



Inequality

The IFS Deaton Review

The inclusive entrepreneurial state: collective wealth creation and distribution

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Introduction

How should the wealth that an economy generates be distributed? Moral as well as economic arguments about who should be entitled to what frequently seek to link rewards to contributions, for reasons of fairness or efficiency. But how these contributions are quantified depends first on how they are theorised. In this way, different theories of how value is created can be used to justify very different distributions of income and wealth.

In this commentary, which accompanies the IFS Deaton Review chapter by De Loecker, Obermeier and Van Reenen (2022), I argue that the contribution to value creation by the state – the different parts of the public sector – has been problematically theorised. Understating the contribution of the state has meant that the contribution of other actors has been overstated, with consequences for the overall distribution of income and wealth. It has also meant that the full potential of the state to drive both innovation-led and inclusive growth has not been realised. But with a new approach to policy and, more broadly, to the role of the public sector in the economy, it could be.

Key to the problem is that in economic theory the state is, at best, seen as facilitating the process of wealth creation, but not being a key driver of the process itself. It is seen as *fixing* markets, not creating them. It is seen as de-risking the value creators, not taking risks in order for value to be created. It is seen as a lender of last resort not an investor of first resort.

This limited view of the role of the state in the dynamics of wealth creation has had problematic effects. It has limited policymakers' understanding of the range of tools and instruments they have for catalysing growth, and they often choose to sit on the sidelines, 'levelling' the playing field; this has reduced the confidence of the public sector, making it more vulnerable to being captured by vested interests, and 'rent-seeking' behaviour; and it has increased inequality by allowing some actors to exaggerate their role in creating wealth, and extract value well beyond their contribution to its creation (Mazzucato, 2017, 2018).

I argue that a better understanding of the role that the state has and can play in the wealth-creation process is the starting point for policy solutions that can increase the rate of wealth creation, while directing the process to achieve growth that is more inclusive and sustainable. This fundamentally requires tilting the playing field, not levelling it, to penalise rent-seeking, reward practices that foster long-termism and sustainability, and ensure a fairer distribution of that co-created wealth. Meeting the challenge of inequality requires less a redistributive state and more an *entrepreneurial state* (Mazzucato, 2013) where the way in which innovation is practised contains predistributive structures, making sure that both risks and rewards are shared (Lazonick and Mazzucato, 2013; Rodrik, 2015). This is the way to create innovation-led growth, which is also more inclusive growth; in so doing, this allows government to be less in the position of having to pick up the mess afterwards, and more in the position of directing growth to achieve the right outcomes in the first place (Palma, 2019).

In the following section, I review 'market failure theory' (MFT), which underlines the depiction of the state in economic theory as simply a market-fixer. I also look at the role that public choice theory has had in focusing on *government failure* as an even greater problem than market failure. Then I present an alternative view of the state as market-maker, which emphasises the role of public investments in driving innovation not just facilitating it, concluding with examples of public-sector wealth creation. I also introduce how mission-oriented policies can help to shift the status quo market-fixing dynamic towards market co-shaping. I consider how that value might be better distributed if it is understood as having arisen from a collective co-creation process where the taxpayer has also played a lead role. Finally, I introduce examples of direct forms of public rewards, and provide a conclusion.

Market failure theory: the state as a fixer

The idea that the state is, at best, a fixer of markets has its roots in MFT, which justifies public intervention in the economy only if it is geared toward fixing situations in which markets fail to efficiently allocate resources (Arrow, 1951). The market failure approach suggests that governments intervene to fix markets by investing in areas characterised by positive or negative externalities. For example, positive externalities arising from public goods (which are non-rivalrous and non-excludable) will be characterised by underinvestment by the private sector and will therefore require public investment. This is the case for basic research, which has high spillovers that create difficulties in appropriating private returns; consequently, basic research is characterised by too little private investment. Negative externalities, such as those created by pollution, require public measures that cause the private sector to internalise external costs, such as through a carbon tax. On top of this, the literature on systems of innovation has also highlighted the presence of system failures – for example, the lack of linkages between science and industry – requiring the creation of new institutions enabling those linkages (Lundvall, 1992).

A particular source of market failure comes from negative externalities that arise from the production or use of goods and services, such as climate change, traffic congestion and antibiotic resistance, for which there is no market. Many of the most significant societal challenges are characterised as negative externalities. Such failures work at the system level; that is, they amount to system failures. The socio-economic system as a whole results in costly outcomes that are undesirable from a societal point of view. For instance, climate change can be seen as a negative externality from carbon-intensive production methods or the burning of fossil fuels. Indeed, the Stern Review (Stern, 2006) on the economics of climate change stated that '[c]limate change presents a unique challenge for economics: it is the greatest example of market failure we have ever seen' (Stern, 2006). Negative externalities are not reflected in the price system: there is no 'equilibrium' price because there is no market for negative externalities. Many economists have called for market-based mechanisms (such as carbon pricing or carbon taxes) or neutral technology policies (such as tax breaks) to correct for this type of market failure, both of which leave the market to determine the direction of change.

While MFT provides interesting insights, it is, at best, useful for describing a steady-state scenario in which public policy aims to put patches on existing trajectories provided by markets. If brought to its extreme, as advocated by critics from public choice theory, MFT calls for the state to intervene as little as possible in the economy, in a way that minimises the risk of government failure, from crowding out to cronyism and corruption. Therefore, MFT is less useful – or could pose an active barrier – when policy is required to dynamically create and shape new markets; that is, 'transformation'. This means it is problematic for addressing innovation and societal challenges because it cannot explain the kinds of transformative, catalytic, mission-oriented public investments (Nelson, 1977; Foray, Mowery and Nelson, 2012; Mazzucato, 2018) that created

new technologies and sectors that did not previously exist. This includes the emergence of the Internet, the nanotechnology sector, the biotechnology sector, and the emerging clean-tech sector (Block and Keller, 2011; Sampat, 2012). Such mission-oriented investments coordinated public and private initiatives, built new networks, and drove the entire techno-economic process, which resulted in the creation of new markets (Mazzucato, 2015). This depiction is very different from assuming that the private sector is in a space and simply needs to be incentivised to invest more or less within that space. It is the space itself that has been created by public policy, with the private sector entering only later. The imagination and vision emanated from the policy itself, which was to actively take risks rather than just de-risking.

The economics of transformation: the state as *market-maker*

Yet the history of capitalism tells us a different story – the story of a state that has often been responsible for actively shaping and creating markets, not just fixing them. Indeed, markets themselves should be viewed as outcomes of the interactions between both public and private actors (as well as actors from the third sector, and from civil society). In his influential work, *The Great Transformation*, Karl Polanyi describes the role of the state in forcing the so-called free market into existence: 'the road to the free market was opened and kept open by an enormous increase in continuous, centrally organized and controlled interventionism' (Polanyi, 1944, p. 144). Polanyi's perspective debunks the notion of state actions as 'interventions'. It is rather a notion in which markets are deeply embedded in social and political institutions (Evans, 1995), and where markets themselves are outcomes of social and political processes. Indeed, even Adam Smith's notion of the free market is amenable to this interpretation. His free market was not a naturally occurring state of nature, 'free' from government interference. For Smith, the free market meant a market 'free from rent', which requires much policymaking (Smith, 1776).

And yet within economic theory, there is an absence of words to refer to the ways in which the actions of public institutions (visions, investments and regulations) contribute to value creation, not only its fixing up, or its distribution. Polanyi's analysis is not only about the way that markets form over the course of economic development. It can also be applied to understanding the most modern form of markets, and in particular those driven by innovation. Some of the most important general-purpose technologies, from mass production, to aerospace, and information and communications technology, trace their early investments to public-sector investments (Ruttan, 2006; Block and Keller, 2011).

A key characteristic of market-creating investments is that they are not limited to upstream basic research (the classic public good). Indeed, public investments that led to technological revolutions (information technology, biotech, nanotech) and new general-purpose technologies (such as the Internet) were distributed along the entire innovation chain: basic research through the National Science Foundation (NSF), applied research through the Defense Advanced Research Projects Agency (DARPA) and the National Institutes of Health (NIH), and early-stage financing of companies through agencies such as Small Business Innovation Research (SBIR) that use government procurement to allow small companies to scale up through providing innovative goods and services for the public sector (Block and Keller, 2011; Mazzucato, 2013). This means that these kinds of innovation instruments were spread across a decentralised network of different agencies across the entire innovation chain. While such agencies might not act together in a planned way, they were often driven by a vision to create new landscapes (in defence or life sciences) rather than to only fix problems in existing landscapes. Indeed, the Internet solved a problem – getting the satellites to communicate – and was funded by a problem-solving purpose-oriented agency inside government (i.e. DARPA). DARPA, the NIH and other such agencies have been successful precisely because they did not limit their role to fixing markets, often leading the

way rather than de-risking the leaders. Similarly, the BBC – a dynamic public broadcaster funded by the UK government – has achieved the success it has due to its willingness not only to do what the private sector does not do (e.g. quality news, documentaries, etc.) but also to transform the landscape of commercial areas such as soap operas (Mazzucato et al., 2020). This has required measures of public value inside the organisation that are not well understood in economics (Mazzucato and Ryan-Collins, 2019).

Such market-shaping also occurred through *demand pull* instruments, from government procurement policy (e.g. the state as a massive purchaser of semiconductors in the early stages, contributing to a fall in costs), as well as bold policies to shape consumer demand, such as suburbanisation, allowing the impact of the mass production revolution to become fully deployed and diffused across the economy.

From fear of picking winners to picking the willing

While the role of public investment is recognised in terms of the 'basics', such as infrastructure (without roads, businesses would have no way of transporting goods) and protecting private property, beyond that it is largely ignored. So, should the public sector do everything? Of course not. And government investment is not always a success story. The point is not that the private sector is unimportant, or that government investment will always lead to successes; but that in new sectors such as biotechnology, nanotechnology and the emerging green economy, private businesses have tended to invest only *after* returns were in clear sight. The animal spirits of business investors are themselves an endogenous function of public investment, roused only after public investments have laid the groundwork in the highest-risk and most capital-intensive areas. Indeed, it is when government investments are bold, strategic and mission-oriented that the most crowding in has happened. And key here is the need for government not to put all one's eggs in one basket – choosing big prize projects, but rather picking a direction that requires many organisations to innovate and invest, and designing instruments (procurement, grants, loans) to crowd in all those organisations that are willing to help achieve a problem – whether this be going to the moon or fighting climate change. In this sense, government support should not be about picking winners – blanket support to a firm or technology – but rather *picking the willing*.

Once we admit that the state has been a market-shaper and creator, a lead investor and a risk-taker, the next question is how to create a policy framework that can foster symbiotic public-private relationship, and to mobilise its energy towards addressing societal challenges and facilitating more sustainable growth. In the next section, I discuss mission-oriented innovation policies as a possible framework – one that is not about levelling but tilting. Not about picking winners but picking the willing. And not about lending as a last resort, but investing as a first resort – in areas that can create a more inclusive and sustainable economy.

From fixing markets to actively co-shaping

Mission-oriented policies can be defined as systemic public policies that draw on frontier knowledge to attain specific goals, or 'big science deployed to meet big problems' (Ergas, 1987). Missions exemplify a more proactive approach to policy than fixing suggests. It has required public organisations to be responsible for actively shaping and creating markets and systems, not just fixing them, and for creating wealth, not just redistributing it. In a market failure framework, *ex ante* analysis aims to estimate benefits and costs (including those associated with government failures), while *ex post* analysis seeks to verify whether the estimates were correct and the market failure successfully addressed. In contrast, a mission-oriented framework, which

actively co-creates new markets, requires continuous and dynamic monitoring and evaluation throughout the innovation policy process. The notion of public value becomes a more useful term than a public good, as missions may be transformative across the entire value chain and not be limited to narrow areas where positive and negative externalities exist.

While the archetypical historical mission is NASA putting a man on the moon, contemporary missions aim to address broader challenges that require long-term commitment to the development of challenges that are as much social as technological (Foray et al., 2012). The Apollo Program shows how a clear outcome – sending a man to the moon and back – drove consequential organisational change (intense state and business collaboration across multiple sectors), well-designed procurement contracts (fostering of bottom-up solutions), and the willingness to innovate and experiment (dynamic capabilities). Indeed, it was that experimentation that caused so many 'spillovers' from space research that benefitted us on Earth, from software to camera phones to baby formula (Mazzucato, 2021).

Missions do not fix existing markets but create new markets. Indeed, this ambition toward transformation can be seen in the explicit remit of mission-oriented organisations. Examples below from three classic mission-oriented agencies exemplify the point: the organisations are not about fixing existing markets but creating new landscapes.

- NASA: to '[d]rive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality, and stewardship of Earth' (NASA 2014 Strategic Plan).
- DARPA: '[c]reating breakthrough technologies for national security is the mission of the Defense Advanced Research Projects Agency'.
- NIH: to 'seek fundamental knowledge about the nature and behaviour of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability'.

By breaking new ground, and bringing together different players, these organisations are better able to attract top talent, as it is an 'honour' and interesting to work for them.

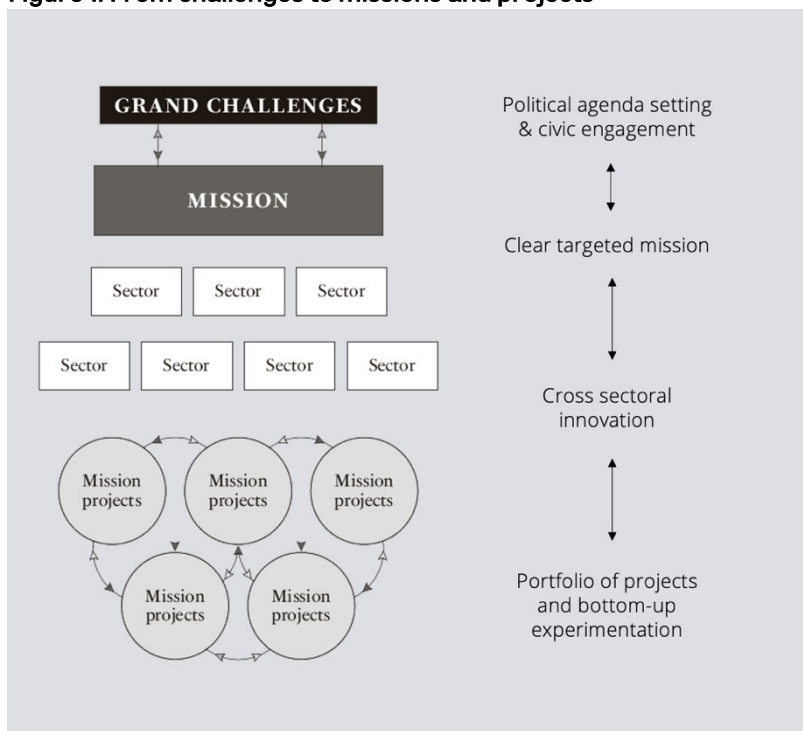
There is an active role being taken by governments and transnational organisations to develop strategies to tackle the grand societal challenges of our time. For example, a greener economy can be seen through a mission-oriented lens, as can those being developed to create improved well-being for an ageing population, and better jobs for modern youth (Mazzucato, 2018, 2019; European Commission, 2011). In fact, these challenges – which can be environmental, demographic, economic or social – have entered innovation policy agendas as key justifications for action, providing strategic direction for funding policies and innovation efforts.

The 17 Sustainable Development Goals (SDGs) are tangible starting points. Each can be transformed into several bold top-down missions that can stimulate multisectoral, bottom-up innovations, much in the same way that the Apollo Program sparked innovation in aeronautics, nutrition, materials, electronics, software, and more. By actively creating new areas of growth, they are also potentially able to crowd in business investment by increasing business expectations about where future growth opportunities might lie (Mazzucato, 2021). This proactive approach, whereby the state leads and business follows, is different from the traditional approach where the state is, at best, a fixer of markets, as described in the earlier sections.

Mission in focus: a green transition

Greening the economy demands and deserves nothing less than a moon-shot worthy of the mission. It is not a question of picking a series of outcomes that are only worthwhile for some market participants and disadvantage others. Solving climate change must be transformative across the entire economy. Public, private and civil actors alike will have to shift their mindset from short-term gains to long-run outcomes and profits, particularly against the background of financial stability and transition risks that form the landscape of climate change. Figure 1 illustrates the movement from broad challenges to specific missions.

Figure 1. From challenges to missions and projects



Source: https://ec.europa.eu/info/sites/default/files/mazzucato_report_2018.pdf.

Green growth is more complicated than the purely technological feat of getting to the moon. In *The Moon and the Ghetto*, Richard Nelson asks how we got a man to the moon but have not been able to solve key issues around inequality. 'Super wicked' problems require more attention to the ways in which social issues interact with political and technological issues, behavioural changes, smart regulation, and critical feedback processes. The so-called Maastricht Memorandum provides a detailed analysis of the differences between old and new mission-oriented projects. It will require innovation, of course, but also regulatory changes, behavioural changes, and much more consensus across the economy.

Today, missions are being taken up by governments and intragovernmental bodies around the world. Mission-oriented approaches are already in play in Europe and beyond – both in industrial strategy and wider innovation and research policy. It is at the heart of the European Union's €94 billion Horizon Europe programme within the Directorate-General for Research and Innovation (DG RTD). The science, research and innovation fund has taken on five Mission Areas with associated Mission Boards: Adaptation to Climate Change; Cancer; Restore our Oceans and Water by 2030; 100 Climate-Neutral and Smart Cities by 2030; and A Soil Deal for Europe (Mazzucato, 2018, 2019). The UK's 'challenge-led' industrial strategy, developed between 2017

and 2019, also demonstrates the possibilities of cross-sectoral rather than vertical or horizontal approaches, which missions around 'Clean Mobility' and 'Healthy Ageing' (UCL Commission for Mission-Oriented Innovation and Industrial Strategy, 2019). This strategy actively aims to link national policy with a raft of regional industrial strategies from devolved regions, including the city regions of Greater Manchester and Liverpool (Mazzucato, McPherson and Hill, 2019).

The Apollo Program was directed at a cold war Sputnik challenge. Today's missions can be directed at the global challenges posed for us by the SDGs, which express 17 inspirational goals, signed up to by 193 countries, and are an opportunity to move forward with mission-oriented thinking in green, inclusive and sustainable directions. The goals are about inequality, hunger, gender parity, climate change, and more. As such, the goals are inspirational, but to be actionable they must be translated into ambitious goals and achievable missions. For example, SDG 14 – 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development' – could be broken down into various missions, including 'a plastic-free ocean'. This would entail innovation and investment across a wide variety sectors from marine, waste, AI, chemicals and new materials.

Similarly, SDG 12 around climate change can be transformed into city-level targets for carbon neutrality, involving sectors as different as energy, construction, food, AI and real estate. The key here is to move away from a sectoral approach towards a challenge-oriented approach that requires many different sectors to invest and innovate. In doing so, sectors undergo a process of transformation. And the key trick is how to nurture and incentivise this transformation through instruments such as procurement, grants and loans, which can be designed in such a way as to foster bottom-up innovation.

Global missions of this sort also require international collaboration and regulations. Missions require not levelling the playing field but tilting it. This can be done through incentives that reward certain types of behaviour. For example, in the independent region of Biscay in Spain, the local government is using a new type of tax policy to reward firms that are making contributions towards Biscay's priority SDGs. Actions are tallied in a manner that allows for participating companies to be compared and they receive, where eligible, a different tax treatment. Such measures are crucial so that SDGs can help clarify what type of economy, society and environment we want and so that tax policy can be used to incentivise action towards these goals.

Thus, far from being simple market-fixers, missions require governments to rethink their role as market creators and shapers. At the same time, the recognition of the entrepreneurial role of the state as lead investor and risk-taker and the potential of the mission-oriented approach to shape public-private partnerships means that the public sector must not just set the background conditions, but also actively ensure the socialisation of rewards. A better realignment between risks and rewards, across public and private actors, can become a concrete way to allow smart, innovation-led growth to also become inclusive growth.

Socialising risks and rewards

In ignoring the entrepreneurial role of the state as lead investor and risk-taker, and focusing only on the role of the public sector as setting the background (horizontal) conditions, orthodox economic theory has also ignored the way in which the socialisation of risks should be accompanied by the socialisation of rewards. Indeed, the more downstream the public investments, in particular technologies and firms, the higher the risk that one of those technologies or firms will fail. But this is indeed normal, as any venture capitalist would admit: for

every success, there are many failures. In reality, the most successful capitalist economies have had active states that made risky investments, some of them contributing to technological revolutions.

But this then raises a more fundamental question: how to make sure that, like private venture capital funds, the state can reap some return from the successes (the 'upside'), in order to cover the inevitable losses (the 'downside') and finance the next round of investments. This is especially important given the path-dependent and cumulative nature of innovation. Returns arise slowly; they are negative in the beginning and gradually build up, potentially generating huge rewards after decades of investment. Indeed, companies in areas such as information and communications technology, biotechnology and nanotechnology had to accept many years of zero profits before any returns were in sight. If the collective process of innovation is not properly recognised, the result will be a narrow group of private corporations and investors reaping the full returns of projects that the state helped to initiate and finance.

So who gets the reward for innovation? Some economists argue that returns accrue to the public sector through the knowledge spillovers that are created (new knowledge that can benefit various areas of the economy) and via the taxation system due to new jobs being generated, as well as taxes being paid by companies benefitting from the investments. But the evolution of the patenting system has made it easier to take out patents on upstream research, meaning that knowledge dissemination can effectively be blocked and spillovers cannot be assumed. The cumulative nature of innovation and the dynamic returns to scale (Nelson and Winter, 1982) mean that countries stand to gain significantly from being first in the development of new technologies. At the same time, the global movement of capital means that the particular country or region funding initial investments in innovation is by no means guaranteed to reap all the wider economic benefits, such as those relating to employment or taxation. Indeed, corporate taxation has been falling globally, and corporate tax avoidance and evasion have been rising. Some of the technology companies that have benefitted most from public support, such as Apple and Google, have also been among those accused of using their international operations to avoid paying tax. Perhaps most importantly, while the spillovers that occur from upstream 'basic' investments, such as education and research, should not be thought of as needing to earn a *direct* return for the state, downstream investments targeted at specific companies and technologies are qualitatively different. Precisely because some investments in firms and technologies will fail, the state should treat these investments as a portfolio and enable some of the upside success to cover the downside risk.

In this context, it is important to note that a mission-oriented approach is not about government 'picking winners' in vertical industrial sectors, but about choosing directions for change – such as a green transition – that require horizontal investment and innovation in many sectors. The full power of policy instruments should be used to create projects that elicit solutions from many different willing actors. De-risking assumes a conservative strategy that minimises the risks of picking losing projects, but does not necessarily maximise the probability of picking winners, which requires the adoption of a portfolio approach for public investments (Rodrik, 2013). In such an approach, the success of a few projects can cover the losses from many projects, and the public organisation in question also learns from its loss-making investments (Mazzucato, 2013). Here, the matching between failures and fixes is less important than having an institutional structure that ensures that winning policies provide enough rewards to cover the losses, and that losses are used as lessons to improve and renew future policies. Research on the developmental state (Block and Keller, 2011) suggests that these goals are best achieved not through heavy top-down policies, but through a decentralised structure in which the organisation(s) involved remain nimble, innovative and dynamic from within (Breznitz and Ornston, 2013). This strand of thinking

can benefit from looking at the ways in which public–private partnerships were created when seeking the joint creation of new products and services, including vaccines (Chataway et al., 2007).

In particular, there is a strong case for arguing that, where technological breakthroughs have occurred as a result of targeted state interventions benefitting specific companies, the state should reap some of the financial rewards over time by retaining ownership of a small proportion of the intellectual property it had a hand in creating. This is not to say that the state should ever have exclusive licence or hold a large enough proportion of the value of an innovation to deter its diffusion (and this is almost never the case). The role of government is not to run commercial enterprises; it is to spark innovation elsewhere. But by owning some of the value it has created, which over time has the potential for significant growth, funds can be generated for reinvestment into new potential innovations.

By sharing risks and rewards, it is inevitable that those rewards going to the top 1% will be lower. The large digital companies (sometimes referred to as FAANG: Facebook, Amazon, Apple, Netflix and Google) have received a large share of income produced by a collective value creation process. For instance, Google's revenue in 2021 was \$185,527 billion but it employed only 139,995 staff, while Apple's revenue was \$274,515 billion with only 147,000 – both corporations relying largely on the collective value created by the billions of users of its platform and products worldwide.¹ Meanwhile, Facebook has received \$785,491,326 in disclosed state subsidies, mostly for data centres, including a \$355 million deal with the state of Georgia, \$150 million packages from Utah and Texas and \$41 million from Oregon.²

If that value is shared more equally, there is no doubt that the share going to FAANG will be lower. Thus, not only must they be paying their fair share of tax, often avoided through tax gimmicks (Mazzucato, Entsminger and Kattel, 2020), but also they should be capturing a lower share in the first place. For example, it was the NSF that funded the Google algorithm. There could be, in the future, a clause in the grant that says that if the grant does not lead to any commercial success, the company owes nothing back. But if the profits made on the back of the public grant or loan leads to X billion in profits for the company, a share of that profit goes to a public wealth fund that can help replenish the public pot to create more Googles.

Similarly, the guaranteed loan that from the US Department of Energy that went to both Tesla and Solyndra could be structured as a proper public portfolio where the government does not only cover the losses when things go bad (e.g. Solyndra) but also gets an upside when things go well (e.g. Tesla). Indeed, the Obama Administration gave nearly the same amount to the two companies during the 2009 post-financial recovery period (Tesla received \$465 million in a guaranteed loan, and Solyndra received \$500 million). Strangely, the agreement was that if Tesla did not pay back the loan, the government would get three million shares in Tesla – an odd deal given that usually when a company does not pay back a loan it is because things are not going well. The idea of a public stake in a bad company is not what taxpayers want. Instead, had the deal been that the government would get three million shares if the loan was paid back, it would have been a good deal. As the share price increased from \$9 in 2009 to \$90 in 2013, the difference multiplied by \$3 million could have gone back to a public fund, covering both the Solyndra loss and a next investment round. The problem is that by not admitting that the state in that case acted like a public venture capitalist, it ends up socialising risks but privatising rewards.

¹ See <https://growthrocks.com/blog/big-five-tech-companies-acquisitions/>.

² Figures taken from <https://subsidytracker.goodjobsfirst.org>.

Another way to socialise rewards in a non-monetary way is to make sure that the companies receiving public subsidies, guarantees and direct investments operate in a way that serves the public. For example, the extraction of value from the real economy that has been a result of the increasing use of share buybacks (Lazonick, 2014) can be reversed through conditionalities that assure that profits being earned from a process of collective wealth creation are reinvested back into the economy. The direction of that investment can also be a condition; for example, making sure that energy companies that receive subsidies transition more to renewables. A recent loan to the German steel industry was conditional on the sector lowering its material composition, which it does through innovations around recycling, repurposing and reusing material throughout the value chain. (Vogl, Åhman and Nilsson, 2020).

There are also good examples emerging from the ongoing COVID-19 crisis. When negotiating bailouts for industries suffering, such as airlines not flying, some states are seeking concrete societal benefits. To accelerate greening of industrial sectors, Austria has made its airline-industry bailouts conditional on the adoption of climate targets, while France has also introduced five-year targets to lower domestic carbon dioxide emissions. And both Denmark and France are denying state aid to any company domiciled in an EU-designated tax haven and barring large recipients from paying dividends or buying back their own shares until 2021.

Similarly, governing innovation for the public good has been highlighted during the COVID-19 pandemic. To maximise the impact on public health, the innovation ecosystem must be steered to use collective intelligence to accelerate advances. Science and medical innovation thrives and progresses when researchers exchange and share knowledge openly, enabling them to build upon one another's successes and failures in real time. The COVID-19 technology access pool (C-TAP), which is a voluntary pool for health technology-related knowledge, intellectual property and data proposed by Costa Rica and adopted and launched by the World Health Organization on 29 May 2020, has offered a pragmatic solution with game-changing significance (World Health Organization, 2020). However, it remains unused to this day.

COVID-19 has also brought to light the possible use of equity stakes by converting government loans (such as the UK's Future Fund) to shore up the supply shock experienced especially by small and medium-sized enterprises, and to protect the enterprising fabric of the society. Also, the crisis reveals the need for developing a 'public option' for the production of affordable and quality-assured key resources that are prone to shortages and supply chain disruptions, and to ensure their availability and accessibility especially at times of emergency. Furthermore, the idea of structuring recovery funds and bailouts to be conditional on private sector investment in areas needed for a green transition has found foot in some countries, including France and Austria. Conditionalities are indeed a way for risks and rewards to be shared so the 'deal' for the government is investment towards beneficial areas – truly 'building back better'.

Examples of direct and indirect public 'returns' for public investments

There are many examples of public organisations that have strategically considered the distribution of risks and rewards. At times, they have granted licences to private firms willing to invest in upgrading publicly owned technologies, offering the opportunity for public and private to share risks and also rewards. For example, NASA has sometimes captured the returns from its inventions, while private partners gained on the value-added in the case of successful commercialisation (Kempf, 1995). During the time of the Apollo Program, NASA also placed a 'no excess profits' clause in its procurement contracts, to make sure that public investments led to more equitable division of returns (Mazzucato, 2021). Further, there are examples of state-owned venture capital activity generating royalties from public investments (e.g. in Israel; see

Avnimelech, 2009) or equity (e.g. in Finland via SITRA, the Finnish Innovation Fund), and the more pervasive use of equity by state development banks (e.g. in Brazil, China and Germany; see Mazzucato and Penna, 2016).

Policy instruments for tackling risk–reward issues combine supply- and demand-side mechanisms, and are geared to enabling public value creation through symbiotic public–private partnerships ('active'; Lazonick and Mazzucato, 2013) and blocking value extraction ('defensive').

The different mechanisms for distributing rewards can work either directly through profit-sharing (via equity, royalties) or indirectly through conditions attached, focused more on the market-shaping role. The latter may involve conditions on the reinvestment of profits, conditions on pricing or conditions on the way that knowledge is governed. I review these below, including the examples at the end of the section 'Mission in focus: a green transition', categorised here in terms of their features.

Direct measures to secure 'upside' for the state

(a) Revenues beyond taxation. On the strategic front, to ensure that both risks and rewards are shared with supported firms, the government might claim a share of the financial gains resulting from public investments, which it can use to cover the inevitable losses and make future investments. Compared with the indirect measures discussed below, direct profit-sharing can better generate directionality of innovation and enhance the flexibility of the management of the recouped revenues. The choice of a profit-sharing mechanism and its intended form of public return should be considered according to the financing instruments selected to support innovation (Laplane and Mazzucato, 2020). A number of examples are summarised in Table 1.

(b) Equity stakes. Governments can, as in the Tesla and Solyndra case described above, take equity stakes in companies that it helps to finance. This has been done in countries with public venture capital funds (e.g. Yozma in Israel) or by public banks (e.g. European Investment Bank, KfW bank in Germany, SITRA in Finland). The idea is that a public fund is rewarded for its high-risk investments, with a gain on the upside of successful investment, through shares of other forms of stakes. Such shares can be used to replenish the fund so that it can cover losses and invest in future rounds. Interestingly, such policies have become more popular now with the COVID-19 recovery funds, where it has been argued that the government should be taking equity stakes in the companies it helps to bail out (Hockett, 2020). But rather than seeing this only as an issue during a crisis-related bailout, the bigger issue is how a public investor of first resort, necessary to innovation-led growth, get back its reward for risk taken. Equity stakes are one possible answer.

Indirect measures to ensure benefits in the public interest

(c) Pricing capping schemes. On the defensive side, to ensure taxpayers do not pay twice, governments might want to adopt pricing-capping regulations instead of relying on market forces to spontaneously produce equitable prices. Indeed, such a possibility exists under section 203 of the Bayh–Dole Act, which established the US government's 'march-in' right over pharmaceuticals if, among other reasons, patent holders that benefitted from public funding fail to satisfy the 'health and safety needs' of consumers (Sampat and Lichtenberg, 2011). Despite numerous discussions over time (Davis and Arno, 2001; Korn and Heinig, 2004), it has not thus far been implemented. Another instrument for ensuring competitive prices is the implementation of competition and antitrust policies, which may be far less tolerant of monopoly prices than has been the case over, say, the past 40 years in the US (Stiglitz, 2017).

- (d) Conditions on reinvestments.** Another possibility is to negotiate conditions on reinvestment into the real economy, which can be achieved through regulation and/or attached to financing contracts. In fact, the inception of Bell Labs resulted from the Department of Justice's implementation of antitrust laws (Brumfiel, 2008): in 1925, among the conditions imposed on AT&T in order for it to be able to retain its monopoly over the phone system, the US government required the company to reinvest a share of its profits in research. Conditions targeting the creation of specific commercial, industrial or technological benefits in the context of defence-related procurement ('offset agreements') are also common practice in many countries – most remarkably in Sweden, where this instrument has been explicitly part of a strategy to promote the military aircraft industry (Eliasson, 2017).
- (e) Knowledge governance.** Several measures can be articulated to advance the creation and diffusion of the key knowledge needed to tackle problems such as climate change, poverty, etc. One is to reform the Intellectual Property Rights (IPR) system so as to harmonise it with the broader set of institutional requirements for multiple actors to access and use knowledge (Henry and Stiglitz, 2010). This involves ensuring that the IPR system is flexible enough and patents are good quality, used for productive instead of financialisation purposes, and narrow in scope and length (Mazzoleni and Nelson, 1998; Frischmann and Lemley, 2007). IPR may also be managed strategically through the exploitation of some of the flexibilities still left under the World Trade Organization agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). For example, governments may choose – or threaten – to issue compulsory licences in order to obtain access to knowledge and/or price reductions on proprietary goods. In the 2000s, this was used to promote access to medicines (e.g. in Brazil, India, Indonesia, South Africa, etc.) and genetic diagnostic tests (in France), and the purchase of antibiotics for defence purposes³ (in the US; see Reichman, 2009). Where IPR block the creation and diffusion of knowledge that is key for competitors (e.g. through refusals to license or defensive patenting behaviour), competition and antitrust policies may help, as applied by European authorities (Motta, 2004). These may be more effective if supplemented by alternative incentives such as 'open source' and prizes. In particular, featuring as lead investor offers more opportunities for public organisations to choose whether to hold title over resulting inventions and negotiate licensing conditions, while engendering within-industry and across-the-economy spillovers, as defence-related R&D spending in the US illustrates (Mowery, 2009).
- (f) Tax reforms.** On the one hand, tackling present evasion, avoidance, loopholes and tax incentives for unproductive entrepreneurship – such as the patent box, which increases profits without increasing business investments, or reduced tax rates over capital as compared with corporate gains – may enhance the government's revenues and its redistributive capacity (Lazonick and Mazzucato, 2013). On the other hand, tax regulation can be designed to more actively incentivise productive entrepreneurship using measures such as low taxation for hiring labour and high taxation for financial transactions. In addition, in seeking to capture a direct share of the profits resulting from strategic investments, the state may choose to create some form of tax-based mechanism (Enke, 1967). Realistically, however, distributive tensions require governments to be creative and, wherever possible, seek tax reforms that may more commensurately reflect its role in the economy – not just 'fixing' but also 'creating' markets.

³ See McNeil, D., Jr (2001), 'A nation challenged: the drug, a rush for Cipro and the global ripples', New York Times, 17 October, available at <http://www.nytimes.com/2001/10/17/world/a-nation-challenged-the-drug-a-rush-for-cipro-and-the-global-ripples.html>.

Table 1. Existing policy instruments for financing innovation that allow for profit-sharing (selected examples)

Financing instruments	Types	Key features	Returns to funding agency	Some country examples
Debt financing	Repayable grants/advances	Repayment required, partial or total; could be granted on the basis of private co-funding	Royalties of IPR licensing or levy on sales	Repayment grants for start-ups from 2014 to 2016 (New Zealand)
Debt/equity financing	Mezzanine funding	Combination of several financing instruments that incorporate elements of debt and equity in a single investment vehicle	Interest rates plus spread	Credit line mezzanine financing (Portugal)
Equity financing	Venture capital funds and fund of funds	Funds provided by institutional investors (e.g. banks, pension funds) to be invested in firms at early-to-expansion stages; referred to as patient capital, due to lengthy time span for exiting (10–12 years)	Equity stakes	Innpulsa (Colombia), National Innovation Fund – Venture Capital Fund (Czech Rep.), Corporate Venture Programme (France), Yozma Fund (Israel), Scottish Co-Investment Fund (UK)

Public procurement for R&D and innovation		Demand for technologies or services that do not exist yet; or purchase of R&D services (pre-commercial procurement of R&D)	IPR of research results; agency can opt to shift ownership to contractors and establish licensing conditions	Entrepreneur Growth Strategy (Estonia), Strategy for Public Procurement (Sweden), Small Business Innovation Research (SBIR) Program (US) and SBIR-type of programmes (UK)
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Source: Adaptation of OECD (2014, 2016) by Laplane and Mazzucato (2020).

Conclusion

I have argued that considering the state as not only a market-fixer, but also – and especially – a market-maker and shaper, provides a different justification for its contribution to economic growth, and hence to a just division of rewards between public and private actors. A mission-oriented approach can be conducive to creating and reinforcing symbiotic public–private partnerships towards addressing societal challenges. Given the state's role as risk-taker, and investor of first resort, new thinking is required for the ability of public institutions to share not only in the risks, but also in the rewards. This can encourage new thinking on how to achieve growth that is not only 'smart' (innovation-led) but also more inclusive. Mechanisms that find ways to socialise both risks and rewards can have an important effect on inequality as they create a 'pre-distribution' approach. By allowing the state to retain a share of the rewards created through a process it contributes to, those rewards can be reinvested back into areas that directly create a more inclusive and sustainable economy. This can help states be more strategic and proactive in investments. Without this, government needs to focus most of its energy on *redistribution*, due to the negative consequences on inequality that arise when incomes are skewed, rewarding the few for the activities of the many. It also provides a new view on stakeholder value (Schwab and Vanham, 2021), placed however not just as the centre of corporate governance reform, but at the centre of where value is created in the first place: at the interface between different actors in the economy. When value is created collectively, it should be shared collectively. If one does not buy into the first part, with the faulty assumption that wealth creation happens only inside business and the state can, at best, fix market failures along the way, then the second part will continue to prove futile.

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