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### Financing risky science does not make the State an entrepreneur

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#### Abstract

This article reviews 'The Entrepreneurial State: Debunking public vs. private sector myths' by Mariana Mazzucato

Mariana Mazzucato, a Professor of Innovation at the University of Sussex, has written a book that is an extended version of a 2011 NESTA report of the same name, in which she lays out a full-throated defence of bold, activist big-government centred innovation policy. The book presents itself as a contrarian truth-telling debunking of the idea of the State as a risk-adverse loser-picking enterprise, which Mazzucato repeatedly attributes to ideological mythmaking. She is worried about the direction of public sector funding of basic science and mission oriented R&D, documenting a steady decline through time that is even more worrying for the retreat in corporate R&D (she largely focuses on the US, but her concern is equally with Europe: she is more impressed with Asia). And she proposes a number of suggestions by which to put things back on the right track, which she associates with the 1940s-60s compact between the military-industrial-academic complex that US President Eisenhower once warned about. One suggestion is to re-balance the risk-reward calculus of public investment by seeking income-contingent equity positions in the technologies that the state is involved in financing. Apparently we need this because the usual way the state recoups its R&D investments (through the tax system) doesn't really work because of widespread corporate tax avoidance. Mazzucato doesn't present any evidence, so your own priors will have to be your guide here. Maybe it's a good idea; maybe it's not.

*The Entrepreneurial State* has been widely lauded by many economic commentators and has made it onto numerous best business books lists for 2013/14 (Martin Wolfe in the *Financial Times* and Teresa Tritch in the *New York Times* wrote glowing reviews; although *The Economist* offers a somewhat sceptical view, noting that she is 'too hard on business?'). It is certainly a provocative and engaging thesis, which Mazzucato sharply illustrates with extended discussions of the public sponsorship of most of the key technologies of the iPhone, and of the wily ways of the pharmaceutical industry and the challenges of green-energy technology. And she *is* hard on business, repeatedly chiding the propensity of large public corporations to engage in share buy-backs in preference to long run-R&D investment, when they're not avoiding taxes and off-shoring jobs, or hypocritically lobbying for bailouts.

The book is unashamedly a Keynesian treatise (of a Schumpeterian subject) that seeks to promote the role of government, and to burnish its image, against the ideological corruption that the neoclassical economists and the neoliberal politicians have foisted over the past few decades. Lines such as 'it is essential to understand innovation as a collective process' and emphatic claims that '[T]here is nothing in the DNA of the public sector that makes it less innovative than the private sector' are thematic refrains that ring through this book.

Readers of this journal might naturally be expected to be sympathetic with Mazzucato's claims, which amount to the idea that we owe the vast revolutions in digital telecommunications (the internet, and its tributaries) to bold, far-sighted government investment in creating new technologies, and not just in correcting for market failure. This speaks to the wisdom and virtue of large scale public funding of not just basic research but also mission-oriented endeavours to tackle big problems, effectively taking on risk to blaze the way for what Mazzucato portrays as the naturally more timid and risk-averse private sector to follow.

So is Mazzucato right about this? There are two basic problems with her argument. The first is the most obvious, and in fairness Mazzucato does try to address it, which is that of causality: *viz.* because government investment in experimental new technologies preceded the iPhone, does that mean that government investment caused the iPhone? The second is the critique of Keynesian (and socialist) economics itself by the Austrian and Public Choice schools of economics (e.g. Dourado & Tabarrok, 2015<sup>[5]</sup>), concerned respectively with the discovery nature of the market process and rent-seeking behaviour. Mazzucato makes no attempt to defend against this, yet it is perhaps the most damaging for her thesis.

But let me start with the causality issue *?post hoc ergo propter hoc*. It is certainly true that many of the good bits in the iPhone, and a great many highly valuable new drugs, among other innovations, have an ancestry that began in a government laboratory or at the pleasure of a government research grant (Google's search algorithm, funded by the NSF is an oft-mentioned example). This is not in dispute, even when the same government actively strangled that same research (as with the work on touch screens that did eventually find their way into the iPhone, see Orlowski, 2013<sup>[6]</sup>). But lots of things preceded the success of Google and Apple that might be imaginatively traced as origins. What about their teachers in high-school? The roads they drove on to get to their Cupertino garages? The laws they used to charter their incorporated companies, and to register their intellectual property. We paid for those too, and pretty soon we're on the fringes of partisan zealotry shouting *?you didn't build that!?* The point is that this is an argument about perceptions of equity, not about logic.

Let me put this the other way around. Would those investments have still been made in a different universe in which the iPhone never appeared? Certainly they would, and we know that because they were made for reasons that had their own logic at the time. Part of this can be squarely sheeted home to the demands of military research and national defence. They needed robust computer networks that would withstand nuclear attack and then they needed small, lighter more powerful microprocessors to put into satellites. So the Department of Defense (through DARPA and the RAND Corporation, among others) funded the research that delivered these technologies. But once they're created, and once they're in the public domain, everything else is an externality (if this fundamental point of economic logic still seems opaque, see Davidson & Spong, 2010<sup>[7]</sup>). Mazzucato seems to have a curious conception of the meaning of public good and externality *? a criticism that has been made elsewhere (by Tim Worstall, in a *Forbes* review), so I shall not rehearse that further here. It's no different from someone giving charity to a person who subsequently acquired a great fortune. Does the person who made that generous charitable donation have a legitimate claim on the fortune? Morally this is perhaps ambiguous, but contractually the answer is clearly no. Now if it was a different contract *? along the lines of an income-contingent loan or a share of income (making it equity) then we would be in a different position. In effect, this is the argument Mazzucato is making. Now if we do have that sort of contract, then we can't build our assessments of how that will work based on prior evidence from a very different set of institutions where no such contracts existed. Now perhaps we should do this experiment: but if we do, we've just created a socialised venture capital fund. It's not entirely clear why we would expect that to work better than a privately held one, but there are some fairly sound reasons to expect worse performance.**

Which is my second point of critique, which is that while Mazzucato seems to have very strong priors about the innate villainy of private sector actors, she finds nothing troubling about public sector incentives. Plainly, there are benefits associated with public sector support of basic science and bold missions ? that is not in dispute, and Mazzucato presents these as her case. The claim then further extends to the distributive justice associated with these benefits, which is where she seems to think the argument lies. But what about the costs of this public spending and decision-making? The real debate is not about the level of B, it is about whether  $B > C$ , or not. That basic attention to cost-benefit considerations is missing from Mazzucato's whole argument.

And what are these costs? On the face of it, from a Keynesian reading, there aren't any costs at all, because the money spent (raised from taxes, which disincentivise investment and spending, a point never mentioned) will multiply through the economy anyway. Mazzucato deflects this issue by repeatedly pointing to the widespread and apparently scandalous use of retained earnings to engage in share-price-boosting buy-backs rather than investment in R&D. Perhaps so, but beside the point. The real issue is that there are also costs associated with this government spending (Davidson and Potts, 2015 <sup>[8]</sup>). These costs are due to misallocation of resources caused by distorted incentives, the most egregious form of which is rent-seeking (Tullock, 1967 <sup>[9]</sup>). Goolsbee (1998 <sup>[10]</sup>) for instance shows how the main beneficiaries of increased public spending on research scientists are, unsurprisingly, research scientists, who facing an inelastic supply curve see an increase in demand translate cleanly through to increased real wages. Kealey (1996 <sup>[11]</sup>) and Greenberg (2001 <sup>[12]</sup>) elaborately document the extent of this, and Diamond (2006) puts the lie to the claim that public sector science is more innovative than private sector science in the context of research institutes (a widely reported study unmentioned in Mazzucato's book).

An example of what I mean here is to compare the focus in the book on green technologies, particularly early stage investment in wind and solar, and the role of the government in developing these emerging industries, and moreover the poor behaviour of venture capital funds in this (Mazzucato accuses them of cutting and running, bankrupting Solyndra, for instance). Or nuclear energy, which was a product of sustained investment in basic science, R&D and industry development. But perhaps the single greatest revolution in global energy supply of recent goes entirely unmentioned, namely the shale gas revolution brought about by private innovation in techniques of horizontal drilling and hydraulic fracturing, or 'fracking'. The fall in the price of hydrocarbon energy in the past 10 years, and the enormous increase in the size of energy reserves (including the US becoming a net energy exporter for the first time since before WWII) is entirely due to this completely private sector innovation which was largely developed by the oil services company Halliburton in the 1950s.

Market incentives operating over research investment gave us commercially successful fracking and tight-gas, not windmills. That's how market incentives are meant to work ? namely delivering the least cost solution that satisfies the most people. That this is regarded as a failure in some quarters is testimony to a strong residual notion that technological choice should ultimately be a political or democratic choice in which the bold and mission-oriented correct answers are solar and wind, regardless of cost and consumer demand.

Mazzucato has written a bold and engaging book targeted to a post-GFC weakening of appetite for spending on public science and innovation. *The Entrepreneurial State* offers a clear thesis, namely that government should not be timid about its role in investing in the science that leads to many valuable and important discoveries. Furthermore, she thinks that it deserves some of the spoils from that, more than the indirect tax revenues the wealth creates. Consistent with this claim, she thinks that many private sector companies have been parasites in this ecosystem, taking but not giving back. It's a popular, if somewhat populist, thesis.

The book is called *The Entrepreneurial State*, presumably to highlight the book's central claim of the State as a bold risk-taker, innovating at the frontiers of science and technology (see also Mazzucato, 2014<sup>[13]</sup>). But that misunderstands entrepreneurship, which is not about technological boldness or discovery really at all, but about, literally, the market discovery of an entrepreneurial opportunity. This is the basic flaw in a very flawed book – innovation involves much more than just basic scientific discovery, or even R&D, but also requires market discovery. This latter aspect is derided in the book as just 'design', in the case of Apple, which utterly misunderstands what is involved in turning a technological opportunity into a market opportunity, and which comes close to treating entrepreneurial action as immaterial to innovation. In contradistinction, Hausmann & Rodrik (2003<sup>[14]</sup>) develop this theme about the importance of cost discovery in reducing the uncertainty associated with entrepreneurial investment. Scholars of entrepreneurial opportunity and judgment emphasise the critical importance of this information gathering to successful innovation (Shane, 2000<sup>[15]</sup> for example, or Foss and Klein, 2012<sup>[16]</sup>). Mazzucato gives no reason to indicate why government might be expected to do this better than the private sector.

Finally, what implications for telecommunications and the digital economy? Mazzucato's thesis calls for bold mission-oriented public investment in the frontiers of new technologies, where the presumption is that the big Telcos are spending their profits buying back shares and, in Australia of recent times, furiously engaged in take-over bids to create new networks. That's not an unreasonable concern. But the problem with that model, however, is that it is products and services that are consumed, not technologies. Entrepreneurs still have a lot to contribute to the innovation process, and there are fundamental limits to what governments can do in this space. While not as snappy, *The Wasteful, Bumbling and Politically Opportunistic Mission-Oriented Basic Science State* might have been a better title for the book.

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