

Institute for Innovation and Public Purpose

A mission-oriented framework for the Scottish National Investment Bank

by Mariana Mazzucato and Laurie Macfarlane

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A MISSION-ORIENTED FRAMEWORK FOR THE SCOTTISH NATIONAL INVESTMENT BANK

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Institute for Innovation and Public Purpose

The mission of the UCL Institute for Innovation and Public Purpose (IIPP) is to change how public value is imagined, practiced and evaluated to tackle societal challenges — delivering economic growth that is innovation-led, sustainable and inclusive.

Growth has not only a rate but also a direction: IIPP confronts this directionality head on. Finding solutions to global challenges requires purposeful organisations to collaborate in fundamentally new ways — across the state, businesses and civil society. Together, they can help reshape markets to produce growth that delivers public value. Building symbiotic eco-systems requires new tools and new forms of collaboration.

IIPP rethinks the role of the state in these collaborations. Rather than just a market fixer, it can be an active co-creator of value. A mission-oriented approach can be used to set inspirational goals, with dynamic tools — from procurement to prize schemes — to nurture bottom-up experimentation and exploration across different sectors. IIPP's research and teaching helps create the new economic thinking and practical tools to make this a reality.

IIPP is a department within University College London (UCL) — founded in 1826 to solve grand challenges — and part of The Bartlett faculty, known internationally for its radical thinking about space, design and sustainability.



Preface by Professor Mariana Mazzucato



Scotland's economy is in a crucial time of transition. The Global Financial Crisis exposed key weaknesses in the prevailing economic model, and this has been compounded by the UK government's post-crisis turn towards austerity. Now, with Brexit posing new challenges, there is a need to find a new way of generating long-term sustainable growth.

At the root of the problem is a low rate of investment. Despite having a large and sophisticated financial sector, levels of investment across the UK are low compared to other advanced economies. The link between the low levels of investment, low productivity and stagnating wages is now increasingly recognised. At the same time, the 21st century is becoming increasingly defined by the need to respond to major social, environmental and economic challenges. Sometimes referred to as 'grand challenges', these include environmental threats like climate change, as well as demographic, health and wellbeing concerns.

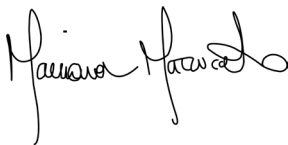
The Scottish Government is already demonstrating global leadership in areas such as transitioning to a low carbon economy and promoting inclusive growth. But fulfilling this potential will require finding new ways of promoting investment in a smart, inclusive and sustainable direction.

That is why I am delighted to have played a key role in developing proposals for the new Scottish National Investment Bank. By making strategic investments and nurturing new firms and technologies, the new bank will support the Scottish Government's ambitious agenda, while also helping to stimulate demand and crowd-in business investment.

If the Bank is to be successful, it must be structured and governed effectively. This is why throughout the process we have drawn on international evidence, as well as the UCL Institute for Innovation and Public Purpose's own path-breaking research, to help inform the design of the bank.

A key innovative aspect of the Bank is the 'mission-oriented' approach that will steer its investments. This means that the Bank will not simply seek to 'fix' market failures, but will also create and shape new markets aimed at tackling modern societal challenges. By adopting a mission-oriented approach, the Bank will be able to play a catalytic role promoting transformational change across the economy.

This paper provides an overview of our mission-oriented framework, and how it can be applied to the Scottish National Investment Bank. I hope this will play a valuable role assisting the Scottish Government in the design and implementation of the Bank, and ensuring that it meets its truly transformative potential.

A handwritten signature in black ink, reading "Mariana Mazzucato". The signature is fluid and cursive, with the first name "Mariana" and the last name "Mazzucato" clearly distinguishable.

Professor Mariana Mazzucato
Founder and Director, UCL Institute for Innovation and Public Purpose

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1 Introduction

The Scottish Government has bold ambitions for achieving a dynamic, inclusive and low-carbon economy. In this context, industrial and innovation strategies have an important role to play in realising this vision. Traditionally, these strategies involve both 'horizontal' policies that attempt to improve conditions across the economy, for example by improving skills and infrastructure, and 'vertical' policies that target interventions on particular sectors such as transport, health or energy.

Vertical policies provide a direction for economic growth, which helps to crowd-in future business investment.¹ Firms often base their investments on the perception of future growth opportunities, therefore if firms are confident about future technological and market opportunities they will invest; and if they are not confident, or see few market opportunities, they will not invest. Therefore, any industrial strategy should not only seek to improve the conditions under which firms invest, but also aim to stimulate demand and increase business expectations about where future growth opportunities might lie. This is particularly important in countries such as Scotland that are experiencing low levels of business investment.

Although certain sectors might be more suited for sector-specific strategies, the 21st century is becoming increasingly defined by the need to respond to major social, environmental and economic challenges. Sometimes referred to as 'grand challenges', these include environmental threats like climate change, demographic, health and wellbeing concerns, as well as the difficulties of generating sustainable and inclusive growth.² 'Mission-oriented' policy responds to these grand challenges by identifying and articulating concrete problems that can galvanise production, distribution, and consumption patterns across various sectors. In doing so it recognises that:

- economic growth has not only a rate but also a direction;
- innovation requires investments and risk-taking by both private and public actors;
- the state has a role in not only fixing markets but also in co-creating and shaping them;
- successful innovation policy combines the need to set directions from above with the ability to enable bottom-up experimentation and learning; and
- missions may require consensus-building in civil society.

A mission-based approach can help to ensure that industrial policy does not end up as merely a static list of sectors to support – a strategy that often gets criticised for its risk of 'picking winners'. Rather, mission-oriented policies focus the vertical element not on sectors but on societal challenges, that require different sectors to invest and innovate. This involves picking the problems and helping any organisation (across the public sector, private sector, third sector, and across all manufacturing and services) that are willing to engage with the investments and activities that such challenges require. In other words, they require picking the 'willing', not picking the 'winners'.

2 What is mission-oriented policy?

Mission-oriented thinking requires understanding the difference between (1) broad challenges, (2) missions, (3) sectors and (4) specific solutions.

A challenge is a broadly defined area which a nation may identify as a priority (whether through political leadership, or the outcome of a movement in civil society). These may include areas like inequality, climate change, or the challenges of an ageing population. On a global level, challenges have been expressed as 17 Sustainable Development Goals (SDGs).³ One hundred and ninety three countries have signed up to these inspirational goals; hence, they provide an excellent opportunity to move forwards with mission-oriented thinking. They must be taken seriously as both an obligation to future generations and for global prosperity, but also as opportunities to steer investment-led growth. Addressing these challenges, around health and the environment, must not be seen as a trade-off with a focus on economic growth. Rather they present a means to focus on opportunities for investment-led growth — crowding-in activity across actors. In addition, targets must be set so that progression to achieving such challenges is as serious as the goal setting itself. The Sustainable Development Solutions Network produces the SDG Index and Dashboards Report yearly to show countries' progress towards achieving the SDGs, and includes sub-indicators for each SDG.

Figure 1: The UN Sustainable Development Goals

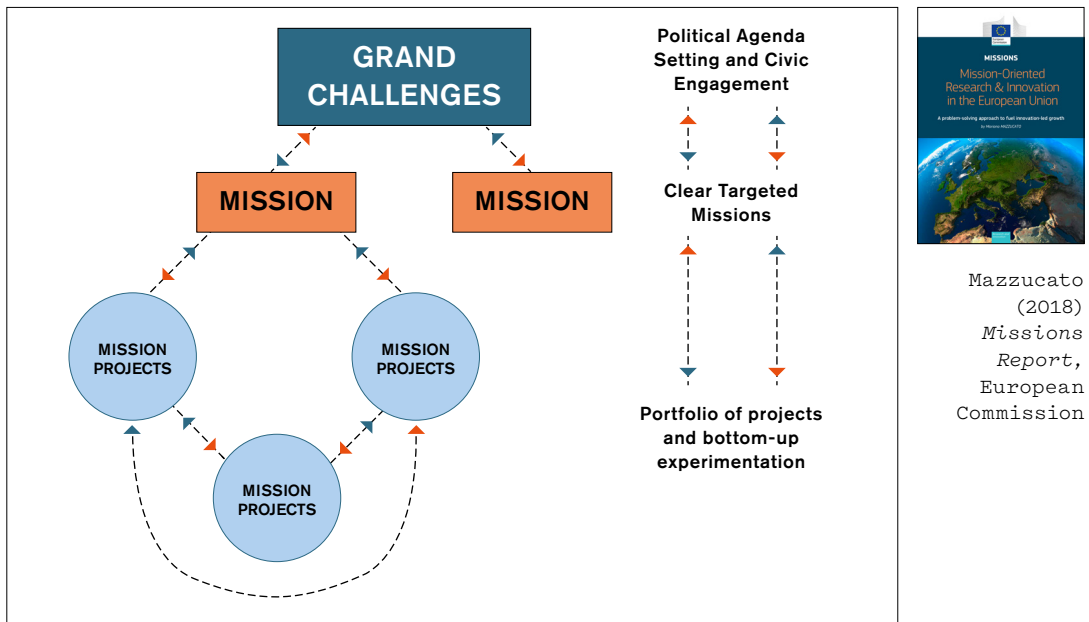


While the SDGs are useful to ensure focus, for the most part they remain too broad to be actionable. Missions, on the other hand, are concrete problems that different sectors can address to tackle a challenge, such as reducing carbon emissions by a given percentage over a specific year period. Sectors define the boundaries within which firms operate, such as transport, health or energy. Missions require different sectors to come together in new ways: climate change cannot be fought by the energy sector alone. It will also require changes

in transport and nutrition, as well as many other areas. Finally, solutions are specific projects undertaken by businesses, governments, universities or the third sector that can help support a mission. Solutions have clear objectives and should involve many different sectors, and can be supported through the use of supportive policy interventions and financial instruments.

The 'granularity' of missions therefore sits between broad challenges and concrete solutions. Missions should be broad enough to engage the public and attract cross-sectoral investment; and remain focused enough to involve industry and achieve measurable success. By setting the direction for a solution, missions do not specify how to achieve success. Rather, they stimulate the development of a range of different solutions to achieve the objective. As such, a mission can make a significant and concrete contribution to meeting grand challenges.

Figure 2: From challenges to solutions



Source: Mazzucato (2018)⁴

Mission-oriented policy is distinct from traditional approaches to economic policy in a number of key ways.⁵ Currently, the analytical frameworks used by governments to evaluate policy assume that government interventions are mainly concerned with correcting 'market failures'. This encourages a view of policy as involving marginal interventions and a focus on improvements to the allocation of limited resources in a particular sector to achieve 'value for money'.

However, mission-oriented policy is concerned with co-creating and shaping markets to achieve societally agreed missions driven by public purpose, rather than limited to 'market fixing'.⁶ This may well involve structural economic change across multiple sectors as well as difficult-to-predict spillover effects outside

the immediate policy area. The market-failure theory for government intervention argues that, under certain conditions, individuals pursuing their own self-interest in competitive markets gives rise to the most efficient and welfare-maximising outcomes. Efficiency is understood in an allocative and utilitarian sense, whereby an activity is efficient if it enhances someone's welfare without making anyone else worse off (so-called 'Pareto efficiency'). Market failures arise when there are impediments to efficient market exchange and competition which prevent pareto-efficient outcomes. Policy interventions are justified to remove such impediments. The typical examples are 'externalities' – such as pollution – that impair an agent's welfare who is not involved in the market transaction or providing public goods (like defence) that cannot be provided effectively by the market because they are non-excludable.

Influenced by the market-failure framework, modern appraisal and evaluation approaches are usually based upon a static form of ex-ante cost benefit analysis (CBA) with costs and benefits measured using existing market prices. The underlying assumption of this approach is that it is possible to estimate reliable future values with the aid of discounting techniques (Net Present Value calculations) because the rest of the economic system itself is characterised by equilibrium behaviour. Evaluation, after the policy intervention, then seeks to verify whether the estimates were correct and whether the market failure was addressed. This approach also tends to be highly risk averse. Influenced by public choice theory, there is typically a strong emphasis on the potential for 'government failure', whereby government intervention may reduce welfare, even where there is clear evidence of market failure.

In contrast, a market-shaping, mission-oriented approach to policy views markets themselves as embedded in society and hence as outcomes of the interactions between the public, private and civil society sectors. In addition, market-shaping policy is not only concerned with the effectiveness of public spending, but also includes the wider institutional features of markets, from the regulatory framework (e.g. environmental standards) to the type of finance available, to the creation of demand for new products and services (e.g. through procurement and fiscal policy). However, in order to coordinate such varied activities and policies effectively, public policy appraisal and evaluation need to be based on a wider understanding of the public value that policies can create. A user-centric approach to the evaluation of market-shaping policies will be important because missions will be more aligned with public purpose where they have been co-created by civil society and users as well public and private sectors.

CBA-type analyses derived from market-failure theory are concerned with allocative or distributive efficiency, which involves making the best use of (fixed) resources at a fixed point in time. But market-shaping policy and mission-oriented innovation is focused upon making the best use of resources to achieve changes over time including, perhaps most importantly, the creation of new technologies and/or the shifting of technology frontiers.⁷ Such change will likely impact multiple sectors and prices, so the assumption of 'all else being equal' becomes inappropriate.

Some useful examples come from the decarbonisation challenge. It is well understood that taxation and subsidies for renewable energy sectors and environmental regulation have had major impacts on innovation and investment in clean energy. An allocative efficiency framework can justify these approaches on the basis of carbon emissions reduced or the amelioration of a market failure (underpricing of carbon). But they tell us nothing about the impact such policies might have on shaping whole new markets in clean energy by helping to crowd-in private investment and stimulating innovation. The same applies to more direct public investment in renewable energy. In contrast, a dynamic efficiency approach to evaluation, with a longer timeframe and an understanding of complex systems will better capture these impacts.

Table 1: Market-fixing vs. Market-shaping analytical frameworks

	Market-fixing	Market-shaping
Justification for the role of government	Market or coordination failures: <ul style="list-style-type: none"> ▪ Public goods ▪ Negative externalities ▪ Imperfect competition/information 	All markets and institutions are co-created by public, private and third sectors. Role of government is to ensure markets support public purpose, also by involving users in co-creation of policy
Business case appraisal	Ex-ante cost benefit analysis (CBA) – allocative efficiency assuming static general relationships, prices etc.	Focused on systemic change to achieve mission-dynamic efficiency (including innovation, spillover effects and systemic change)
Underlying assumptions	Possible to estimate reliable future value using discounting. System is characterised by equilibrium behaviour	Future is uncertain because of potential for novelty and structural change; system is characterised by complex behaviour
Evaluation	Focus on whether specific policy solves market failure and whether government failure avoided (Pareto efficient)	Ongoing and reflexive evaluation of whether system is moving in direction of mission via achievement of intermediate milestones and user engagement. Focus on portfolio of policies and interventions, and their interaction
Approach to risk	Highly risk averse; optimism bias assumed	Failure is accepted and encouraged as a learning device

Source: Kattel et al (2018)^B

In practice, mission-oriented policy is underpinned by a number of key principles:

- **Picking the problem, not sectors:** instead of using vertical policies to 'pick' sectors or technologies, the vertical aspect of missions picks the problem. The solution is then reached by stimulating multiple sectors and multiple forms of cross-actor collaborations to work to address those problems using the entire innovation value chain, from fundamental research to applied research and cutting-edge innovative firms.
- **Focusing on societal relevance:** all missions should have societal relevance, for example in the ability to improve health, nutrition, or the living environment for a large section of Scottish citizens. Missions focused on specific technologies should be avoided unless they are framed in the context of specific societal challenges. For example, a mission on artificial intelligence will not be effective unless it is framed in terms of the potential to improve industrial processes, or support the enhancement of social outcomes such as healthcare. At the same time, the innovative spillovers that might result along the way may not be known beforehand and can have unforeseen applications. Indeed, most of the technologies in our smart products today — from the Internet to GPS — emerged as spillovers from missions of the past.⁹
- **No 'one size fits all':** missions come in different shapes and sizes. There is no 'one size fits all' definition of what a mission should be and how it should be structured. To allow missions to create impact with societal relevance, flexibility is needed in how the mission is defined. In some areas, a mission should trigger action to speed up progress in the development of technologies to increase their societal impact. In other areas, the mission should drive a systemic change. Most likely, ambitious missions that have the potential to have wide societal impact will need a combination of both, but their characteristics may differ.^{10 11} We must allow missions to genuinely interact with the new types of complex problems societies face, as well as incorporating the new knowledge we have on how innovation comes about to their design: it is serendipitous, non-linear and high risk.
- **Fostering experimentation:** missions must be chosen, yet their success will depend on the bottom-up processes that nurture innovation while 'getting there'. A culture of experimentation and risk-taking is a crucial element in the philosophy of missions. There must be incentives to 'think outside the box' to come up with new solutions and address the mission objective. This requires a portfolio approach, based on different solutions, and a broad range of different interactions. The objective should be addressed by multiple actors stimulating cross-sector investments, collaborations across different industries; and new forms of partnerships between the public sector, the private sector and civil society organisations. Innovation itself is often characterised by feedback effects, trial and error, and serendipity (the search for one thing leads to the discovery of another). Picking missions that have different possibilities for solutions will enhance the innovation dynamic itself.

Case study: Commission for Mission-Oriented Innovation and Industrial Strategy (MOIIS)

The UCL Commission for Mission-Oriented Innovation and Industrial Strategy (MOIIS) brings together academics and world-leading industry experts from cross-disciplinary institutions to provide thought leadership on how mission-oriented policy can be implemented. Co-chaired by Professor Mariana Mazzucato and Lord David Willetts and hosted by IIPP, the Commission has been instrumental in developing mission-oriented policy within the UK Government's Industrial Strategy. The Industrial Strategy sets out four clear and ambitious Grand Challenges to drive innovation and investment: future of mobility, AI and data, clean growth and ageing society. The purpose of the Commission is to consider how to transform these 'grand challenges' into concrete 'missions' and how the public sector can foster bottom-up innovation across the economy to achieve these missions.

The Commission's thinking on missions has brought to light several key "cross-cutting" issues that run across all parts of government that are critical for implementing mission-oriented policy:

- **Patient finance and urgent finance:** Are new types of patient finance needed to support missions, and more broadly how can patient mission-oriented finance crowd in other forms of finance?
- **Public procurement:** How can government instruments like procurement and prize schemes be used to crowd-in experimentation to solve a mission?
- **Agency and leadership:** What kind of agencies and what types of leadership are needed to manage missions?
- **Standards and regulation:** What is the role of standards and regulation in the adoption of new technologies?
- **Citizen and public engagement:** How can missions engage citizens in innovation policy? How can we ensure that citizen concerns are reflected in the government missions and how can missions be used to link innovation policy to citizens' lived experience?
- **Support for technologies:** Missions rely upon new and novel technologies, so how can the industrial strategy support the development of fundamental technologies we need to reach these and future missions?
- **Public sector capabilities:** What new capabilities will be needed in the public sector?

3 Scotland's mission potential

Scotland is well placed to benefit from a mission-based approach. The Scottish Government's Programme for Government builds on its 2015 Economic Strategy, and sets out a clear economic approach which aims to establish an inclusive, fair, prosperous, innovative country, ready and willing to embrace the future.¹² It acknowledges that the successful economies of the future will be resource efficient, low carbon and harness the power of technology, and illustrates a bold and forward-looking vision of a future-proofed, high-tech, low-carbon Scottish economy.

The Scottish Government has already set a range of ambitious social and environmental goals, including a target to achieve net-zero emissions of carbon dioxide by 2050; to ensure that renewable sources generate the equivalent of 100% of gross annual electricity consumption by 2020; and to rank in the top performing quartile of OECD countries in terms of having the lowest levels of inequality.

In 2018, the Scottish Government updated its world leading National Performance Framework (NPF), which sets out a vision for national wellbeing in Scotland across a range of economic, social and environmental factors. The NPF consists of 11 'national outcomes' that reflect the values and aspirations of the people of Scotland, and are aligned with the UN Sustainable Development Goals.¹³

Figure 2: Scotland's National Performance Framework



Source: Scottish Government¹⁴

In order to measure progress against these national outcomes, 81 economic, social and environmental 'national indicators' have been developed. Performance is assessed as improving, maintaining or worsening based on the change between the last two data points of an indicator, and progress against these milestones is published online.¹⁵ The NPF therefore provides a good basis from which to develop a mission-oriented approach to policy. Missions for the Scottish National Investment Bank should be developed with reference to the NPF and in collaboration with different government departments to ensure a coherent policy approach across government.

4 The role of patient strategic finance

The structure of the financial system is key to the successful implementation of mission-oriented policy. This is because finance is not neutral; the type of finance available can affect both the investments made and the type of activity that occurs.^{16 17} The types of financial institutions and markets that exist have a material impact on activity in the real economy.

Missions by nature are designed to spur innovation towards addressing societal challenges. But because innovation is highly uncertain, has long lead times, is collective and cumulative, it requires a specific type of finance. Uncertainty means that finance must be willing to bear high risks; the long-run nature of innovation and its cumulateness imply that the kind of finance must be patient.¹⁸ Financial returns from investment in riskier innovative activities are not always assured, and it usually takes time before they can materialise. Thus, achieving smart, innovation-led growth requires not just any type of finance, but long-term patient strategic finance.

Short-termism and risk-aversion means that the private sector will often not invest in higher-risk areas until future returns become more certain. This is why across the world the early stages of the innovation chain are disproportionately occupied by public sector actors. Early stage public investment helps to create and shape new markets, nurturing new landscapes which the private sector can develop further. From advances such as the internet and microchips to biotechnology and nanotechnology, many major technological breakthroughs – in both basic research and downstream commercialisation – were only made possible by direct public investment. In each of these areas the private sector only entered much later, piggybacking on the technological advances made possible by public funds.¹⁹

In countries that have achieved smart, innovation-led growth, the state has often supplied the patient strategic finance that the private sector was unwilling to provide.²⁰ In these places, the state has not just sought to fix market failures but has acted boldly to create new technological and industrial landscapes by acting as investor of first resort, not simply as lender of last resort. This has taken different institutional forms, but in many countries patient strategic finance is increasingly coming from national investment banks (NIBs).^{21 22}

Because the governance arrangements of NIBs typically do not create pressure to deliver short-term returns, they can provide patient financing over a longer time horizon, prioritise wider social and environmental objectives, and take a different approach to risk and reward. While the traditional functions of NIBs have been in infrastructure investment and counter-cyclical lending, in recent times they have taken on more active 'venture capital' and 'mission-oriented' roles. In countries such as Germany and China, NIBs have taken centre stage in confronting the key social and environmental challenges of the 21st century, such as climate change.²³

Most NIBs have their mandated sphere of activities set out clearly in law or in their Articles of Association, and it is common for these mandates to change and evolve over time. While some NIBs are given a narrow mandate which explicitly refers to the sectors, type of customers or activities that a NIB is expected to support, many of the more successful NIBs have broader mandates that enable them to support a wider range of economic objectives and respond to emerging priorities.²⁴

There is a growing consensus that NIBs that are 'mission driven', with investment activities guided by specific missions aligned with government policy, tend to be more effective than those which are focused on more neutral economic objectives such as promoting 'growth' or 'competitiveness'.²⁵ Although presented differently in each case, the mandates of leading NIBs such as the KfW, BNDES, European Investment Bank and China Development Bank are all linked to overcoming specific economic, social and environmental challenges. This enables them to play a leading strategic role in their respective economies. In contrast, the mandate of Italy's Cassa di Risparmio di Roma is more static, focusing on 'economic development' and 'competitiveness' without signalling a desired direction for the economy, and this is reflected in its more inertial activities.²⁶

For example, while initially KfW's lending focused on the reconstruction of post-war Germany, today all investments must contribute to at least one of three pre-established missions, or 'megatrends':²⁷

- **Climate change and the environment:** KfW finances measures to support renewable energy, improve energy efficiency, safeguard biodiversity and prevent and/or reduce environmental pollution. To address the special importance of this area, KfW has set an environmental commitment ratio of 35% of total promotional business volume. The KfW has played an instrumental role in the systemic greening of the German economy through the Energiewende policy, which aims to combat climate change, phase-out nuclear power, improve energy security by substituting imported fossil fuel with renewable sources, and increase energy efficiency. The KfW 'Energy Transition Action Plan' was launched in 2011, which had invested over €100 billion by the end of 2016.
- **Globalisation and technological progress:** KfW contributes to strengthening the international competitiveness of German companies by granting loans in the following areas, among others: research and innovation, projects to secure Germany's supply of raw materials, and infrastructure and transport.
- **Demographic change:** KfW's objective is to address the consequences that result from a declining and ageing population, including the following focus areas: age-appropriate infrastructure, vocational and further training, family policy and childcare as well as corporate succession.

The Scottish National Investment Bank therefore presents an opportunity to tailor the design of a new bank towards supporting a mission-oriented agenda.²⁸ In order to fulfil a mission-oriented mandate the Scottish National Investment Bank must have a wide range of instruments at its disposal, including both debt and equity, suited to different areas of the risk landscape. For example, equity investments may be suitable for radical innovation, while debt instruments such as long-term loans may be better for lower-risk activities. This will enable the Bank to invest across the innovation chain from the pre-R&D phase all the way through to providing long-term patient capital for established firms. In addition to lending operations, many NIBs offer advisory services such as strategic planning, capacity building, and training programmes to help create viable projects and catalyse investments that otherwise would not happen.²⁹

A key difference between mission-oriented NIBs and private financial institutions is the breadth of expertise and capacities contained within staff. In many cases, such as KfW and the European Investment Bank, this includes not only financial expertise but significant in-house engineering and scientific knowledge about the sectors the bank is active in and the nature of the investments being made. This enables investment decisions to be based on a wider set of criteria than relying on market signals alone, and means they are better placed to appraise social and environmental considerations.³⁰ A key priority for the Scottish National Investment Bank will therefore be to recruit appropriate in-house skills and expertise.

Acting as lead investor necessarily means absorbing a high degree of uncertainty and accepting failures when they happen. In making investments the Scottish National Investment Bank can use its balance sheet to structure investments across a risk-return spectrum so that lower risk investments help to cover higher risk ones. In order for this to work, it is important that the Bank is able to capture some of the reward (the 'upside') that is made possible by their risk-taking and investment in order to cover the inevitable losses. The Scottish National Investment Bank could do this by employing mechanisms such as retaining equity in the innovative companies it supports, or co-owning intellectual property with innovative firms it invests in.³¹

To be most effective, it is important that the missions of the Scottish National Investment Bank are aligned with the Scottish Government's wider policy objectives. This close alignment can create a powerful synergy between policy, regulation and financing, which can be simultaneously coordinated for maximum impact. For example, new government policies can be complemented with new financing instruments in order to transmit policy objectives more efficiently. This close alignment between the KfW and government policy has been instrumental to the systemic greening of Germany's economy through the Energiewende policy.³² Although potentially powerful, this relationship is highly dependent on effective governance arrangements, which are particularly important for public banks.

On the one hand, it is the distinct governance structures of NIBs that enable them to play a fundamentally different role in the economy compared to that of

private financial institutions. However, many of the problems that have commonly been associated with public banks, such as weak performance, financial problems, unfair competition with the private sector, capture by interest groups, can be attributed to poor governance.³³ Achieving the right balance between political representation and independent decision making is a key challenge. While political representation can help to maintain alignment with government policy and maintain a path of democratic accountability, steps should be taken to prevent undue political interference or capture by interest groups. It is important that management teams are free to make sound, long-term decisions in line with the Bank's mandate, free of day-to-day political interference.

NIBs and other public financial institutions are often criticised on the basis of 'picking winners', 'crowding out' or funding large incumbent companies. While there are instances where criticism may be merited, part of the reason for this lies in the absence of monitoring and evaluation frameworks which adequately capture the dynamic spillovers generated by the investments made by these institutions. As a result, it will be important to develop appropriate monitoring and evaluation frameworks for the Scottish National Investment Bank which do not focus on market failures, but instead assess the extent to which they have been successful at catalysing activity that otherwise would not have happened.³⁴

Finally, in order to be successful it is important that the Scottish National Investment Bank works closely with other actors in the wider financial, business and innovation ecosystems. In some cases it may be most appropriate to invest directly in firms and infrastructure aligned with the missions of the bank, while in other cases it may be more appropriate to co-invest with other actors.³⁵ Structured properly, investments should seek to 'crowd-in' private investment by giving private sector actors the confidence they need to invest.³⁶

5 Five key criteria for selecting missions

Selecting missions is not a straightforward task. While it is important to allow for flexibility in the design of missions, in general they should fulfil the following key criteria:³⁷

1. **A clear direction:** missions should be broad enough to engage the public and attract cross-sectoral interest; and remain focused enough to involve industry and achieve measurable success. Missions should not specify how to achieve success – they rather should stimulate the development of a range of different solutions to achieve the objective. Rather than 'picking' sectors or technologies, missions pick the problem and encourage solutions by stimulating multiple forms of cross-actor activity to work to address those problem.
2. **Targeted, measurable and time-bound:** missions need to be very clearly framed. They need a specific target that can either be formulated in binary ways (as clearly as whether man has reached the moon and returned back safely) or quantified. Without specific targets, it will not be possible to determine success (or failure), or measure progress towards success. In addition, they will need a clear timeframe within which actions should take place. This needs to be long enough to allow the process to grow, for actors to build relationships and interact, while at the same time being time-limited.
3. **Ambitious but realistic:** setting missions unrealistically high will result in a lack of buy-in, while setting the objective too low will not incentivise activity. Furthermore, the missions should attract investment that otherwise would likely not be undertaken by private actors, providing the justification and legitimacy for public intervention. This does not have to be done within a narrow market failure framework, but a more active market 'co-creation' framework.
4. **Cross-disciplinary, cross-sectoral:** missions need to be chosen to address clear challenges that stimulate the private sector to invest where it would not have otherwise invested ("additionality"). Missions should be framed in such a way as to spark activity across different industrial sectors (e.g. transport, nutrition, health, services), and different types of actors (public, private, third sector, civil society organisations). By taking a problem-focused lens and not a sectoral lens, problems related to sustainability will not just involve, for example, renewable energy, but could also involve transport, strategic design, new digital solutions, amongst others.
5. **Multiple bottom-up solutions:** missions should not be achievable by a single development path, or by a single technology. They must be open to being addressed by different types of solutions. A mission-based approach is clear on the expected outcome. However, the trajectory to reach the outcome must be based on a bottom-up approach of multiple solutions — of which some will fail or have to be adjusted along the way.

6 Missions for the Scottish National Investment Bank

The implementation plan for the Scottish National Investment Bank cited the following areas as potential themes for missions, based on existing Scottish economic policy:³⁸

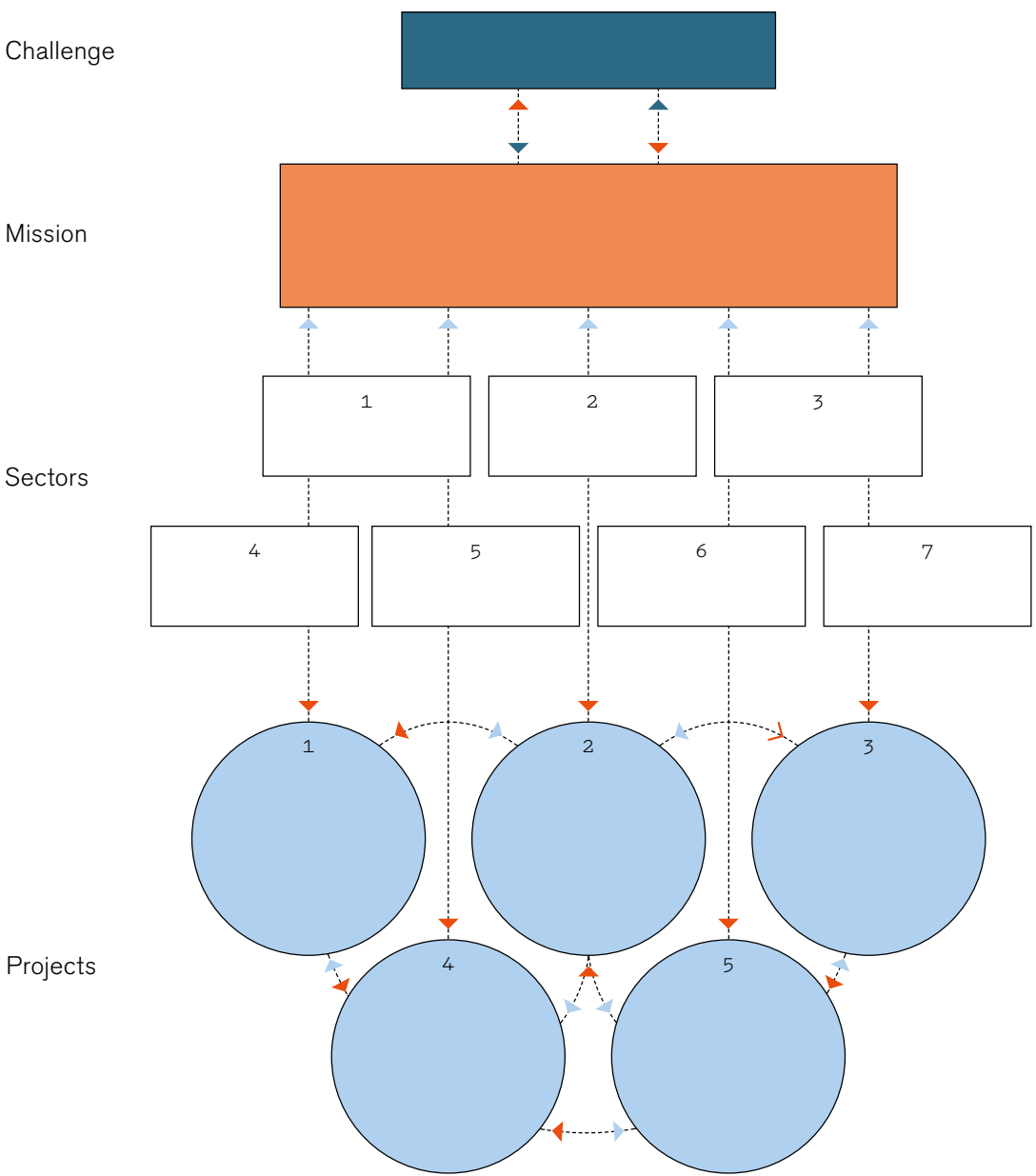
- Transitioning to a low-carbon economy, including decarbonisation of the transport network.
- Responding to emerging demographic pressures, including the twin challenges of an ageing population and wider population health.
- Promoting inclusive growth through place-making and local regeneration, including site preparation, infrastructure (transport and communication links), housing and related commercial, education and health investment.

In order to turn these themes into concrete missions, a 'mission road-mapping' methodology can be applied. This involves identifying the following for each theme:

- **Grand challenges:** broadly defined areas that have been identified as a priority in Scotland, either through political leadership, or the outcome of a movement in civil society. Ideally this should align with at least one of the Sustainable Development Goals (SDGs).
- **Missions:** a set of concrete problems that different sectors can address to tackle the challenge. Possible missions should be tested against the criteria outlined in the previous section (clear direction; targeted, measurable and time-bound; ambitious but realistic; cross-disciplinary and cross-sectoral; and involve multiple, bottom-up solutions). Missions should be selected with reference to the Scottish Government's National Performance Framework.
- **Sectors:** sectors of the Scottish economy that are well placed to invest and innovate in ways that will contribute to a mission. This should include sectors spanning the public sector, private sector, third sector, and across all manufacturing and services.
- **Solutions:** a portfolio of potential projects from across different sectors that could be financed by the Scottish National Investment Bank to help support a mission. Efforts should be made to identify potential new areas of collaboration and new forms of partnerships across different industries and between different actors.

This mission road-mapping framework is summarised in figure 3.

Figure 3: Mission road-mapping



7 Implementation of missions

Missions will also require new approaches to implementation, learning from successful mission-oriented organisations around the world. Here a number of different aspects need to be considered.

Who selects missions?

Missions must be widely perceived to be legitimate and of high societal importance. This will ensure their durability and survival across political cycles. In order to achieve this, meaningful public participation in the selection process of missions is essential even if missions are ultimately selected at the political level. Without civic engagement, the risk of alienation from the broader public and a purely technocratic approach is too high. A mission will not inspire people unless they feel like they are part of it.

The implementation plan for the Scottish National Investment Bank recommended that the Scottish Government establishes a five-year Strategic Framework to set, monitor and, where appropriate, amend the overall missions for the Bank and the rules or parameters within which it will invest. It also recommends that an advisory group comprising representatives from stakeholders and wider civic society should be established to advise Ministers on the Bank's Strategic Framework, and that the Chair of this group should have a place on the Bank's Board as a Non-Executive Director.³⁹ This is a good starting point, but steps must be taken to ensure that the input of the advisory group is meaningful, and that members are drawn from a diverse cross-section of society. After missions have been set, a rigorous process of evaluation is needed to ensure continuing relevance and commitment and to prevent selection being captured by either passing fashion or vested interests.

Public participation in the selection process must be followed by public inclusion in the implementation. Keeping society informed of progress and achievement of intermediate milestones, for example using social media or community-based workshops, could play a role in maintaining broad interest and thus incentivising continuation of the mission. The opportunities for such engagement will of course differ depending on the nature of the mission, but some form of genuine participation of civil society organisations in concrete projects within a mission will be crucial to facilitate open dialogues on expected outcomes and practical applicability of solutions.

Furthermore, innovation often finds its true purpose in the hands of consumers who work out what a technological innovation is really capable of or what it can be used for. Innovation is 'stillborn' until people find a way to fit it into their lives. So while it is important that missions pervade the supply side of innovation (driving communities of knowledge to bring about important changes), innovation can also come from the demand side (people discovering what a technology is for

in the process of using it, or solving important problems they face). Indeed, there is lots of evidence from within innovation processes that this interaction between supply side and demand side is vital to the success of missions.

All available and proven channels of communication with citizens should be explored so citizens can feel enthusiasm and trust in the process of change. The precise constellations of civil society, public and private actors that should be involved will only be fully developed when particular missions are selected.

Measurement and impact by goals and milestones

It is essential for missions to define a concrete target and objectives. Monitoring frameworks will need to be established to measure progress. They must be dynamic, recognising that static cost-benefit analysis and net-present value calculations may stop any bold mission from the outset.⁴⁰ Crucially, it must be possible to say definitively whether the mission has been achieved or not. Technological missions such as 'putting a man on the moon' had obvious end points which made evaluation easier. However, modern grand challenges are more long-term with less easy to define end points. So while missions must allow for long-term investments, the use of intermediate milestones is critical. Intermediate milestones will provide the means to keep track of progress towards the mission objective and allow for informed and flexible adaptive decisions to intervene. Realtime data, publicly available, on progress on the milestones will also keep a sense of urgency, achievement and motivation among involved actors. The Scottish Government has already adopted such an approach with its National Performance Framework.

Intermediate milestones will also be important for flexibility and adaptation so that the mission can be changed over time if the milestones provide new information or show that the mission, for whatever reason, has been framed problematically and needs adjusting. While missions are long-term and should have a stable goal, the intermediate signposts should be used to decide whether changes in direction are required, and, in some cases, whether the mission itself needs redefining.

In addition to the milestones, broader measures of the cross-sectoral and cross-science impact are needed. So even if a milestone or the overall mission objective is not reached, the mission might still be considered to be successful (at least to an extent) if the process produced positive, economy-wide spillovers. Indeed, creating cross-sectoral spillovers can be an objective itself, best achieved when the process of innovation remains open and cross-disciplinary.

A portfolio of instruments to foster bottom-up solutions

A mission is not a single project, but a portfolio of actions that can encourage multiple solutions. A diverse set of different funding instruments, such as debt and equity provided by the Scottish National Investment Bank, will help achieve this. However, other instruments such as grants, prizes, and new forms of procurement practice offered by other public bodies can also help contribute to missions.

Collaboration between the Bank and different government departments will be important to maximise synergies and avoid duplication. It may be appropriate for a customer to be referred to the Bank for scale-up financing after an initial grant from another public body had been successful, for example.

Flexibility, proactive management and building in-house capabilities

Missions are a concerted effort to reach a pre-defined objective through a multitude of actions. As the focus is on reaching an outcome, a high degree of flexibility and adaptability is required to allow the possibility to change course if there is a risk that the objective will not be achieved. In finance terms, there should be a possibility to increase financing for a mission if there are indications that extra investment (within boundaries) could make the difference between reaching a mission objective or not. Similarly, if indicators consistently point towards a situation where a mission objective is out of reach, the possibility to terminate a mission should also be conceivable.

Such decisions should be based on metrics that can orchestrate the tricky balance between the need for some form of ex-ante dynamic risk assessment and the danger of writing off potentially viable missions at an early stage because ex-ante impact assessments cannot predict the kind of unexpected spillovers the mission approach can create. This has implications for how Scottish National Investment Bank financing is allocated and assessed. Evaluation of project proposals should pay as much attention to the portfolio of projects as to the impact of individual proposals. If individual projects, after a period of time and based on clear indicators, seem not to be contributing to the mission objective, it may be desirable to redirect financing to other activities. In a similar vein, to ensure the maximum contribution of activities to the mission objective, funding should be distributed on a 'stage-gate' principle, where successive tranches of funding are only allocated based on reaching an intermediate milestone.

This proactive approach to the management of a portfolio of projects requires significant in-house capacities and expertise. Lessons should be learned from mission-oriented organisations like DARPA and ARPA-E in the US, Yozma in Israel, SITRA in Finland and Vinnova in Sweden. The point is not to copy these organisations but to learn from key sources of their success. For example, these organisations have explicitly welcomed risk-taking at the organisational level; they have used secondment practices to bring high-level scientists into the

civil service for limited time periods; they have often aligned goals with national procurement practices; and have been extremely good at drawing on expertise of wider networks. Such organisations develop what has been called 'mission mystique' or institutional charisma: it is an honour to work in a mission-oriented organisation where ambitions for the use of innovation to solve problems are as important as building in-house capacity and expertise.⁴¹

At present however, the trend is for much of the in-house knowledge to be outsourced to third parties, whether consulting companies, think tanks or the private sector. This is particularly noticeable in policy and programme evaluations where increasing number of public organisations rely on external evaluators. While some outsourcing is fine (scientific peer-review is a case of outsourcing), it is also crucial to build dynamic capabilities inside public institutions that are responsible for engaging with technological and scientific priorities. While public organisations may require more long-term stability than private ones, they still must nurture risk-taking and experimentation — and hence such capabilities have to be consciously nurtured in the public sector.

Public institutions in charge of mission-oriented policies need to be willing to experiment with both bringing in new expertise (e.g. establishing novel forms of collaboration with third-sector organisations to pool and share expert knowledge) and changing everyday routines and processes to build dynamic organisational capabilities (including dynamic performance management, procurement, and human resources).

8 Conclusion

Scotland's economy has many key strengths. But like many other advanced economies, it is at a crossroads and faces many major challenges — from inequality and climate change to an ageing population and technological change.

But these challenges do not need to be a threat to future prosperity. Instead, there is a significant opportunity to turn these challenges into opportunities for revived innovation-led growth. However, doing so requires bold and ambitious plans for financing and directing investment in a smart, inclusive and sustainable direction. By establishing the new Scottish National Investment Bank, the Scottish Government has taken an important step towards being able to fully exploit these opportunities.

This report has outlined a mission-oriented framework for the Bank which, if implemented successfully, will maximise its potential for promoting transformational change across Scotland's economy. Drawing on international evidence, as well as the UCL Institute for Innovation and Public Purpose's own path-breaking research, we have set out clear criteria for designing missions, as well as how a mission-based approach should be implemented in practice.

The Institute for Innovation and Public Purpose has created a new network for this purpose: the Mission Oriented Innovation Network (MOIN). This is a dynamic learning platform for global mission-oriented organisations to share their challenges and opportunities — of stepping outside the purely market-fixing box into the creative world of co-shaping markets.

Correctly structured and governed, a mission-oriented Scottish National Investment Bank will be a powerful catalyst for supporting the Scottish Government's ambition to deliver smart and inclusive growth while transitioning to a low-carbon economy.

Endnotes

- 1 Dosi, G. and Lovallo, D. (2007) 'Rational entrepreneurs or optimistic martyrs? Some considerations on technological regimes, corporate entries, and the evolutionary role of decision biases', in Garud et al., eds. Technology
- 2 Mazzucato, M. (2017). 'Mission-Oriented Innovation Policy: Challenges and Opportunities'. Working Paper IIPP WP 2017-01. Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/moip-challenges-and-opportunities-working-paper-2017-1.pdf>
- 3 European Commission (2018) The Sustainable Development Goals. Available at: https://ec.europa.eu/europeaid/policies/sustainable-development-goals_en (Accessed 16 February 2018)
- 4 Mazzucato, M. (2018). Mission-Oriented Research & Innovation in the European Union: A problem-solving approach to fuel innovation-led growth. European Commission.
- 5 Kattel, R., Mazzucato, M., Ryan-Collins, J., Sharpe, S. (2018). The economics of change: Policy appraisal for missions, market shaping and public purpose. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2018-06). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-06>
- 6 Mazzucato M., (2016). From Market Fixing to Market-Creating: A new framework for innovation policy, special issue of Industry and Innovation: Innovation policy – can it make a difference?, 23 (2)
- 7 Mazzucato, M., (2017). Mission-Oriented Innovation Policy: Challenges and Opportunities, UCL Institute for Innovation and Public Purpose Working Paper (2017-1), <https://www.ucl.ac.uk/bartlett/public-purpose/sites/public-purpose/files/moip-challenges-and-opportunities-workingpaper-2017-1.pdf>
- 8 Kattel, R., Mazzucato, M., Ryan-Collins, J., Sharpe, S. (2018). The economics of change: Policy appraisal for missions, market shaping and public purpose. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2018-06). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-06>
- 9 Mazzucato, M. (2013) The Entrepreneurial State: debunking public vs. private sector myths, London: Anthem Press, UK
- 10 Foray, D., Mowery, D.C., and Nelson, R. R. (2012) 'Public R&D and social challenges: What lessons from mission R&D programs?', Research Policy, 41(10), pp. 1697–1902
- 11 Mowery, D.C., Nelson, R. R. and Martin, B. (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), pp. 1011–1023.
- 12 Scottish Government (2017), A Nation with Ambition: The Government's Programme for Scotland 2017-18 (<http://www.gov.scot/programme2017>)
- 13 Scottish Government. (n.d.) 'National Performance Framework'. <https://nationalperformance.gov.scot/what-it>
- 14 Scottish Government. (n.d.) 'National Performance Framework'. <https://nationalperformance.gov.scot/what-it>
- 15 Scottish Government. (n.d.) 'National Performance Framework: performance overview'. <https://nationalperformance.gov.scot/measuring-progress/performance-overview>
- 16 O'Sullivan, M. (2004), 'Finance and Innovation', in J. Fagerberg D. C. Mowery R. R. Nelson, (eds), The Oxford Handbook of Innovation, New York, Oxford University Press.
- 17 Mazzucato, M. (2013), 'Financing Innovation: Creative Destruction vs Destructive Creation', Industrial and Corporate Change , 22, 851–67.
- 18 Lazonick, W. & Mazzucato, M. (2013) 'The Risk-Reward Nexus in the Innovation Inequality Relationship: Who Takes the Risks? Who Gets the Rewards?' Industrial and Corporate Change, 22(4):1093–1128.
- 19 F.L.Block and R.M.Keller,. (2011). 'State of Innovation: The U.S. Government's Role in Technology Development'. Boulder, CO: Paradigm Publishers
- 20 Mazzucato, M. (2013) The Entrepreneurial State: debunking public vs. private sector myths, London: Anthem Press, UK
- 21 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). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-01>

- 22 Mazzucato, M. Macfarlane, L. (2017). Patient strategic finance: opportunities for state investment banks in the UK. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2017-05). Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/wp2017-05>
- 23 Mazzucato, M. and Penna, C. C. R. (2015) The Rise of Mission-Oriented State Investment Banks: The Cases of Germany's KfW and Brazil's BNDES. SPRU Working Paper Series, 2015-26
- 24 de Luna-Martinez, J. and Vicente, C. (2012). Global Survey of Development Banks. World Bank Policy Research, Working Paper No. 5969
- 25 Mazzucato, M. Macfarlane, L. (2017). Patient strategic finance: opportunities for state investment banks in the UK. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2017-05). Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/wp2017-05>
- 26 Mazzucato, M. Macfarlane, L. (2017). Patient strategic finance: opportunities for state investment banks in the UK. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2017-05). Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/wp2017-05>
- 27 KfW. (2016). 'Financial Report 2016'. Available at: https://www.kfw.de/PDF/Download-Center/Finanzpublikationen/PDF-Dokumente-Berichte-etc./3_Finanzberichte/Finanzbericht-2016-D
- 28 Mazzucato, M. Macfarlane, L. (2017). Patient strategic finance: opportunities for state investment banks in the UK. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2017-05). Available at: <https://www.ucl.ac.uk/bartlett/public-purpose/wp2017-05>
- 29 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). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-01>
- 30 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). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-01>
- 31 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). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-01>
- 32 Moslener, U., Thiemann, M. and Volberding, P. (2017). 'National Development Banks as Active Financiers: The Case of KfW'. The Future of National Development Banks. Available at: http://policydialogue.org/files/events/background-materials/Future_of_National_Development_Banks_-_Germany.pdf
- 33 Luna-Martinez, J. and Vicente, L. (2012) 'Global Survey of Development Banks', World Bank Policy Research Working Paper
- 34 Kattel, R., Mazzucato, M., Ryan-Collins, J., Sharpe, S. (2018). The economics of change: Policy appraisal for missions, market shaping and public purpose. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2018-06). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-06>
- 35 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). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-01>
- 36 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). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-01>
- 37 Mazzucato, M. (2018). Mission-Oriented Research & Innovation in the European Union: A problem-solving approach to fuel innovation-led growth. European Commission
- 38 Scottish Government. (2018). 'Scottish National Investment Bank Implementation Plan.' <http://www.gov.scot/Resource/0053/00532119.pdf>
- 39 Scottish Government. (2018). 'Scottish National Investment Bank Implementation Plan.' <http://www.gov.scot/Resource/0053/00532119.pdf>
- 40 Kattel, R., Mazzucato, M., Ryan-Collins, J., Sharpe, S. (2018). The economics of change: Policy appraisal for missions, market shaping and public purpose. UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2018-06). <https://www.ucl.ac.uk/bartlett/public-purpose/wp2018-06>
- 41 Goodsell, Ch. T. (2011) 'Mission Mystique: Strength at the Institutional Center', The American Review of Public Administration, 41(5), pp. 475–494.

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