



History suggests the ‘British ARPA’ will be a wasteful failure

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Back in March 2019 Dominic Cummings wrote in a blog:

We KNOW how effective the very unusual funding for computer science was in the 1960s/1970s—ARPA-PARC created the internet and personal computing ...

Never has Boris Johnson’s former adviser been more wrong. In fact, ARPA was born of US government failure and it begat only more failure – to which the British government is now going to add £800 million worth of its own failure with the newly announced Advanced Research & Invention Agency (ARIA), a Cummings brainchild if ever there was one.

A brief history of ARPA

Given that ARPA seems to have inspired so much of Cummings’ thinking on the role of the state in research, it’s worth setting out how the agency came into being – and why it was later overhauled.

Before 1941 the US government did not fund research, except only very modestly in the service of very narrow missions such as defence. Yet by 1890 the US had already become the richest and most technologically advanced country in the world, thanks in part to a *laissez-faire* approach to research.

In 1941, however, the federal authorities launched a new research body, the Office of Scientific Development and Research (OSDR), to help fight the upcoming war, and between 1941 and 1945 it did sterling work. By 1945, though, the OSDR was facing redundancy. That prompted its director, Vannevar Bush, to write a book called *Science, the Endless Frontier*, to try to persuade the federal government to continue funding it.

Bush failed in his lobbying, and the OSDR closed. Nonetheless, he had resurrected an old thought, namely that advances in technology flowed out of advances in pure science. Resurrected is the right word, for the idea had long been thoroughly discredited. As early as 1776, in his *Wealth of Nations*, Adam Smith had shown that advances in pure science emerged as by-products of advances in technology, and later economists including Marx, Engels and Schumpeter had confirmed that finding.

Yet in 1950, when Harry Truman created the National Science Foundation (NSF) to help win the Cold War, Bush persuaded him that the new body should be dedicated to pure science. Even though Bush's own OSDR hadn't won the Second World War by pure science (the OSDR's research had been ruthlessly focused on technology), he leveraged its success to promote a completely different model of Cold War research, one based on pure science rather than technology.

And it failed. For in 1957 the USSR launched Sputnik, beating the US into space and threatening the land of the free and the home of the brave with nuclear annihilation from above. It was in response to that failure that, in 1958, the federal government launched ARPA, the Advanced Research Projects Agency (note the word 'Projects'), specifically to fund *technology*. The NSF's pure science had delivered little of strategic value, so the federal authorities reverted to the original OSDR model of (1) first identifying technological goals (an atom bomb, say) and (2) then recruiting the necessary tools by which to reach those goals.

Unfortunately, ARPA too was soon captured by its scientists and started to fund pure science. In 1969, however, the ARPA model came unstuck. The Office of the Director of Defense Research and Engineering in Washington DC published *Project Hindsight* to analyse 700 research 'events' that had led to the development of 20 weapons systems. The Office found that only two of those 700 research events could be classified as pure science. Thus did the DC defence establishment confirm that pure science was simply irrelevant to the US's defence requirements.

Consequently, in 1969/70 and 1973 respectively, Senate Majority Leader Mike Mansfield pushed through his celebrated amendments to the Military Authorization Acts to strip ARPA (now named DARPA, the Defense Advanced Research Projects Agency) of its pure science. In doing so Mansfield effectively made all of ARPA's pure scientists redundant. And though he was at the time condemned for destroying American science, Mansfield should actually be seen as one of the fathers of the modern American economy.

Enter Mazzucato

Among the most prominent contemporary advocates for state-led scientific research is Mariana Mazzucato, a Professor in the Economics of Innovation and Public Value at UCL. As well her academic posts, she holds an inordinate number of advisory roles – with the OECD, the EU, the UN and various national governments. She's also a member of the UK Innovation Expert Group, a government advisory body.

In 2013 Mazzucato was named one of "the three most important thinkers about innovation" by *New Republic*, in 2014 she won the *New Statesman* SPERI Prize in Political Economy, and in 2015 she won the Hans-Matthöfer-Preis. In 2020 she won the greatest prize of all, the one bestowed by the empyrean heights, when Pope Francis praised her work in his book *Let Us Dream: The Path to a Better Future*.

Mazzucato, in short, is the panjandrum's panjandrum, and as such, of course, she is wrong about virtually everything; including her assertion in her celebrated 2013 book *The Entrepreneurial State* that D/ARPA was responsible for key advancements in microchips and personal computing:

Going way beyond simply funding research, DARPA funded the formation of computer science departments, provided start-up firms with early research support, contributed to semiconductor

research and support to human computer interface research, and oversaw the early stages of the internet.

A Cummings blog of 2019 picks up the same theme:

As Bill Gates said, he and Steve Jobs essentially stole into PARC, stole their ideas, and created Microsoft and Apple.

Now PARC, or XeroxPARC (the Xerox Palo Alto Research Center), was indeed one of Silicon Valley's foundational institutions. It invented the mouse, windows, pop-up menus and the trash can – indeed, the graphical user interface – as well as the laser printer. XeroxPARC, in short, invented the personal computer. Moreover, it pioneered an Ethernet network and sent things called 'emails'.

It's also true that XeroxPARC was hugely indebted to ARPA – but in ways that are diametrically opposed to the Mazzucato/Cummings story. In his 2002 book *Digital Culture*, Charlie Gere explained:

The first head of XeroxPARC was Bob Taylor [of] ARPA's computing research arm...The Mansfield amendment and the presence of Taylor at XeroxPARC meant that many talented computer scientists and researchers who had been ARPA-funded were drawn to the Centre [ie, the Xerox Palo Alto Research Center].

So, far from the state driving innovation, it was only when Mansfield drove the pure scientists out of their ivory tower and into the real world of Silicon Valley that the US began to create the modern world. And now, with ARIA, Johnson wants to re-build that ivory tower?

Knight of the wrong takes

The fundamental problem here is that the conventional justification for the government funding of science is based on bad economics. Here is Mazzucato in *The Entrepreneurial State*:

The real Knightian uncertainty that innovation entails...is in fact the reason that the private sector, including venture capital, often shies away from it. It is also the reason why the State is the stakeholder that so often takes the lead.

Yet this misunderstands Knightian uncertainty to the point of inverting its message.

Frank Knight showed (i) that risk, being probabilistic, can be insured against, while (ii) uncertainty, being unknown, cannot be insured against. Engaging with risk thus yields only normal profit (ie, the person who engages in risk can expect only to cover their costs), but engaging with uncertainty yields economic profit (ie, only the person who engages in uncertainty can generate real profit.)

Knightian uncertainty, in short, is the *reason why* people engage in, and invest in, entrepreneurial activities. So the idea that Knightian uncertainty disincentivises entrepreneurship is an inversion of reality. Which is why there is no evidence whatsoever that government funding of science stimulates economic growth. Indeed, as even the OECD found in 2003, on balance such funding seems only to slow economic growth.

False as an Arrow

We've been here before. In 1962 the economist Ken Arrow wrote a preposterous paper to show that, in a fictitious 'neoclassical perfectly-competitive market', companies would not perform research. But the definition of a 'neoclassical perfectly-competitive market' is that knowledge is 'perfect', i.e. such a market, by definition, does not sustain private research. This has no bearing on private research in the real, classically-competitive world, where a company like Amazon spent \$22.6 billion on research in 2017.

Nonetheless, the Arrow paper prompted Harold Wilson to deliver his famous 1963 White Heat of the Technological Revolution speech, in which he adumbrated the vast sums his government would indeed spend on research in the years 1964-1970. And the consequence? Economic degradation. "For the scientists, the party's over," was how a disgusted Shirley Williams summarised the waste of money.

Well, here we go again, because this £800 million for ARIA is also going to be wasted. If it were only £800 million, we might overlook it (it's certainly too small a sum to make much positive impact over the four years it's budgeted for.) But unfortunately it's only the first tranche of the planned doubling in the government's research budget to £22 billion a year by 2024/25.

Some Brexiteers had hoped that leaving the EU would be a chance to shrink the state. Sadly for them, Boris Johnson knows he's Prime Minister only because of the votes of the 'left behind', and such folk are none too keen on the bracing winds of competition: they are keen on high public spending, subsidies and a corporate state within which they can find shelter.

And boy, is Johnson delivering for them, starting with an industrial policy based on vast corporate welfare – starting with research.

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