THOMAS WOODSON

Is It Time to Say Bye-Bye to Bayh-Dole?

In 1980, Senators Birch Bayh (D-IN) and Bob Dole (R-KS) brought to the Senate floor a bill that would allow universities, small businesses, and nonprofits to retain intellectual property resulting from federally funded research. At the time, the federal government retained ownership of all inventions originating from taxpayer-funded research and had amassed some 28,000 patents. Very few of these inventions were ever licensed to the private sector, and the accumulation came to represent a bureaucratic bottleneck on the commercial impacts of American innovation. Lawmakers argued that taxpayer-funded research was bringing no benefit to the taxpayer by collecting dust on the shelves at the US Patent Office. During the lame-duck session of the 96th Congress, the Bayh–Dole Act passed with unanimous bipartisan support.

By many measures, the law has been a success. Economists, policymakers, and scientists have hailed it as a major driver of American innovation over the past 45 years. According to the Bayh–Dole Coalition, the act and the academic technology transfer apparatus it has fostered have supported 6.5 million jobs, contributed $1.9 trillion to US gross industrial output, and created over 19,000 startups over the last three decades.

But even though Bayh–Dole is widely considered a success, the modern research enterprise operates under new tensions that the legislation was not built to address. Today, I argue, signals of its demise are getting louder, and it is time to consider a new arrangement that better fits the current political economy.

One of Bayh–Dole's most significant accomplishments is the way that it changed the business of US innovation. By decentralizing federal control, it shifted the incentive to commercialize technology onto universities. However, the unintended consequences of this shift have become obvious over the last four decades. Bayh–Dole has pushed research universities to redirect resources from teaching and training to commercialization activities. Critics also charge that it has encouraged institutions to pursue short-term gains and neglect long-run returns on investment. And finally, it has intensified competition between universities and companies over the value of intellectual property, which may have stifled commercialization in some sectors.

Today, Bayh–Dole—and the patenting regime it created—is being challenged by constituencies across the political spectrum. Secretary of Commerce Howard Lutnick has suggested the government should receive a share of patent royalties and has even floated the idea of a 50% flat tax on university patents. On the left, Senator Bernie Sanders has called for the government to stop providing exclusive licenses to producers of certain lifesaving

medicines, including some cancer drugs and vaccines. Other critics, including economist Mariana Mazzucato, argue that the system has socialized the risks of innovation but privatized its returns, allowing private companies to profit (in some cases, enormously) off taxpayer-funded research.

Further sign of Bayh–Dole's weakening can be noted in the frequency with which Senator Sanders and other politicians call to invoke the act's own "march-in" rights clause. A provision in the legislation allows the federal government to issue compulsory licenses on Bayh–Dole patents under certain conditions—for example, if a technology is not made "available to the public on reasonable terms." March-in rights have never been employed, but a Biden-era rule suggested that high drug prices could be the basis of a government takeover of intellectual property. Ambiguity around when and why march-in rights should be applied complicates the investment environment for the venture capitalists and private investors that university startups count on to scale, which weakens the innovation environment the Bayh–Dole Act intended to create.

Additionally, some parts of the federal government are using alternative contracting mechanisms to negotiate intellectual property rights and cost-sharing agreements with commercial industry that bypass Bayh–Dole altogether. For decades, Congress has been incrementally expanding research agencies' authority to engage in Other Transaction Agreements (OTAs), which are not subject to the Bayh–Dole Act (or many other government contracting laws and regulations). OTAs are not new mechanisms—NASA was granted OT authority in 1958—but some agencies are exercising their authority with increased frequency. Other agencies are leveraging the flexibility of OTAs to test new approaches to accelerating breakthroughs, like the National Science Foundation's X-Labs. Although OTAs are less high-profile than, say, a flat tax on patents, their expanded use erodes the authority of Bayh–Dole nonetheless.

More broadly, the Bayh–Dole Act was written to fit an innovation paradigm that upheld a laissez-faire approach to government involvement in the private sector. The embrace of industrial policy by both the Biden and Trump administrations has upended this norm. Today, a new paradigm is emerging in which the pillar of Bayh–Dole's decentralized approach—US research universities—are increasingly at odds with the federal government, while government intervention in the private sector is increasingly common. The Trump administration has even gone as far as acquiring equity stakes in private companies in sectors critical to national and economic security.

The research enterprise needs new approaches to innovation policy that are more compatible with today's economic and political reality.

Universities and much of the scientific establishment are expending political capital to keep the system created by the Bayh–Dole Act going, but they should begin to think about what comes next. Other member countries of the Organisation for Economic Co-operation and Development use repayable grants, debt financing with equity, and mechanisms that secure returns on investment for public funders of research that recognize the state as a cocreator of innovation. For example, Israel's state-directed innovation system employs several risk-sharing programs and legal provisions that have fueled the creation and commercialization of high-tech innovations.

> Even though Bayh–Dole is widely considered a success, the modern research enterprise operates under new tensions that the legislation was not built to address.

Israel and dozens of other countries manage government-run venture capital-style funds. Singapore's Temasek Holdings has a portfolio of over $434 billion in Singapore dollars that it invests in companies around the world. The United Kingdom created British Patient Capital to help with late-stage funding gaps for companies.

Innovation policy in the United States should move beyond the paradigm constructed around a public-private binary to a model that allows both sectors to share the risks and rewards of innovation. A profit-sharing model with payouts to the federal government based on the commercial impact of inventions is a strategy that could both preserve America's rich startup innovation environment and reward taxpayers for supporting such research.

In fact, a similar proposal was debated by Congress during the hearings in the lead-up to Bayh–Dole's passage: The recoupment of payments from universities in the case of windfall profits based on federally funded research was repeatedly discussed. A recoupment provision even made it into the version of the bill that passed in the Senate, but it did not make it into the final law.

A profit-sharing system could be based on three tiers,

recognizing that it is challenging and expensive to move a discovery from an idea to a commercialized product, and that each stage of development has different levels of risk and return. Accordingly, a tiered profit-sharing system would allow startups to use patents for free in the early stages, require modest royalties in middle stages, and demand higher royalties on blockbuster successes. The goal of this strategy would be to encourage as many plausible startups as possible, while also enabling taxpayers to get a reward from massively successful innovations, like Google's PageRank or Merck's cancer drug Keytruda, which used federal funds for research and have profited by the billions.

In this system, the government would take no money or equity from companies founded on federally sponsored research. Companies would retain all revenue until they recoup their initial expenses from patenting fees, legal costs, lab costs, and translation costs, which could be tracked and verified by existing structures within research organizations, such as tech transfer offices. Once startups meet this milestone, they would be responsible for paying the government back for its initial investment. In the recoupment stage—the second tier of the model—startups would pay royalties (for example, 5–10% of net profits) to the government until some multiple of the initial investment is repaid.

The third tier of profit-sharing would award the government a major financial dividend (say, 20% of profits) from companies that become blockbuster successes based on federally funded research. This tier allows the taxpayer to benefit from the massive upside of startups that exceed a certain revenue threshold (for example, $500 million annually). When the initial patents expire, the government would relinquish the payback claim.

Funds recovered by the government could be directed into a science dividend fund that furthers science and innovation for the public's benefit. Depending on political will, the fund could be used to return dividends directly to taxpayers so that they see the benefits of investing in research directly. It could also be applied to benefit the innovation system by stabilizing federal science funding while reducing the direct taxpayer burden of basic research. It could fund research translation for innovation in the public interest. Finally, the fund could be organized to give extra support to smaller institutions and regional consortia, or to fund public research infrastructure, such as clean rooms and supercomputers, that can benefit a whole region.

It goes without saying that any science dividend fund would need to be properly managed, protected, and disbursed. Policymakers must build assurances into the founding laws of the fund and involve stakeholders across the country and the political spectrum in guarding it. If all corners of the country benefit from a robust science dividend, similar to the military's strategy of spreading defense manufacturing across the country, it is more likely to survive political challenges.

A profit-sharing model would restructure the commercialization incentives of the innovation ecosystem, for federal agencies, universities, and private investors. These changes would not be popular with everyone. Critics may claim that these policies would dampen innovation, chill private investment, or give bureaucratic agencies too much power and responsibility over commercialization. Others could argue that the government already benefits from innovation through taxes and increased productivity. But a tiered system would continue to support early-stage startups, while allowing institutions that profit under Bayh–Dole to continue making money. And while the profit-sharing model might be criticized as government interference in private business, it builds on a long tradition of US industrial policy and matches the current level of government involvement in key industries.

Innovation policy in the United States should move beyond the paradigm constructed around a public-private binary to a model that allows both sectors to share the risks and rewards of innovation.

The Bayh–Dole Act was a revolutionary policy for its time, but a new arrangement that fits with today's political economy is needed to better ensure federally funded research gets commercialized and all Americans see the benefits. Keeping US science at the cutting edge means saying farewell to an arrangement the research enterprise has outgrown, and hello to a future where public investment brings more perceptible public returns.

Thomas Woodson *is an associate professor at Stony Brook University who specializes in science and technology policy and inclusive innovation.*

This article is part of an exploration of science's social contract that is generously supported by The Kavli Foundation, the Rita Allen Foundation, and the Dana Foundation.