The entrepreneurial state: socializing both risks and rewards

Mariana Mazzucato [Institute for Innovation and Public Value, University College London, UK]

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Abstract
The paper looks at the way the state is understood in traditional economic theory, as limited to "fixing markets" and to "enabling" or de-risking the private sector. These assumptions are based on a limited understanding of value creation, as only happening within business organizations. Value is understood as being enabled or redistributed by the state, but not co-created by it. In truth, the state has often actively co-shaped markets, and taken high risks, before the private sector was willing or able. This is especially true in the innovation economy, where individual entrepreneurs and companies are mythologized as being the only risk-taking wealth creators. Understanding the market shaping and co-creating role of the state requires recognizing that public actors are also risk-taking investors, and the implication of this for how rewards are shared between public and private actors. A market shaping role of public policy, which also allows risks and rewards to be socialized, can better enable growth to be both "smart" (innovation-led) and also more inclusive.

1. Introduction

How should the wealth that an economy generates be distributed? Moral as well as economic arguments about who should be entitled to what – whether paid in wages, retained profits, or dividend payments – 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 theorized. In this way, different theories of how value is created can be used to justify very different distributions of income and wealth. If entrepreneurs are believed to make extraordinary contributions to value creation, then maybe extraordinary rewards are justified? If hedge fund managers really do create more wealth than small nations, then might their initial rewards be both efficient and fair? In this paper we argue that the contribution to value creation by the state – the different parts of the public sector – has been problematically theorized. 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 realized. But with a new approach to policy, 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. In microeconomics, it is seen as *fixing* markets, not creating them. In industrial-innovation economics, its role is limited to spending on public goods like science or infrastructure and de-risking the activities of innovators, and does not extend to being an innovator itself. In macroeconomics, it is seen as fixing the business cycle and as a lender of last resort. It is not seen as a lead risk-taker across the business cycle or an *investor* of first resort. And if or when a public agency does dare to make strategic choices and take risks, it is often accused of crowding out the private-sector actors, or of being too inept to "pick winners".

This limited view of the role of the state in the dynamics of wealth creation has had three problematic effects. First, it has limited policymakers' understanding of the range of tools and

instruments they have for catalysing growth, often choosing to sit on the sidelines, "levelling" the playing field. Second, it has reduced the confidence of the public sector, making it more vulnerable to being captured by vested interests, and "rent-seeking" behaviour. Third, 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.

The paper argues 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 reducing rent-seeking and ensuring 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) or, as Rodrik has argued, shifting the focus from a "Welfare State to an Innovation State" (Rodrik, 2015). This is the way to create innovation-led growth which is also more inclusive growth.

The paper is organized as follows**.** Section 2 reviews the economic and political thinking behind the depiction of the state as simply a market-fixer. It also looks at the role that public choice theory has had in focusing on *government failure* as an even greater problem than market failure. Section 3 presents an alternative view of the state as market-maker, drawing on the work of Polanyi, Keynes, as well as the neo-Schumpeterian literature that has emphasized the role of public investments in driving innovation, not just facilitating it. This section concludes with examples of public-sector wealth creation. Section 4 looks at the other side of the coin: government investments that have led to failures. In doing so, it considers the need to understand failure in two ways: (1) as part and parcel of the investment and innovation process; and (2), failure that arises from instances where the state is captured by vested interests, which make money simply by moving around existing wealth, not creating new wealth. In cases where the public sector is not captured and is producing new value, section 5 considers how that value might be better distributed if it is understood as having arisen from a collective co-creation process where the tax-payer has also played a lead role. Section 6 concludes.

2. The state as *market-fixer*

The idea that the state is at best a fixer of markets has its roots in neoclassical economic theory. But this view has hardened in recent years as a result of an ideological political project against the state. We review both perspectives briefly.

Based on Arrow's first fundamental theorem of welfare economics (Arrow, 1962), when markets are complete, competitive, and operating in equilibrium, they are taken to be the most efficient allocators of resources. But these conditions are rarely obtainable, and five broad categories of "market failure" which justify government "intervention" have been identified: (1) coordination failures, including inter-temporally through the operation of the business cycle, making it difficult to coordinate expectations and preferences (Stiglitz, 1974); (2) public goods such as clean air or new knowledge arising from basic research; (3) imperfect competition, whether arising from natural monopolies, network effects, or economies of scale; (4) information failures, leading to adverse selection, moral hazard, or high transaction costs (Stiglitz and Weiss, 1981; Coase, 1960); and (5) negative externalities such as traffic congestion or climate change (Stern, 2007). Government intervention is justified when any of these conditions exist.

If government is viewed as, at best, a fixer of market failures, at worst it is seen as an impediment to growth, given its natural tendency towards corruption, of capture by the lobbying of specific business interests, inefficiency, and the risk its actions will crowd out other private actors (Friedman, 1979) and will be constantly vulnerable to lobbying of specific business interests (Krueger 1974; Falck, Gollier and Woessmann, 2011). In this caricature, governments are Hobbesian leviathans, sucking dry the dynamic energy of the market, and an ever-present threat to the creativity and dynamism of the private sector (Phelps, 2013). Market failure is therefore a necessary but not sufficient condition for governments to act (Wolf, 1988). There is a trade-off between two inefficient outcomes – one generated by markets, and the other generated by "government failures" from intervention. The benefits of acting must outweigh the costs that may arise from these risks of "government failure" (Tullock, Seldon and Brady, 2002).

In this dominant view, government's main role is to set the rules of the game and to keep them working (the rule of law); fund basic public goods such as infrastructure and education; "level the playing field" so that industry and competition can thrive (through competition rules or support to new firms in order to compete with incumbents); and devise market mechanisms to internalize external costs (e.g. pollution) or benefits (e.g. herd immunity). If and when the public sector does more than intervene in areas characterized by market failures, it is deemed to be causing different types of problems, such as: (1) crowding out the private sector; (2) government failure due to the inability of the state to "pick winners"; and (3) government failure due to the state's inevitable vulnerability to capture by rent-seeking private interests (Buchanan, 2003).

Although scepticism about the role of government dates back to the first developments of philosophy, and later, economics, the strict modern formulation of the limits to government can be traced to the rise of New Public Management theory, which grew out of Public Choice theory in the 1980s. This perspective has been used to convince governments that the way they can be less burdensome is to emulate the private sector as much as possible (Buchanan, 2003). Judt (2011) has shown how the dismantling of the welfare state, a political project that began with Reagan and Thatcher in the late 1970s–early 1980s, co-evolved with this theoretical framework. And Jones (2014) shows how the neo-liberal agenda was underpinned by the view of the state as an inept and constantly captured entity. These trends have led to an undermining of confidence in the positive power of public institutions, and an increasing outsourcing of government functions to the private sector: it is surely easier to get business to act like business than for government to do so (Crouch, 2016).

This view of government also has its roots in the way that output is measured in both macro- and microeconomics. Government typically exists in macroeconomic theory, as a redistributor of the wealth that is created by companies, and an investor in some basic public goods like infrastructure, basic research, and education. It normally exists only in macroeconomic models that look at the effect of regulation or investment at the aggregate level. And it is totally missing from the microeconomic *production function*, where value is created. In microeconomics, total output is understood in terms of the (marginal) productivity of labour, capital, and technology inputs. The production function posits the relationship between the output that a company produces and the various inputs it uses, including labour, machinery, and technology. Yet this view disregards the enormous government inputs that have created both the human capital and the technology that enter the production function, as well as the early stage high-risk financing that innovative companies require. In essence, in standard

microeconomics, government is ignored, except for its role in regulating the prices of inputs and outputs, and fixing market failures of different types.

3. The state as *market-maker*

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 seminal work, *The Great Transformation*, Karl Polanyi (1944) 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" (p. 144). Polanyi's perspective debunks the notion of state actions as "interventions". It is rather one 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). Indeed, all of the technologies which have made Apple's i-products (iPhone, iPad, etc.) "smart" were initially funded by public-sector institutions: the internet by the Defense Activated Research Projects Agency (DARPA); global positioning system (GPS) by the US Navy; touchscreen display by the Central Intelligence Agency (CIA); and the voice-activated personal assistant Siri by DARPA again (Mazzucato, 2013).

Key to understanding the implications of these histories is that public investments in the areas named above were not limited to simply funding "basic" research, a typical "public good" in market failure theory (Arrow, 1962; Nelson, 1959). In the US, for example, government agencies funded areas along the entire innovation chain: both basic *and* applied research and, in many cases, provided downstream early stage high-risk finance to companies deemed too risky by the private financial sector.

For example, in its early years, Apple received $500,000 from the Small Business Investment Corporation, a financing arm of the US government (Audretsch, 2003). Likewise, Compaq and Intel received early stage funding to set up the companies, not from venture capital but from the public Small Business Innovation Research (SBIR) programme. This programme has been particularly active in providing early stage finance to risk-taking companies – more so than private venture capital (Keller and Block, 2013). Indeed, while it is a common perception that it is private venture capital that funds start-ups, evidence shows that most high-growth innovative companies receive their early stage high-risk finance from public sources, such as

Yozma in Israel (Breznitz and Ornston, 2013); venture funds in public banks (Mazzucato and Penna, 2016); and the SBIR programme funds in the US (Keller and Block, 2013). Although venture capital entered the biotech industry in the late 1980s and early 1990s, all the heavy investments in this sector occurred in the 1950s, 1960s and 1970s – and were mostly made by the state (Lazonick and Tulum, 2011; Vallas, Kleinman and Biscotti, 2011). Indeed, around 75 percent of the most innovative drugs on the market today (the so-called "new molecular" entities with priority rating) owe much of their funding to the public US National Institutes of Health (NIH) (Angell, 2004). Since 2000, the NIH has invested more than $400 billion (2013 dollars) in the biotech-pharma knowledge base, and $29 billion in 2013 alone.[126] These "mission-oriented" institutions (Mazzucato, 2017/2018b; Mowery, 2010; Foray, Mowery and Nelson, 2012) actively created new industrial and technological landscapes.

This pattern is being repeated in renewable energy, where the US government has been behind some of the most important advances through innovation in agencies such as the Advanced Research Projects Agency–Energy (ARPA-E), the sister organization of DARPA in the Department of Energy, as well as the recent revolution in fracking to extract shale gas (Trembath et al., 2012). And the Chinese government is today the largest global funder of green innovations (Mazzucato and Semieniuk, 2016). In all these cases – from ICT to health and energy – it has been these early direct public investments that have prepare the ground, creating and shaping new landscapes that businesses develop only later.

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 suburbanization, allowing the impact of the mass production revolution to become fully deployed and diffused across the economy.

Should the public sector do everything? Of course not. The point is not that the private sector is unimportant, but that in new sectors like biotechnology, nanotechnology, and the emerging green economy, private businesses have tended to invest only *after r*eturns 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. This role of public investment is recognized in terms of the "basics", such as infrastructure (without roads, businesses would have no way of transporting goods) and protecting private property. But beyond that it is largely ignored

4. Government failures

Of course the story is not always a positive one. While the examples above focus on public investments that have led to important successes (e.g. the internet, GPS, shale gas, blockbuster drugs), there are also government investments end in failure. These include investment in products like the Concorde aircraft, which ultimately failed commercially; in the discovery of new drugs (of which most attempts fail); or the provision of guaranteed loans to companies which then might go bankrupt. An example of the latter includes the guaranteed loan of $528 million provided by the US Department of Energy to the company Solyndra for the production of solar cells. This was followed by the company's bankruptcy when the price

[126] http://officeofbudget.od.nih.gov/approp_hist.html

of silicon chips fell dramatically, leaving the taxpayer to pick up the bill (Wood, 2012). Any venture capitalist will argue that attempts to innovate require exploring new and difficult paths, and that occasional failure is part of that journey. Indeed, a similar guaranteed loan ($465 million) was provided to Tesla for the development of the Model S electric car – which led to success. This *trial-and-error* process, in which tolerance of failure is also the road to success, is accepted in the private sector, but when governments fail this is regarded as a sign of incompetence, often leading to accusations of the government being unable to "pick winners". As a result, public organizations are frequently told to stick to "levelling the playing field", and to promote competition without "distorting" the market by choosing specific technologies, sectors, or companies to invest in (Owen, 2012). Yet this ignores our first point that markets are outcomes. And they have historically been outcomes of government playing a lead role: none of the great advances of the twentieth century would have occurred without public investment.

There are, nevertheless, good reasons to worry about government failures outside this natural trial-and-error explorative process. These reasons arise from situations where "rent-seeking" behaviour in the business community leads to government being captured by vested interests (Tullock, Seldon and Brady, 2002). Rents arise when value is extracted through special privileges (Kruegher, 1974), and when a company or individual grabs a large share of wealth that would have been produced without their input (Stiglitz, 2012 p. 32). The idea is that profit-maximizing firms are likely to try to increase their profits through special policy-related favours, and this often leads to success on their part because politicians and policymakers are seen as naturally prone to corruption. Rent-seeking could arise from specific companies, or sectors, seeking extra funding from government through either a subsidy or a tax credit of some sort. Such concerns are valid. But these problems become more acute precisely when there is not a clear view of government value. If the state is seen as irrelevant, it will over time also become less confident, and more easily corruptible by different actors who call themselves the "wealth creators". It is these actors who can then convince policymakers to hand out favours in order to increase wealth.

Furthermore, some rent-seeking may occur precisely as a result of the problematic assumptions regarding the role of public investment. If private investment is driven by perceptions of future opportunities in a sector, and if those opportunities are highly correlated with direct public investments that create markets into which business investment later moves, then policy tools which are overly focused on indirect support to business (e.g. via tax incentives) will create far less additionality. That is, they will not make things happen that *would not have happened anyway.* They may increase profits (through a reduction of costs), but not investment. And the primary objective of the policymaker should be to increase business investment, not profits. In this sense, such policies can lead to rent-seeking outcomes, even if there were no explicit "rent-seekers": they result in a company or individual earning income without having generated any wealth.

An example is the way in which the private equity and venture capital community successfully persuaded governments in the US and Europe of their wealth-creating potential, and of the need to reduce capital gains to make this happen. In the US, capital gains tax fell by 50 percent in five years at the end of the 1970s as a result of pressure from the National Venture Capital Association (Lazonick and Mazzucato, 2012). As the US investor Warren Buffett put it, such policies do little for investment, which is driven by expectations of growth opportunities, or what he calls "sensible" investments, while increasing job destruction and inequality (Buffett, 2011).

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 make sure that policy leads not only to the socialization of risks but also 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. We turn to this in section 5.

5. Socializing 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 socialization of risks should be accompanied by the socialization 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. The Finnish public innovation agency, SITRA, has had some great successes, but also some failures. Likewise, Israel's public venture capital fund Yozma. In the Anglo-Saxon economies public debate has been too quick to criticize public investments when they go wrong, and too slow to acknowledge the state's role in those that succeed.

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 like ICT, 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 recognized, the result will be a narrow group of private corporations and investors reaping the full returns of projects which 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 benefiting 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), means 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 rising. Some of the technology companies which have benefited the most from public support, such as Apple and Google, have also been among those accused of using their international operations to avoid paying tax (Johnston, 2014). 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 particular, there is a strong case for arguing that, where technological breakthroughs have occurred as a result of targeted state interventions benefiting 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 adopting a "portfolio" approach to public investments in innovation, success from a few projects can then help cover the losses from other projects. In this way, *both* risks and rewards are socialized (Mazzucato, 2016).

Examples of direct forms of public rewards

There are many examples of public organisations that have strategically considered the distribution of risks and rewards. At times, they have granted licenses to private firms willing to invest in up-grading publicly-owned technologies, offering the opportunity for public and private to share risks and also the rewards. For example, NASA has sometimes captured the returns to its inventions, whilst private partners gained on the value-added in case of successful commercialization (Kempf, 1995). Further there are examples of state-owned venture capital activity generating royalties from public investments (in Israel, see Avnimelech, 2009) or equity (in Finland via Sitra), and the more pervasive use of equity by state development banks (eg in Brazil, China and Germany, see Mazzucato and Penna, 2016).

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

The different mechanisms to distribute rewards can be done either directly through profit sharing (via equity, royalties) or indirectly through conditions attached, focussed more on the market shaping role. The latter may involve conditions on reinvestment of profits, conditions on pricing, or conditions on the way that knowledge is governed. We review these below (for a longer discussion see Laplane and Mazzucato, 2018).

a) **Pricing capping schemes.** On the defensive side, to ensure that 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 benefited from public funding fail to satisfy "health and safety needs" of consumers (Sampat & Lichtenberg, 2011). Despite numerous discussions from time to time (Davis & Arno, 2001;

Korn & 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 with monopoly prices than it's been, say, over the past 40 years in the U.S. (Stiglitz, 2017).

b) **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. As a matter of fact, the inception of the Bell Labs resulted from the Department of Justice's implementation of antitrust laws (Brumfiel, 2008). In 1925, among the conditions imposed on AT&T Company to be able to retain the monopoly over the phone system, the US government required the company to reinvest a share of its profits in research. Also, conditions targeting the creation of specific commercial, industrial or technological benefits in the context of defence-related procurement ("offset agreements") is 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), but also in the US and Brazil (Vieira & Alvares, 2017) among others.

c) **Knowledge governance.** Several measures can be articulated to advance the creation and diffusion of the key knowledge needed to tackle problems like climate change, poverty, etc. One is to reform the Intellectual Property Rights (IPR) system so as to harmonize it with the broader set of institutional requirements for multiple actors to access and use knowledge (Henry & Stiglitz, 2010). This involves ensuring IPR is flexible enough and patents are good quality, used for productive instead of financialization purposes, narrow in scope and length (Mazzoleni & Nelson, 1998; Frischmann & Lemley, 2007). IPR may also be managed strategically through the exploitation of some of the flexibilities still left under the WTO-TRIPS agreement. For example, governments may choose to issue compulsory licenses or threat to do so in order to obtain access to knowledge and/or price reductions on proprietary goods. In the 2000s, this has been used to promote access to medicines (e.g. in Brazil, India, Indonesia, South Africa, etc.), genetic diagnostic tests (in France), and government's purchases of antibiotics for defence purposes[127] (in the US) (Reichman, 2009). Where IPR blocks 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 like "open source" and prizes. In particular, featuring as lead-investors offers more opportunities for public organizations to choose whether to hold title over resulting inventions, and negotiate licensing conditions, whilst engendering within-industry and across the economy spillovers, as defence-related R&D spending in the US illustrates (Mowery, 2009).

d) **Tax reforms.** On the one hand, tackling present evasion, avoidance, loopholes, and tax incentives for unproductive entrepreneurship – like the patent box which increases profits without increasing business investments, or reduced tax rates over capital as compared to corporate gains – may enhance the government's revenues and its redistributive capacity (Lazonick & Mazzucato, 2013). On the other one, tax regulation can be designed

[127] D. McNeil Jr. "A nation challenged: the drug, a rush for Cipro and the global ripples", *The New York Times*, October 17, 2001. Available at: http://www.nytimes.com/2001/10/17/world/a-nation-challenged-the-drug-a-rush-for-cipro-and-the-global-ripples.html

to more actively incentivize productive entrepreneurship using measures such as low taxation for hiring labour and high 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 for tax reforms which may more commensurately reflect its role in the economy – not just "fixing" but also "creating" markets.

e) **Revenues beyond taxation.** On the strategic front, to ensure that both risks and rewards are shared with supported firms, government might use royalties on IPR licensing or sales/exports of supported innovations through "recoupment measures" like income or sales-contingent (repayable) funds (Windus & Schiffel, 1976). This has been the case in the Dutch Technological Development Loan program carried out by the Senter-agency of the Ministry of Economic Affairs, from 1954 to 2001 (Kaivanto & Stoneman, 2007). While these have been most often implemented in support to SMEs, there are also experiences of using this type of schemes to finance projects in large firms, such as in the aircraft industry. This suggests that some innovations around this idea of income-contingent funds could be useful to support transformations of existing locked-in sectors such as energy, industrial agriculture, manufacturing, and transport, where large corporations are key. Another possibility is to retain royalties on equities, through state-owned venture capital funds, like in the case of Yozma in Israel (Erlich, 2002; Avnimelech, 2009; Lerner, 2010). Similar experiences, at different scales, can be found in the Finish Innovation Fund (SITRA) and state-owned banks in Brazil, China and Germany. This instrument also provides the state with greater opportunity to negotiate the ownership structures of firms, which can be seen as strategic to block value extraction. For example, preferred stocks get priority in receiving dividends, granting the government with high dividend rates and warrants; golden shares enable to veto mergers, liquidations, asset sales, and other major corporate events. Both have been widely adopted by the UK government to avoid privatized firms being fully controlled by foreigners or successfully targeted for hostile takeover (Jones, Megginson, Nash, & Netter, 1999). In any of the above forms, firms' payment of royalties is conditioned and proportional to their success.

This list is not meant to be exhaustive, but rather, to illustrate that there are multiple experiences in handling policy instruments that, implicit or explicitly, permit to take account of issues like value extraction and enabling government to capture a share of the value it helped to generate. The latter, in particular, have been adopted by different types of agencies, at different stages of the innovation chain but mainly downstream, involving different types of partners (e.g. firm size) and industries. However, not always have they been adjusted to the specificities of different economic, industrial and legal settings. Absent a framework that more clearly informs these policies, decisions on these matters have sometimes been made unintentionally and haphazardly, inviting both government and systemic failures.

The prospect of the state owning a stake in a private corporation may be anathema to many parts of the capitalist world, but given that governments are already investing in the private sector, they may as well earn a return on those investments (something even fiscal conservatives might find attractive). The state need not hold a controlling stake, but it could hold equity in the form of preferred stocks that get priority in receiving dividends. The returns could be used to fund future innovation (Rodrik, 2015). Politicians and the media have been too quick to criticize public investments when things go wrong, and too slow to reward them when things go right.

Thus, rather than worrying so much about the “picking winners” problem, more thinking is needed about how to reward the winning investments so they can both cover some of the eventual losses (which are inevitable in the innovation game), and also raise funds for future investments. This can be done by, first, getting the tax system to work, and, second, considering other mechanisms which allow the state to reap a direct reward in those cases when it is making specific bets on companies. If all fails, the taxpayer picks up the bill. But when it goes well, the taxpayer gets rewarded.

Going hand in hand with this consideration is the need to rethink how public investments are accounted for in the national income accounting. Investments in innovation are different to current expenditures. The latter does not add to balance-sheet assets; the former does, and is potentially productive investment in the sense that it creates new value (Mazzucato and Shipman, 2014). When setting limits to fiscal deficits, it is therefore necessary to distinguish public debt contracted for investment in R&D and infrastructure (value-creating investments) from public debt contracted for (public or private) consumption. In this sense, financial and accounting reforms should be regarded as a prerequisite for any successful smart and inclusive growth plan.

Finally, considering the role of government as lead risk-taker helps to debunk fundamental assumptions behind the *theory of shareholder value*, which underpins the exorbitant rewards earned by senior executives in recent years. Pay via stock options has been a key feature of modern capitalism, and especially a key driver of the inequality between the top 1 percent of income earners and the rest (Piketty, 2014). Stock options are boosted when stock prices rise, and prices often rise through “financialized” practices such as share repurchase schemes by companies (Lazonick, 2014). Focusing on boosting share prices is justified on the grounds of the theory of *shareholder value*, which holds that shareholders are the biggest risk-takers in a company because they have no *guaranteed* rate of return (while workers earn set salaries, banks earn set interest rates, etc.). That is, they are the *residual claimants* (Jensen, 1986). But this assumes that other agents do have a guaranteed rate of return. As we have argued throughout the paper, precisely because what the state does is not just facilitate and de-risk the private sector, but also take major risks, there is no guarantee of success in its investments, which have historically also played a crucial role in enabling wealth creation. The fact that a key driver of inequality has been linked with a problematic understanding of which actors are the greatest risk-takers implies that combatting short-termism (Haldane, 2016) and speculative forms of corporate governance (Kay, 2012) requires not only reforming finance and corporate governance, but also rethinking the models of wealth creation upon which they are based (Lazonick and Mazzucato, 2012).

6. From public goods to public value

Thinking about the returns to public investment forces us to rethink the terminology with which we describe government. Portraying government as a more active value creator – investing, not just spending, and entitled to earn a rate of return – can eventually modify how it is regarded and how it behaves. All too often governments see themselves only as “facilitators” of a market system, as opposed to co-creators of wealth and markets. And, ironically, this produces exactly the type of government that the critics like to bash: weak and apparently “business-friendly”, but open to capture and corruption, privatizing parts of the economy that should be creating public and collective goods. This dismal outcome is unnecessary, however.

Government's role in creating value needs to be better reflected, not only in GDP but also more generally in the concept of "public value". While this term has been used in the literature on public administration, too often it has resulted in putting pressure on government to get "value for money" rather than allowing democratic processes to engage in an open debate on what sort of society we should be striving for, and the role of public spending, investment and regulation in achieving it (Mazzucato, 2018a).

A new discourse on value, then, should not simply reverse the preference for the private sector over the public. What is required is a new and deeper understanding of public value, an expression found in philosophy but almost lost in today's economics. This value is not created exclusively inside or outside a private-sector market, but rather by a whole society; it is also a goal which can be used to shape markets. Once the notion of public value is understood and accepted, reappraisals are urgently required – of the idea of public and private and of the nature of value itself. "Public values are those providing normative consensus about (1) the rights, benefits, and prerogatives to which citizens should (and should not) be entitled; (2) the obligations of citizens to society, the state, and one another; (3) and the principles on which governments and policies should be based" (Bozeman, 2013, p. 13).

The idea of public value is broader than the currently more popular term "public good". The latter phrase tends to be used in a negative way, to limit the conception of what governments are allowed to do, rather than to stimulate the imagination to find the best ways to confront the challenges of the future. So the state-owned BBC is thought to serve the public good when it makes documentaries about giraffes in Africa, but is questioned if it makes soap operas or talk shows. State agencies can often fund basic science due to the "positive externalities", but not downstream applications. Public banks can provide counter-cyclical lending, but they cannot direct their lending to socially valuable areas like the green economy. These arbitrary distinctions reflect a narrow view of the economy which often results in a public actor being accused of "crowding out" a private one – or, worse still, delving into the dangerous waters of "picking winners": the state is only supposed to do what the private sector does not want to do, rather than have its own vision of a desirable and achievable future (Mazzucato, 2018a).

Public institutions can reclaim their rightful role as servants of the common good. They must think big and play a full part in the great transformations to come: squaring up to the issues of climate change, ageing populations and the need for twenty-first-century infrastructure and innovation. They must get over the self-fulfilling fear of failure, and realize that experimentation and trial and error (and error and error) are part of the learning process. With confidence and responsibility, they can expect success, and in so doing will recruit and retain top-quality employees. They can change the discourse. Instead of de-risking projects, there will be risk-sharing – and reward-sharing.

It might also make sense for private enterprises – which benefit from different types of public investments and subsidies – in return to engage in a fair share of activities which are not immediately profitable. There is much to be learned from the history of Bell Labs, which was born out of the US government's demand that the monopolist AT&T invest its profits rather than hoard cash, as is so common today. Bell Labs invested in areas that its managers and its government contractors thought could create the greatest possible public value. Its remit went well beyond any narrow definition of telecommunications. The partnership of purely government-funded research and work co-financed by Bell Labs and agencies like DARPA led to phenomenal tangible results – many found in our handbags and pockets today.

A bold view of the role of public policy also requires a change in the metrics used for evaluation of those policies. Today's typical static cost-benefit analysis is inadequate for decisions which will inevitably have many indirect consequences. A much more dynamic analysis, one which can capture more of the market-shaping process, is urgently required. For example, any measure of the success of a government project to organize a charging infrastructure for electric cars must try to take into account the opportunities offered for further technical development, the reduction of pollution and the political and the ecological gains of lessening reliance on non-renewable oil from countries with objectionable governments.

It is crucial to find metrics which favour long-run investments and innovation. In the 1980s, it was not cost-benefit analysis that led the BBC to establish a dynamic "learning programme" to get kids to code. The activity led to the development of the BBC Microcomputer, which found its way into all British classrooms. While the Micro did not itself become a commercial success, procurement for its parts supported Acorn Computers and eventually led to the creation of ARM Holdings, one of the most successful UK technology companies of recent decades. Similarly, there would almost certainly be more European high-tech successes if there existed greater interaction between innovation systems and public procurement policies. However, to recognize that the public sector creates value we must find ways to assess that value, including the spillovers from this sort of ambitious public funding. The BBC initiative helped kids learn to code and increased their interest in socially and economically beneficial new technologies. It also had direct and indirect effects in different sectors, helping new companies to scale up and bringing new investors into the UK tech landscape.

Making public value better justified, appreciated and evaluated would potentially open up a new vocabulary for politicians. Rather than being mere "regulators" of health care, as co-creators of that care policymakers would have a more justifiable right to make sure that the benefits are accessible to all. A different vocabulary would reduce the timidity which has kept politicians from funding much-needed infrastructure investments for decades, and which led to a bare-minimum fiscal and legislative response to the 2008 financial crisis and subsequent recession. Once the potential of the executive and legislative branches to promote the good of society is fully recognized, then elected officials can start to live up to higher, but still realistic, expectations. Who knows, young, ambitious people might start choosing electoral politics over careers in the City or business – if they see that such choices are valuable and valued.

7. Conclusion

Thus 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. Underscoring and understanding the co-creation of value leads to a different way to consider the division of rewards between public and private actors – away from one that is about policy either only facilitating private value creation or redistributing it, towards one that is about co-creating and shaping it, and aligning the distribution of rewards in such a way that reflect that collective value creation (as well as welfare based redistribution). In other words, given the state's role as risk-taker, and investor of first resort, new thinking is required for the ability of public institutions to not only share in the risks, but also the rewards. This can encourage new thinking on how to achieve growth that is not only "smart" (innovation-led) but also more inclusive – and also make being a civil servant exciting again.

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Author contact: m.mazzucato@ucl.ac.uk

SUGGESTED CITATION:
Mariana Mazzucato, "The entrepreneurial state: socializing both risks and rewards", *real-world economics review*, issue no. 84, 19 June 2018, pp. 201-217, http://www.paecon.net/PAEReview/issue84/Mazzucato84.pdf

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