy: Can the Swedish National Innovation Council (NIC) be a role model?. *Research Policy*, 48(4), 869-879.

Elia, G., & Margherita, A. (2018). Can we solve wicked problems? A conceptual framework and a collective intelligence system to support problem analysis and solution design for complex social issues. *Technological Forecasting and Social Change*, 133, 279-286.

Ergas, H. (1987). Does technology policy matter. *Technology and global industry: Companies and nations in the world economy*, 191-245.

Feldman, M., Hadjimichael, T., Lanahan, L., & Kemeny, T. (2016). The logic of economic development: a definition and model for investment. *Environment and Planning C: Government and Policy*, 34(1), 5-21.

Flanagan, K., Uyarra, E., & Laranja, M. (2011). Reconceptualising the 'policy mix' for innovation. *Research Policy*, 40(5), 702-713.

Flanagan, K., & Uyarra, E. (2016). Four dangers in innovation policy studies—and how to avoid them. *Industry and Innovation*, 23(2), 177-188.

Freel, M. S. (1998). Policy, prediction and growth: Picking start-up winners?. *Journal of Small Business and Enterprise Development*, 5(1), 19-32.

- Freel, M., Liu, R., & Rammer, C. (2019). The export additionality of innovation policy. *Industrial and Corporate Change*.
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation?. *Technological Forecasting and Social Change*, 114, 254-280.
- Geddes, A., Schmidt, T. S., & Steffen, B. (2018). The multiple roles of state investment banks in low-carbon energy finance: An analysis of Australia, the UK and Germany. *Energy Policy*, 115, 158-170.
- Gregson, G., Mann, S., & Harrison, R. (2013). Business angel syndication and the evolution of risk capital in a small market economy: evidence from Scotland. *Managerial and Decision Economics*, 34(2), 95-107.
- Grilli, L., Mazzucato, M., Meoli, M., & Scellato, G. (2018). Sowing the seeds of the future: Policies for financing tomorrow's innovations. *Technological Forecasting and Social Change*, 127, 1-7.
- Haldane, A. (2018). The UK's productivity problem: hub no spokes. *Speech at the Academy of Social Sciences Annual Lecture, London, 28*. <https://www.bankofengland.co.uk/-/media/boe/files/speech/2018/the-uks-productivity-problem-hub-no-spokes-speech-by-andy-haldane.pdf>
- Hall, B. H., Lotti, F., & Mairesse, J. (2009). Innovation and productivity in SMEs: empirical evidence for Italy. *Small Business Economics*, 33(1), 13-33.
- Hall, B. H., & Lerner, J. (2010). The financing of R&D and innovation. In *Handbook of the Economics of Innovation* (Vol. 1, pp. 609-639). North-Holland.
- Harris, R., & Moffat, J. (2017). The sources of the Scotland–Rest of the UK productivity gap: implications for policy. *Regional Studies*, 51(9), 1297-1311.
- Hennecke, P., Neuberger, D., Ulbricht, D. (2019) The economic and fiscal benefits of guarantee banks in Germany, *Small Business Economics*, 53, 771-794.

- Hyytinen, A., & Toivanen, O. (2005). Do financial constraints hold back innovation and growth?: Evidence on the role of public policy. *Research Policy*, 34(9), 1385-1403.
- Intarakumnerd, P., & Goto, A. (2018). Role of public research institutes in national innovation systems in industrialized countries: The cases of Fraunhofer, NIST, CSIRO, AIST, and ITRI. *Research Policy*, 47(7), 1309-1320.
- Isaksen, A., & Nilsson, M. (2013). Combined innovation policy: Linking scientific and practical knowledge in innovation systems. *European Planning Studies*, 21(12), 1919-1936.
- Jamieson, B. (2019) My concerns over the new Scottish National Investment Bank, *The Scotsman*, 02,03,19. <https://www.scotsman.com/business-2-15069/bill-jamieson-my-concerns-over-new-scottish-national-investment-bank-1-4882353>
- Jensen, M. B., Johnson, B., Lorenz, E. & Lundvall, B. Å. (2007) Forms of knowledge and modes of innovation, *Research Policy*, 36(5), pp. 680–693
- Kempton, L. (2019). Wishful thinking? Towards a more realistic role for universities in regional innovation policy. *European Planning Studies*, 1-18.
- Kerr, W. R., Lerner, J., & Schoar, A. (2011). The consequences of entrepreneurial finance: Evidence from angel financings. *The Review of Financial Studies*, 27(1), 20-55.
- King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics*, 108(3), 717-737.
- Kitson, M. (2019). Innovation policy and place: a critical assessment. *Cambridge Journal of Regions, Economy and Society*, 12(2), 293-315.
- Kon, Y., & Storey, D. J. (2003). A theory of discouraged borrowers. *Small Business Economics*, 21(1), 37-49.

Kuhlmann, S., & Rip, A. (2018). Next-generation innovation policy and grand challenges. *Science and Public Policy*, 45(4), 448-454.

Lanahan, L., & Feldman, M. P. (2015). Multilevel innovation policy mix: A closer look at state policies that augment the federal SBIR program. *Research Policy*, 44(7), 1387-1402.

Lee, N., Sameen, H., & Cowling, M. (2015). Access to finance for innovative SMEs since the financial crisis. *Research Policy*, 44(2), 370-380.

Lee, N., & Brown, R. (2017). Innovation, SMEs and the liability of distance: the demand and supply of bank funding in UK peripheral regions. *Journal of Economic Geography*, 17(1), 233-260.

Macfarlane, L. and Mazzucato, M. (2018) State investment banks and patient finance: An international comparison. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2018-01).

Markusen, A. (2003). Fuzzy concepts, scanty evidence, policy distance: the case for rigour and policy relevance in critical regional studies. *Regional Studies*, 37(6-7), 701-717.

Mason, C., & Brown, R. (2013). Creating good public policy to support high-growth firms. *Small Business Economics*, 40(2), 211-225.

Mason, C. M., & Harrison, R. T. (2015). Business angel investment activity in the financial crisis: UK evidence and policy implications. *Environment and Planning C: Government and Policy*, 33(1), 43-60.

Martin, B. R. (2016). R&D policy instruments—a critical review of what we do and don't know. *Industry and Innovation*, 23(2), 157-176.

Mazzucato, M., & Penna, C. C. (2016). Beyond market failures: The market creating and shaping roles of state investment banks. *Journal of Economic Policy Reform*, 19(4), 305-326.

Mazzucato, M., & Semieniuk, G. (2017). Public financing of innovation: new questions. *Oxford Review of Economic Policy*, 33(1), 24-48.

Mazzucato, M. (2018). Mission-oriented innovation policies: challenges and opportunities. *Industrial and Corporate Change*, 27(5), 803-815.

Mazzucato, M. and Macfarlane, L. (2019) A mission-oriented framework for the Scottish National Investment Bank. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2019-02)

McCann, P. (2018). Productivity Perspectives. *Productivity Insights Network*.

<https://productivityinsightsnetwork.co.uk/app/uploads/2018/06/P-McCann-Final-synthesis.pdf>

Mertens, D., & Thiemann, M. (2019). Building a hidden investment state? The European Investment Bank, national development banks and European economic governance. *Journal of European Public Policy*, 26(1), 23-43.

Mohnen, P., & Hall, B. H. (2013). Innovation and productivity: An update. *Eurasian Business Review*, 3(1), 47-65.

Mowery, D. C., Nelson, R. R., & Martin, B. R. (2010). Technology policy and global warming: Why new policy models are needed (or why putting new wine in old bottles won't work). *Research Policy*, 39(8), 1011-1023.

Mowery, D. C. (2012). Defense-related R&D as a model for "Grand Challenges" technology policies. *Research Policy*, 41(10), 1703-1715.

Mueller, C., Westhead, P., & Wright, M. (2012). Formal venture capital acquisition: can entrepreneurs compensate for the spatial proximity benefits of South East England and 'star' golden-triangle universities?. *Environment and Planning A*, 44(2), 281-296.

Mulgan, G. (2018) Making Mission-oriented innovation more than just words, NESTA blog, <https://www.nesta.org.uk/blog/mission-oriented-innovation-seven-questions-search-better-answers/>

- Mustar, P., & Larédo, P. (2002). Innovation and research policy in France (1980–2000) or the disappearance of the Colbertist state. *Research policy*, 31(1), 55-72.
- North, D. C. (1991). Institutions. *Journal of Economic Perspectives*, 5(1), 97-112.
- North, D., Baldock, R., & Ullah, F. (2013). Funding the growth of UK technology-based small firms since the financial crash: are there breakages in the finance escalator?. *Venture Capital*, 15(3), 237-260.
- Oh, D. S., Phillips, F., Park, S., & Lee, E. (2016). Innovation ecosystems: A critical examination. *Technovation*, 54, 1-6.
- Pahnke, A., & Welter, F. (2019). The German Mittelstand: antithesis to Silicon Valley entrepreneurship?. *Small Business Economics*, 52(2), 345-358.
- Rodrik, D., Subramanian, A., & Trebbi, F. (2004). Institutions rule: the primacy of institutions over geography and integration in economic development. *Journal of Economic Growth*, 9(2), 131-165.
- Roper, S., Love, J., Cooke, P., & Clifton, N. (2006). The Scottish Innovation System: Actors, Roles and Actions, Report for the Scottish Government, Edinburgh.  
<https://www2.gov.scot/resource/doc/89713/0021562.pdf>
- Scale-Up Manifesto. 2016. *A Report of the Lisbon Council Think-tank*. Brussels: Lisbon Council.  
<https://www.lisboncouncil.net/news-a-events/714-scale-up-europe-a-manifesto-for-change-and-empowerment-in-the-digital-age.html>
- Schot, J., & Steinmueller, W. E. (2018). Three frames for innovation policy: R&D, systems of innovation and transformative change. *Research Policy*, 47(9), 1554-1567.
- Scottish Government (2015) The Market for SME Finance, Scottish Government, Edinburgh.  
<https://www.webarchive.org.uk/wayback/archive/20170702002947/http://www.gov.scot/Publications/2015/08/3776/1>

Scottish Government (2018a) Consultation on the Scottish National Investment Bank Bill, Scottish Government, Edinburgh.

Scottish Government (2018b) The Scottish National Investment Bank: Implementation Plan, Scottish Government, Edinburgh. <https://www.gov.scot/publications/scottish-national-investment-bank-implementation-plan/>

Scholtens, B. (1999). Analytical issues in external financing alternatives for SBEs. *Small Business Economics*, 12(2), 137-148.

Tödting, F., & Trippel, M. (2005). One size fits all?: Towards a differentiated regional innovation policy approach. *Research Policy*, 34(8), 1203-1219.

Uyarra, E., Shapira, P., & Harding, A. (2016). Low carbon innovation and enterprise growth in the UK: Challenges of a place-blind policy mix. *Technological Forecasting and Social Change*, 103, 264-272.

Uyarra, E., Ribeiro, B., & Dale-Clough, L. (2019). Exploring the normative turn in regional innovation policy: responsibility and the quest for public value. *European Planning Studies*, 1-17.

van der Schans, D. (2015). The British Business Bank's role in facilitating economic growth by addressing imperfections in SME finance markets. *Venture Capital*, 17(1-2), 7-25.

Weiss, L. (2014). *America Inc.?: innovation and enterprise in the national security state*. Cornell University Press.

Wieczorek, A. J., & Hekkert, M. P. (2012). Systemic instruments for systemic innovation problems: A framework for policy makers and innovation scholars. *Science and Public Policy*, 39(1), 74-87.

Wilson, N., Wright, M., & Kacer, M. (2018). The equity gap and knowledge-based firms. *Journal of Corporate Finance*, 50, 626-649.

Wonglimpiyarat, J. (2016). Government policies towards Israel's high-tech powerhouse. *Technovation*, 52, 18-27.



**The Centre for Responsible Banking & Finance  
CRBF Working Paper Series**

School of Management, University of St Andrews  
The Gateway, North Haugh,  
St Andrews, Fife,  
KY16 9RJ.

Scotland, United Kingdom

<http://www.st-andrews.ac.uk/business/rbf/>



**Recent CRBF Working papers published in this Series**

**Fourth Quarter | 2019**

19-019 **Dimitris K. Chronopoulos, George Dotsis, Nikolaos T. Milonas:** International Evidence on the Determinants of Banks' Home Sovereign Bond Holdings.

19-018 **Robert DeYoung, John Goddard, Donal G. McKillop, John O.S. Wilson:** Who Consumes the Credit Union Tax Subsidy?

19-017 **Santiago Carbó-Valverde, Pedro J.Cuadros-Solas, Francisco Rodríguez-Fernández:** A Machine Learning Approach to the Digitalization of Bank Customers: Evidence from Random and Causal Forests.

19-016 **Christian Engels, Kamlesh Kumar, Dennis Philip:** Financial Literacy and Fraud Detection.

**Third Quarter | 2019**

19-015 **Franco Fiordelisi, Ornella Ricci, Francesco Saverio Stentella Lopes:** Corporate Culture and Merger Success.

19-014 **Tatiana Damjanovic, Vladislav Damjanovic, Charles Nolan:** Default, Bailouts and the Vertical Structure of Financial Intermediaries.

19-013 **J. Michael Collins and Carly Urban:** Understanding Financial Well-being over the Lifecourse: An Exploration of Measures.

19-012 **Declan French, Donal McKillop, Elaine Stewart:** The Effectiveness of Smart Phone Apps in Improving Financial Capability.



**University of St Andrews**  
*Scotland's first university*

**600 YEARS**  
**1413 – 2013**