

ARPA-H Could Offer Taxpayers a Fairer Shake

BY TRAVIS WHITFILL, MARIANA MAZZUCATO

US drug companies turn taxpayer-funded innovation into astronomical profits. A new agency focused on health innovation could shift the rewards of medical advances to benefit public health.

Years before the pandemic began, the US government was a major investor in what would become COVID-19 vaccines. It supplied nearly \$350 million to build technologies crucial to mRNA vaccines. Later, as coronavirus infections surged, it spent some \$2 billion to support vaccine clinical trials. Ultimately, the US government put more than \$30 billion into research, development, and procurement of the vaccines.

Once the vaccines were deployed, executives at pharmaceutical companies paid themselves back richly. Moderna executives made more than a billion dollars in stock sales, taking in substantial pay even while populations in poorer countries lacked access to the vaccine. Many biopharma companies have piggybacked on government-funded projects to bring in record profits, set astronomical executive pay, boost share prices, and pressure officials for funding favors.

High drug prices and big pharma profits—paired with patients and health systems that cannot afford therapies—have long been a political flashpoint. A recent Senate report showed that the top executives in just 10 biopharma companies made \$1.9 billion in 2021. This March, after Moderna announced plans to quadruple the prices of its vaccines, Senator Bernie Sanders called the lack of pricing transparency for taxpayers “a totally insane situation,” given that taxpayer-funded work was essential to producing Moderna’s vaccines. He also accused the company of profiteering and “unprecedented corporate greed.” Of course, medical therapies do provide massive value to patients, and high profits are neither illegal nor confined to the pharmaceutical industry. Nonetheless, this industry now regularly takes innovation supported by public investment and transfers gains into private hands, extracting great cost from the health care system with insufficient return to taxpayers. The corporate taxes (or other fees) that drug companies pay on their sales revenues and stock sales do not reflect the government funds that enabled that abundance.

As scholars who study the economics of innovation, we think that the Advanced Research Projects Agency for Health (ARPA-H), a newly created US agency devoted to health innovation, provides an opportunity to rethink how medical advances are funded so that they benefit all stakeholders fairly: not just innovators, but also taxpayers and the broader public. Well-crafted government investment policies could help bolster the creation of accessible products that improve health and well-being, rather than simply channeling returns toward shareholders. As one of us (Mazzucato) has written, the system should reward businesses for creating value, not extracting it.

VALUE-CREATING INNOVATION

ARPA-H is modeled on the Defense Advanced Research Projects Agency, or DARPA, which was formed during the space race to give the US military a technological edge over its rivals. DARPA is acclaimed for its revolutionary approach to innovation in a range of technologies over the last 60 years. Its unique model—program officers take a hands-on role in directing high-risk, high-reward projects with well-defined objectives—has distinguished itself from other government agencies to pave the way for radical innovation.

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It is safe to assume that many of ARPA-H's programs will be in technology supporting medical innovation: less-expensive ways to produce viral vectors for gene therapies, for example, or customized blood cells for personalized cancer medicines that could greatly slash manufacturing costs.

One essential area for innovation, however, is in finance. ARPA-H should find ways to ensure that publicly funded science generates better, more equitable public returns. Though many in the pharma industry would argue that any attempts to restrict profiteering will stifle innovation, our work (including Whitfill's years as a biopharma venture capitalist, start-up executive, and entrepreneur-in-residence) has shown that there are ways to ensure investors receive appropriate returns, reinvest in innovation, and improve the public good. Here are three such strategies.

CAPTURE RETURNS THROUGH EQUITY

Rather than simply handing out research funds with few strings, ARPA-H could explore novel investment mechanisms, borrowing from the venture capital model that has fueled innovation for decades. In the current system, agencies such as the National Institutes of Health (NIH) and the National Science Foundation typically fund only the earliest stages of innovation. Then private investors provide funds for promising but still-risky ventures and receive an ownership stake that might eventually be worth nothing—or yield many multiples of the original investment. The government could realize some of these returns by extending its funding further into the development pipeline in the form of grants to companies that convert to equity at some future event, such as when a product moves into clinical trials, is licensed to another company, or reaches the market.

There is precedent for a government-led venture model. For example, the Central Intelligence Agency's venture arm, In-Q-Tel, is a nonprofit venture fund that supports cutting-edge innovation for national security. One of its investments was in satellite-mapping software later acquired by Google. That resulted in In-Q-Tel acquiring stock in Google, which it sold in 2005 for more than \$2 million. In-Q-Tel even works with private equity firms and corporate venture groups to create an integrated, public-private investment ecosystem that enhances the likelihood of success. At the state level, some states have adopted a publicly funded venture model. Connecticut has a quasi-public venture arm, Connecticut Innovations (with whom Whitfill has worked through his company, Azitra). This agency awards grants to companies that later convert into equity. The funds have helped spur innovation in the state while capturing returns for the public.

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ARPA-H could create a similar model. Indeed, this model could be even more powerful in accelerating biotechnology and medical treatments because health products and technologies need a longer time horizon to become profitable. Industry statistics show it takes a new drug more than a decade to go from early clinical testing to market approval. Capital firms are geared toward short-term returns, seeking an "exit" quickly (usually five to seven years or less) through an initial public offering or acquisition by another company; this focus can mean these firms avoid longer-term investments. For example, a company might design clinical trials to measure a quickly assessed but less reliable biomarker for a

neurodegenerative disease rather than waiting for rigorous evidence of stable clinical improvement—or it may steer clear of long-term assessments altogether.

But ARPA-H, unhindered by corporate short-termism, could make equity investments suitable for the time horizon of drug development. It could, for instance, invest in following patients over several years to see if easily measurable biomarkers predict actual improvements in longevity or quality of life. Such patient investing could also minimize dilution of ownership because start-ups would not need to raise multiple investment rounds to cover costs as a drug moves through clinical trials. Rather than behaving like traditional investors on the lookout for a lucrative exit, ARPA-H could essentially give cheap loans to support promising technologies over the long term, with the loan converting to equity (and payback to ARPA-H) only when a product is developed.

CURB EXCESSIVE PROFITEERING

Generally, when a company does bring a product to market, only a small fraction of profits is reinvested in future innovation. A 2023 analysis by our colleagues at University College London noted that from 2016 to 2020, the top pharma companies spent \$56 billion more on share buybacks and dividends than on research and development. They also spent more on sales, marketing, and nonmanufacturing costs than they did on R&D.

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Although there is little precedent for this, ARPA-H could encourage or require pharma company profits to be reinvested into R&D once innovation has succeeded. In pursuit of a similar goal, the Clinton administration explored capping the federal tax deductions companies could take for executive pay. That strategy was rolled back, but ARPA-H might look for other ways to restrict egregious financialized practices.

Of course, ARPA-H shouldn't institute policies that would keep companies from working with it. But many of the companies ARPA-H might invest in will be young, ambitious, and eager for investors. And mechanisms redirecting funds toward innovation rather than profiteering will apply only to the small fraction of work that is commercially successful. What's more, such policies would rightly reward the investors who put up the funds—the taxpayers—for their part in innovation.

SET CONDITIONS FOR APPROPRIATE PRICING

Many drug prices have little to do with their cost to manufacture. By one estimate, COVID-19 vaccines cost less than \$1 per dose to manufacture, but Moderna and Pfizer both intend to sell doses at over \$100 starting this year. Insulin costs \$3 to \$4 per vial to produce, but the list price for popular treatments can be as high as \$289 per vial. In the United States, commercial drug companies have considerable latitude to set drug prices, routinely arguing that new products should be priced at a premium to existing products on the market. Other considerations—including that more patients would be eligible to take a new form of a drug, thus expanding the number of sales—are often not taken into consideration for drug pricing, although they could boost company profits. To ensure affordability and access to medicines, ARPA-H could place conditions on its contractors.

Countries such as the United Kingdom and France have agencies that set or cap the prices on drugs based on medical benefits, but the United States, with its fragmented health care system, has no comparable way of containing costs. Research groups like the nonprofit Institute for Clinical and Economic Review (ICER) advocate for drug pricing set by factors such as comparative effectiveness and other parameters, but there is no US entity

with effective regulatory authority over drug pricing, and guidance from the ICER is often ignored by drug companies.

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Recently, provisions in the US Inflation Reduction Act of 2022 have allowed the federal government some leeway to negotiate prices for certain prescription drugs under Medicare, albeit with several restrictions. Even these measures have been criticized by pharma companies for potentially stifling innovation. Still, ARPA-H could offer additional levers to ensure reasonable drug pricing once a product is approved. One potential lever is the Bayh-Dole Act's "march-in rights," which grant the federal government the right under certain circumstances to assert legal title to an invention it has funded, despite patents. Although the act was passed in 1980, these rights have never been exercised. NIH has been petitioned to march in on drugs for AIDS, glaucoma, cancer, and other diseases, and has consistently declined to do so. But it is not hard to imagine that ARPA-H could place conditions on intellectual property generated with its funding to require accessible drug prices, thus creating mechanisms that would trigger the march-in rights provision.

All three of these mechanisms—capturing returns through equity, placing conditions on pricing, and restricting excessive profiteering—aim to prioritize patient access and R&D investments over shareholder returns. These and other unconventional financing mechanisms could spark innovation that prioritizes public health needs, including broadening access to technology, lowering pricing, enhancing knowledge transfer, and securing global distribution. In much the same way that DARPA has shaped new technology markets, ARPA-H promises to turn emerging science into new biotechnologies and medicines. The agency should lay a foundation from the beginning to fuel innovation and boost access to health technologies.

Yet another benefit of this approach would be running experiments in how to do taxpayer-funded innovation that provides returns to taxpayers and so makes future funding more politically stable. If a portion of the rewards that flow from this success also flow toward further innovation, that will be a triple win for patients, taxpayers, and investors alike.