

Mission-oriented or mission adrift? A critical examination of mission-oriented innovation policies

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Mission-Oriented or Mission Adrift? A Critical Examination of Mission-Oriented Regional Innovation Policies

Abstract

This debate article provides a critical examination of the rationale for, and validity of, mission-oriented innovation policies. It does so by providing a 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. Arguably, 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. The paper outlines an alternative “diffusion-oriented” approach which seems better equipped at overcoming the entrenched “*low productivity, low innovation equilibrium*” evident in Scotland. Regional innovation policy must be properly customised to ensure new agencies are effectively tailored and aligned to the demand conditions within their local innovation and entrepreneurial ecosystems. In short, policy should be context-led rather than mission-led.

Key Words: Innovation Systems

State Investment Banks

Mission-Oriented

Diffusion-Oriented

Entrepreneurial ecosystems

1. Introduction

This debate article provides a critical examination of mission-oriented regional innovation policy. 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 and marks a bold departure within the UK context in terms of regional economic development policy. 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 mission-based policy initiative. While thus far there has been considerable interest in the so-called “normative turn” within innovation policy (Uyarra et al, 2019), to date there has been little academic scrutiny of how mission-oriented policies such as this are implemented and operationally deployed by organisations. Therefore, this paper’s key intended contribution is to critically examine the rationale for, and validity of, regional 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 somewhat unclear, Mariana Mazzucato claims to have played a pivotal role in devising proposals for SNIB (Mazzucato and MacFarlane, 2019). Drawing on her self-proclaimed “path-breaking” research (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 (Schot and Steinmueller, 2018; Uyarra et al, 2019). Ergas (1987, p. 193) originally labelled this approach as “big science deployed to meet big problems”. More recently these policies are loosely defined as “systemic public policies that draw on frontier knowledge to attain specific goals” (Mazzucato and Semieniuk, 2017, p. 33). Mission-oriented policies are often associated with radical technological breakthroughs which are heavily associated with a linear science and technology based approach to

innovation (STI). In many respects, the conflation of mission-oriented with a STI view of innovation is a key hallmark implicit in these policy frameworks¹. Consequently, some refer to them as “moonshots” because they draw inspiration from the famous NASA Apollo space programme (Bloom et al, 2019).

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 will “provide a focus for its investment strategy” (Scottish Government, 2018a, p. 11). Given state-run investment banks (SIBs) 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). Despite this ambitious assertion, during a review of eight state-owned investment banks conducted by the same authors there is no proper attempt to assess their perceived effectiveness compared to those focused purely on promoting growth or competitiveness (MacFarlane and Mazzucato, 2019).

SIBs are heterogeneous organisations performing three main roles i) a counter-cyclical role; ii) a capital development role; & iii) a new venture support role (Mazzucato and Penna, 2016). The specific policy instruments deployed by these banks include grants, soft loans, credit guarantees and equity co-investments (Mertens and Thiemann, 2019). The intended focus of SNIB suggests it is likely to focus 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 small and medium-sized enterprises (SMEs). While systemic policy instruments are integrated tools designed “for a specific innovation system (or part

¹ The author wishes to thank one of the referee’s for making this important point.

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).

This is not a conventional article but instead aims to provide a novel contribution to the innovation literature by examining the *ex ante* appropriateness of mission-oriented regional innovation policies using the specific case of SNIB. Debate articles such as this are a good method for questioning assumptions which often go unchallenged, such as the perception universities are benign drivers of regional development in peripheral regions (see, Power and Malmberg, 2008; Brown, 2016; Kempton, 2019). The widespread acceptance of ideas such as the profundity of normative mission-oriented policies is another commonplace assumption rapidly becoming the received wisdom within innovation policy despite a lack of evidence to support such a belief. Yet, in many cases it may be hard to “articulate and economic rationale behind these moonshots” (Bloom et al, 2019, p. 20), making such scrutiny all the more important. Indeed, Mazzucato (2018) herself acknowledges that the appropriate tools for deploying mission-oriented goals are far from certain.

Therefore this paper seeks to answer the following research question: “*are mission-oriented innovation policies sufficiently nuanced to assist policy makers in the operational and strategic deployment of new policy instruments such as the SNIB*”. In contrast to most policy analysis which typically examines policies *ex post* after their deployment, this paper examines the effectiveness of policy making during the crucial policy formulation phase. This is crucial because it can help strengthen our insights into the role of strategic policy intelligence and how it informs interventions innovation policy interventions (Flanagan et al, 2011, p.711). 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 senior policy makers charged with implementing the bank. This evidence provides a strong vantage point to empirically examine the research question outlined above.

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 the nature of the regional innovation and associated entrepreneurial ecosystem (Markusen, 2003). How such a bank is structured, what types of innovation it supports, what products it offers 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. 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 localised 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 as follows. The paper outlines different policy approaches towards innovation. It then critiques the “mission-orientation” conferred on SNIB. The nature of the Scottish innovation system is then highlighted. In the penultimate policy section, a “diffusion” orientation for SNIB is unpacked. 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). 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 seek 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). 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).

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 SIBs 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 SIBs have adopted include climate change and the environment, food security, globalisation and technological progress and demographic change (MacFarlane and Mazzucato, 2019). Examples of “mission-oriented” investments include the European Investment Bank’s €14.7 billion commitment to sustainable city projects and the KfW’s support for Germany’s *Energiewende* policies through the greening of German industries (Mazzucato, 2018).

Mission oriented countries often heavily prioritise a highly linear STI view of innovation (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 (Cooke, 2016). 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; Mazzucato, 2018). 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, interactive and relational approach towards innovation (Brown and Mason, 2014). Sources of knowledge arise from doing, using and interacting (DUI) processes which typically arise from inter-firm collaboration. DUI is based on a series of iterative, recursive forms of learning which arise 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). Garud and Karnøe (2003) vividly demonstrate the differences between DUI and a STI “breakthrough” approaches towards innovation in their study of the Danish and US wind turbine industry. In the US, there was a focus on producing a radically new high-tech, light-weight and high-speed turbine. However, this led to a much lower degree of mutually supporting inter-actor relationships to enable to build up a stock of knowledge to ensure their robust operation. Whereas in Denmark there was less emphasis on developing dramatic solutions, instead strong networks of actors gradually built up their technological competencies. Ultimately, the lower-tech and incremental DUI approach evident

in Denmark prevailed over the more radical STI breakthrough approach embedded in the US firms (Garud and Karnøe, 2003).

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 inter-linkages between these firms and public technology-transfer institutions (Isaksen and Jakobsen, 2017). 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).

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. For example, the Norwegian Centre of Expertise programme was initiated in 2006 and develops “cross-over initiatives” to help disseminate technology competences in one industry (oil & gas) to solve challenges in other sectors such as aquaculture (Isaksen and Jakobsen, 2017). 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” which is often risky and problematic for the public sector (Breznitz et al, 2018, p. 887).

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 regional investment banks.

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 inevitably 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 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 (Deerin, 2019; Jamieson, 2019). This is all the more salient as the Scottish Government has a track record of being very interventionist in terms of industrial policy². 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”

² 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).

(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.

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).

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 such as 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 SMEs (Scottish Government, 2018a, p. 11). The implementation plan strongly suggests that businesses who can “accelerate new innovation” and those driven by “knowledge and ideas” merit support, rather than those with a strong base of fixed and tangible assets (i.e. typical SMEs).

Given the well-established funding problems encountered by smaller innovative firms, focusing support for high growth firms with innovative potential seems, on the face of it, a legitimate policy focus (Hall and Lerner, 2010; Lee et al, 2015). Plus, innovation and business support policies are often most effective when targeted towards smaller rather than larger firms (Criscuolo 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.

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 potentially 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 facing innovative Scottish SMEs. This is crucially important because recent research suggests that there is a second crucial funding gap appearing confronting 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, 90% of 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 (Scottish Government, 2015). 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)³. Although the Scottish Government (2018a) has left the door open for SNIB 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

³ This occurs when good borrowers do not seek finance for fear of rejection (Kon and Storey, 2003).

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 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. Despite this, most mission-oriented policies have typically ignored these local contextual demand conditions (Boon and Edler, 2018).

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 1, 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).

[Insert Table 1 about here]

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 than viewing this situation as a reason to enhance the 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 (McCann, 2018). 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 "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 2 below). Plus, the UK's (and Scotland's) relative performance on start-ups and unicorns is also above the EU and OECD average⁴.

[Insert Table 2 about here]

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 vast bulk of companies experienced virtually no productivity growth over the ten year period between 2004-2014 (see Table 2). 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 the diffusion and dissemination of innovation to the long, lengthening, languishing lower tail". In other words,

⁴ "Unicorns" are privately-owned firms who are valued at over £1bn dollars who policy makers view as vital drivers of strong entrepreneurial ecosystems.

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 started to examine the importance of localised institutional entrepreneurial actors which together coalesce to form key components of local entrepreneurial ecosystems (Alvedalen and Boschma, 2017). 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 complex and fragile interdependencies underlying these complex regional 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 Scotland⁵. Indeed, in many respects, Scotland has much more in common with similar resource-based "diffusion" oriented economies such as Denmark and Norway

⁵ Interestingly, both authors' of the bank's blueprint are located in institutions based in London.

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 Trippl, 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 3 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 3 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*".

[Insert Table 3 about here]

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 3, 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 purely 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 much stronger diffusion-oriented approach for SNIB seems like a sensible way forward, we do however take the 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. 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 from these equity finance investors 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 considerable success via their famous Yozma Fund (Wonglimpiyarat, 2016). A dedicated large scale policy instrument similar to this type of fund could then leverage the benefits of outside VCs to help combat the dearth of follow-on equity finance in the Scottish context. This would also help upscale innovative SMEs with additional levels of “smart money” (Aernoudt, 2017). 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. If SNIB is serious about increasing innovation across the Scottish business sector it will have to offer “more than money” to recipient firms. Clearly, this will need to be closely aligned with other governmental agencies such as Scottish Enterprise, Scotland’s main business development agency. Relatedly, a further novel suggestion could see the bank attach “competitiveness clauses” (similar to traditional bank covenants) to future loan funding tranches which are conditional on productivity improvements within funded businesses. Given innovation is a means to an end rather than a “goal in itself” (Borrás and Edquist, 2013, p. 1515; Freel et al, 2019) indicators of improved productivity and increased competitiveness such as increased exporting could be used to monitor the performance of recipient firms.

6. Conclusion

This article aims to make a novel contribution to the innovation literature by examining how mission-oriented policies are operationalised and enacted by policy makers. This is line with scholars who call for newer approaches to innovation policy analysis which aspire to greater context-sensitivity, experimentation and examination of “the role of agency in making and breaking policy path dependencies” (Flanagan and Uyarra, 2016, p. 183). The central contention put forward in the paper is that a mission-oriented policy approach constitutes “fuzzy” policy making. 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 hold greater credibility if they articulated more comprehensive and detailed mechanisms for their operational deployment. Otherwise missions risk going “adrift” and instead become “an aerosol sprayed onto existing programmes” (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 better attuned towards overcoming the enduring “*low innovation equilibrium*” evident in Scotland.

However, a 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). Therefore, while we strongly advocate a diffusion-orientation for the new bank this should be supplemented with hybrid policies aimed at generating breakthrough innovative firms such as the VC fund outlined above. This means that innovation policy should be driven by the unique demand conditions and innovation requirements of local entrepreneurial actors such as start-ups and SMEs rather than being led by vague opaque missions. In short, policy should be context-led rather than mission-led.

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