



# Redesigning Federal Funding of Research and Development

## The Importance of Including Black Innovators

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# Introduction and summary

Innovation is central to the American dream. Federal funding for research and development (R&D), as it exists today, began after World War II and with the clear purpose of providing essential research that can improve many aspects of the “nation’s well being, primary health, economic growth, and national security.”<sup>1</sup> But like many facets of the American dream, it has been reserved for a select few. Black researchers, inventors, and entrepreneurs have not had equitable access to capital to seed that innovation and research.

Federal R&D funding has laid a foundational plank for the United States’ ability to compete and lead internationally. It promotes finding and identifying new solutions to both existing problems as well as new challenges. These public investments allow researchers and businesses to develop new technology to use their existing resources—labs, computers, manufacturing plants, office spaces, and people—more efficiently.

Federal R&D spending has often yielded great returns on investment, seeding successes<sup>2</sup> such as the internet, the Google search engine, the MRI, and the Human Genome Project—ubiquitous advances that play critical roles in improving people’s lives. Much of Silicon Valley would likely not exist in its current form without federal research support. Yet despite a concrete and clear mission, the current model for federal R&D cements existing racial inequities in the labor market—affecting Black researchers, inventors, and entrepreneurs, due to a lack of investment in this group.<sup>3</sup>

This lack of support for Black innovators in science and technology as well as in the innovation economy more broadly also negatively affects Black communities as a whole—slowing economic development, for example. It minimizes homeownership in neighborhoods surrounding the campuses of historically Black colleges and universities (HBCUs), and it decreases the availability of well-paying jobs among Black Americans. It is not that Black researchers, inventors, and innovators do not exist; these pioneers have long been providing wide-ranging and often life-saving contributions to American society.<sup>4</sup> But Black inventors and innovators are not getting the same investment and support that their white counterparts receive.

This report examines the current R&D funding structure, detailing the persistent racial inequality Black innovators face in federal R&D support. It also offers solutions to better utilize federal R&D spending with a goal of investing in African American innovation, while helping to close the racial wealth gap.

# The history of federal support of R&D

The U.S. government has a long history of funding basic and applied research in national defense, technology, and space exploration.<sup>5</sup> It encourages the development of new products and opportunities, often through private-public partnerships among governments, nonprofit research centers and universities, and private industry. These investments take many different forms. For example, R&D dollars are disbursed through direct federal investments in private-public partnerships whereby the government and private sector researchers share financial responsibilities on research projects.

## Road map to partnerships

Private-public partnerships exist in a number of areas such as infrastructure and science and technology.<sup>6</sup> The International Space Station National Laboratory, for example, has been developed with public investments but has also been open to private innovators to pay for the use of that space lab<sup>7</sup> as well as direct grants to researchers at universities and private labs.<sup>8</sup> The federal government also provides patents and copyrights to private investors who receive exclusive rights over researchers' inventions,<sup>9</sup> and it provides subsidized loans, liability protections, and tax breaks to bring innovations to markets.<sup>10</sup>

The federal government regularly spends money on R&D in three broad categories: basic research, applied research, and development.<sup>11</sup> In 2018, the U.S. government awarded \$92.8 billion for R&D to nongovernment researchers, with the disbursements as follows: Private industry and its research centers received 47.2 percent of the funding; universities, colleges, and their research centers got 39.3 percent; and other nonprofits were awarded 9.1 percent of the funds.<sup>12</sup> Federal dollars provide direct support through R&D grants, patent protections, and providing seed capital for startups and small businesses to commercialize federally funded research.<sup>13</sup> And part of these R&D funds go to universities to integrate R&D with training of scientists.<sup>14</sup>

The federal government also provides subsidized loans for the broader commercialization of new technologies. For instance, the U.S. Department of Energy's Loan Programs Office provides loans and loan guarantees for large-scale infrastructure projects. The government's involvement reduces the costs to borrowers and the risks to private sector banks through loan guarantees.<sup>15</sup>

As a result of federal support for R&D, a large share of U.S. patents have come out of this funding.<sup>16</sup> Federal R&D in all of its forms, though, has significant racial disparities, preventing many new innovations from ever happening in the first place or making it to a broader market.

Without massive and long-term financial commitments from the federal government, many innovations that are commonplace today might have never gotten off the ground.<sup>17</sup> For example, the internet would not exist without the decadeslong federal investment into the private sector from various federal agencies such as the Defense Advanced Research Projects Agency (DARPA). In the early 1960s, DARPA started coordinating and funding scientists across the country to develop a network of computers that could communicate with each other. The resulting Advanced Research Projects Agency Network (ARPANET), which sent its first transmission in 1969, was the precursor to the internet.<sup>18</sup> Furthermore, the National Institutes of Health (NIH) regularly provides funding for research into new treatments for existing and emerging diseases as well as for the development of new drugs. A wide range of lifesaving and life-improving discoveries would never have occurred or made it to the market had the federal government not used its ability to absorb the long-term risks to foster R&D.

Targeted long-term federal R&D spending can improve living standards, especially when directed to the areas of infrastructure and education investments.<sup>19</sup> Those government outlays, while crucial to a country's economic success, often take decades before measurable gains are observed. For instance, it will likely take two decades before new investments in smaller class sizes, increased nutrition support, and better learning tools in elementary schools will translate into increased innovation in the labor market. In comparison, federal R&D spending immediately supports researchers and their labs; nonprofit and private industry research centers; and university-based research. The federal government also provides patents and licenses for new products and services to private firms, assuring them often substantial profits for the development of their own products. Increasing such funding is likely to yield more expeditious results through faster productivity, growth, and innovation.

Importantly, R&D spending can be very risky, particularly if the research may not pan out as hoped. But even federal R&D spending that does not produce the promised research results—or that develops products and services that quickly become obsolete—increases economic value in a crucial way. It teaches researchers and businesses which venues for innovation not to pursue and where to better allocate their resources. While these additional funds can boost overall economic growth, there are spillover effects that will directly affect the Black-white wealth gap.

#### Racial disparities in research access and the Black-white wealth gap

Black researchers and inventors are less likely to get access to federally funded resources because they have often been excluded or faced barriers in the research profession.<sup>20</sup> A study of the Small Business Innovation Research program found that only 0.3 percent of its grants went to Black principal investigators.<sup>21</sup>

Furthermore, the impact of systematic violent oppression of Black Americans—from slavery to extrajudicial killings and lynchings to police violence—has also stymied Black innovation. For instance, economist Lisa Cook, in her landmark study of racial violence and patents from 1870 to 1940, found that racial violence systematically lowers the number of patents from Black inventors. During the period of her study, Black inventors filed 726 patents, which is likely an undercount; she estimates 1,100 patents were never filed due to racial violence.<sup>22</sup> In addition, Black researchers are more likely to live in communities that receive disproportionately fewer federal R&D dollars, and they have been historically blocked from accessing full patent protections.<sup>23</sup>

Moreover, HBCUs receive fewer R&D resources than predominantly white institutions of higher education.<sup>24</sup> For example, in 2018, Harvard University received more federal R&D financing than all HBCUs combined.<sup>25</sup> This also makes it harder for HBCUs to collaborate with other research institutions on cutting-edge innovation and to secure access to future funding.<sup>26</sup> The lack of investment in Black researchers and inventors limits the growth of their entrepreneurship and innovation.<sup>27</sup>

# The financial challenges

Making the necessary changes to combat racial inequity in the current R&D process will not be easy. Federal R&D spending has fallen in recent years, from a high of \$168 billion in 2009 to a low of \$118 billion in 2018, both in 2020 dollars, before increasing again to \$139 billion in 2020. While the latest spending increase is a meaningful bump in R&D investments, the 2020 spending levels are still below those from 2003 to 2016 in inflation-adjusted terms.<sup>28</sup> Relative to the size of the U.S. economy, federal R&D spending lags even further, since economic growth has been faster than inflation over this time. Currently, the amount of federal R&D is also highly unevenly distributed. Regions such as Silicon Valley, Boston, Maryland, Virginia, and the Research Triangle in North Carolina receive a disproportionately large share of federal R&D funding. For example, Maryland received \$18.3 billion, California \$17.9 billion, while South Carolina, Nevada, and Wisconsin received less than \$1 billion each in 2018.<sup>29</sup> The available funding is highly concentrated in a few predominantly white areas of large urban centers on the East and West coasts, where major research universities are located.

In addition, much of the funding is limited to a select few existing institutional networks, perpetuating racial inequities in research, technology, and wealth over generations. For example, between 2009 and 2013, HBCUs received 0.2 percent of the funding awarded for research grants from the National Science Foundation.<sup>30</sup> HBCUs represented 1 percent of all grants awarded by foundation but received a disproportionately smaller share in such critical innovation funds than other universities.<sup>31</sup>

The federal government also fails to capture all the added value from federally funded R&D. Much of the high value added from breakthrough research accrues to the firms that received the patents and licenses, which protect the discovery of new technology. Patents and licenses leverage the private sector's ability to bring new products to market and thus bring critical new goods and services to a socially desirable scale. But because the federal government does not receive a cut of the economic gains, R&D funding is never replenished or grown. This lack of recouping any gains provides no direct incentive for the government to invest more money. In the short term, R&D funding is a cost to the government that leaves it with fewer resources to address persistent inequalities.

# Recommendations

The federal government can address the racial disparities in funding and provide a better pathway for R&D dollars by investing in a new model with two key approaches: dedicating funding for Black-led research and establishing an innovation dividend.

These new options for federal R&D would have several benefits for closing the racial wealth gap. First, Black Americans could receive more stable, well-paying research jobs, which could increase access to entrepreneurship opportunities. Second, HBCUs would become more integral as partners in basic research, and the country would have greater access to the existing pool of Black scientists in academia, nonprofits, and private businesses. Third, greater support for African American entrepreneurs and inventors to participate in research collaboration and the commercialization of new, high-value-added products could boost the creation of not only new innovations but also good jobs in predominantly Black communities. Lastly, a dividend could provide unrestricted money directly to Black Americans and/or Black institutions.

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## Dedicate funding for Black-led research

Congress should increase spending that will target Black researchers and inventors as well as HBCUs and other predominantly Black research centers. These initiatives would provide new funding within existing federal research agencies—such as the National Science Foundation, the NIH, and the Small Business Administration’s Small Business Innovation Research and Small Business Technology Transfer programs—with the intended purposes of redressing decades of failed investment in Black-led innovation. These investments would immediately build wealth for Black families and communities by boosting access to good, well-paying jobs in newly created Black innovation hubs.

Congress will need to increase R&D funding, especially for Black scientists, businesses, and HBCUs. It should start by establishing an oversight board that includes stakeholder representatives from the Black research community, from

Black-owned businesses, and from Black communities. This board should report to Congress and the White House Office of Science and Technology Policy on the racial impact of R&D funds within programs administered by federal agencies. In addition, the White House Office of Science and Technology Policy and the White House Initiative on Historically Black Colleges and Universities should work with federal agencies to prioritize allocation of federal R&D dollars to Black scientists, businesses, and HBCUs. The White House office should also require the agencies responsible for the allocation of federal R&D dollars to report to the White House initiative, which would generate one annual report on the impact of that spending on Black researchers, HBCUs, and Black American communities. That way, Congress would increase the money available for innovation in the African American community. Its own oversight board would provide feedback on additional funding needs. The administration will need some discretion in the allocation of R&D funds. Agencies then reporting to the White House—which will report to Congress on the use of funds dedicated for Black researchers, research centers, and HCBUs—will assure accountability in the administration’s use of the newly appropriated funds.

With a focus on racial equity when deploying new funds and the allocation of all federal R&D dollars, the government can support innovation at research centers located in disproportionately African American cities or regions with a high concentration of Black scientists and engineers as well as HBCUs. Guided by the White House Initiative on Historically Black Colleges and Universities, Congress and the above-described accountability structure should:<sup>32</sup>

1. Increase the allocation of federal R&D funding to HBCUs.
2. Require federal agencies to provide technical assistance and funding support to build grant management capacity at HBCUs. In addition, federal agencies should create avenues for mentoring relationships for researchers at HBCUS with experienced African American researchers who have received grant funding in the past.
3. Provide federal dollars for research conducted at HBCUs beyond medical researchers and medical professionals. The oversight board must ensure that Black scientists can fully participate in identifying new, innovative solutions to many of society’s problems, such as finding therapies for new illnesses and reducing climate change and its effects and food insecurity. This will require the federal government to provide increased funds to build robust research capacity.<sup>33</sup>
4. Ensure increased public-private research partnerships between HBCUs and the private sector. This not only yields investments in the research, but also increases access for students and faculty.

5. Use federal real estate to establish or expand innovation incubators at or near HBCUs. The federal government would provide low-cost or free access to researchers at HBCUs and those who collaborate with HBCUs to set up labs, manufacturing, and other research facilities.

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## Establish an innovation dividend

The federal government should capture more of the value created by R&D through an innovation fund that pays a dividend. A range of proposals already exists to capture part of the value added from federally funded R&D, as discussed further below. A combination of these approaches could generate sufficient money to finance an innovation dividend, which could directly support wealth building for Black Americans. The innovation dividend could be paid out as unrestricted grants to HBCUs and provide debt-free college admission to Black students, seed grants for new businesses, or direct cash benefits to African Americans.

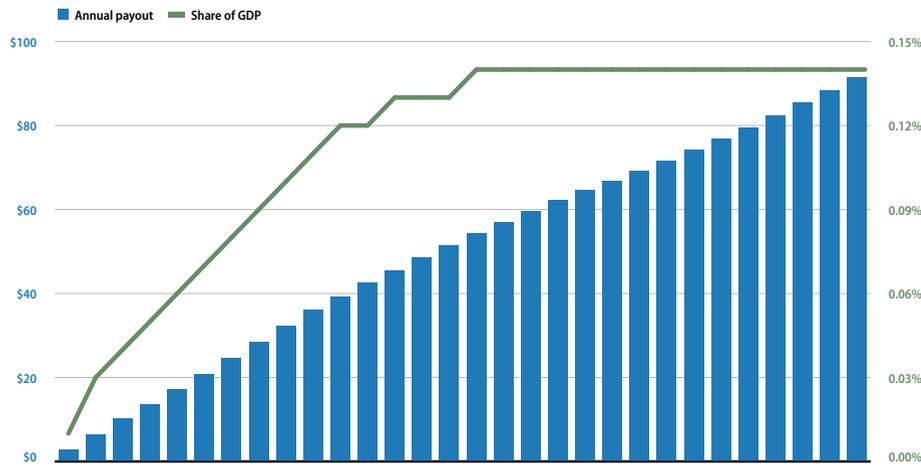
This innovation dividend is likely to have a much larger impact on Black families and communities than the Center for American Progress' projections suggest. In determining how impactful these payments could be, this analysis makes the following assumptions:

1. The federal government spends \$125 billion annually in new R&D, which is higher than the current low of about \$100 billion per year.
2. The government's annual outlay for R&D increases with gross domestic product (GDP) growth, based on the Congressional Budget Office's long-term economic projections.<sup>34</sup>
3. Each investment lasts for 20 years, which is equal to the typical length of patent protections and may be a reasonable benchmark of the usual life span of an invention.
4. All investments generate an average nominal rate of return of about 3 percent, which is akin to the long-term, risk-free rate of return assumed by the Congressional Budget Office but well below historical averages.<sup>35</sup>
5. The federal government is able to capture all of that added value from these investments so that private sector profits only arise from private sector investments.

Importantly, these assumptions understate the value that such a program could create since they assume that R&D investments grow at a modest rate, even as the need for more technology investments amid sluggish productivity growth is apparent. This analysis also assumes a very low rate of return based on historical standards. If executed correctly, this program has the potential to have a large impact.

**FIGURE 1**  
**Dividends paid to African Americans will increase over time as the pool of federal research and development (R&D) investments grows**

Projected annual dividend payouts in absolute dollars and relative to gross domestic product (GDP), 2021–2050



Source: Congressional Budget Office, "Budget and Economic Data: Long-Term Budget Projections, March 2020," available at <https://www.cbo.gov/data/budget-economic-data#1> (last accessed August 2020).

As Figure 1 indicates, the federal government could pay out a growing amount from \$3 billion in 2021 to \$91.5 billion in 2050. The growth of the payouts over time is the result of the government’s yearly contributions to the pool of inventions, creating the innovation dividend and thus a payment. Existing R&D funding up to the point where the innovation dividend fund starts, after all, will not serve as a foundation for the dividend since that funding has already been spent under existing rules. Only new R&D spending will generate investments that will support the dividend. Each year, the federal government will make new investments, worth \$100 billion to start with, and each year’s new investments will generate gradually declining dividends, due to depreciation, for 20 years. Because the federal government will add more investments each year faster than the depreciation of existing investments, the basis of inventions that can generate a dividend will grow. And the payments will also grow alongside that pool of investments.

The payments increase from a low of 0.01 percent of GDP to 0.14 percent by 2036. (see Figure 1) These projections are likely conservative, and payouts could be much larger.

A dividend of this amount could take many forms. The money could fund direct cash payments for a reparations program,<sup>36</sup> provide scholarship money, or provide seed capital for other asset building tools such as creating a business or purchasing a home. For instance, \$10 billion could fund 200,000 annual college scholarships at a value of \$50,000 each—roughly the average amount of debt African American college graduates obtain.<sup>37</sup> Alternatively, the dividend could provide \$10,000 to 10 million children—the approximate number of African American children in the United States right now—through a baby bond proposal.<sup>38</sup>

Whether and how the federal government should directly finance this innovation dividend are open questions. Currently, most of the added value from innovation is indirect—resulting in private sector jobs with increased incomes. These benefits disproportionately help white Americans due to centurieslong employment and wage discrimination. One financing option of an innovation dividend would be general revenue financing to offset the legacy of exclusion of Black Americans from innovation and from the benefits of innovation over centuries.

Alternatively, the federal government could drastically change the way it designs its R&D funding programs and directly capture the added value from innovation. Establishing a financing mechanism for an innovation dividend has the advantage of becoming more insulated from political risk. It will be harder for a future Congress to end payments of an innovation dividend if this dividend is funded with a dedicated funding stream. On the other hand, creating a dedicated funding stream would impose a small reduction in profits for private sector companies, which may muster political opposition and possibly reduce the chance that private sector companies take advantage of federal government support.

### 3 ways to capture innovation value to finance an innovation dividend

The first method would involve the federal government providing direct equity or debt financing of private sector companies for the adaptation of new technologies. In exchange, the federal government would receive capital income—from corporate profit payouts, interest payments, and capital gains—that could fund the innovation dividend. Importantly, the federal government would then share in the upside gains from new innovations as it takes on a large share of the risk of the early stages of R&D.

Under equity financing, if a company receives federal R&D funding, the government acquires a claim on a company's future valuation. This approach includes so-called golden shares. The government could retain golden shares of intellectual property rights when granting licenses to private companies.<sup>39</sup> The government would, thus, directly benefit from the commercialization of new products. A similar option would involve the government taking an equity stake in new companies in exchange for financing the commercialization of publicly funded R&D. These venture funds could be a variant of the National Science Foundation's America's Seed Fund, which has existed since 1977 but has not taken an equity stake in any ventures it funds.<sup>40</sup> Equity financing of innovative technologies is a departure from current U.S. practice and could prove to be a disincentive for companies to accept federal R&D support in the first place.

Another option is the implementation of an innovations fee. Companies that receive intellectual property rights from publicly funded research must pay a share of their future profits into an innovation fund.<sup>41</sup> This approach would also provide the federal government with an opportunity to share in the upside gains of new innovations without becoming a partial owner of a company.

The U.S. government often provides loans for strategically important programs, rather than taking an equity stake. In this case, it acts as a lender to, rather than partial owner of, a company developing a new product or technology. For example, the American Recovery and Reinvestment Act continued the Department of Energy's Section 1705 Loan Program for U.S.-based energy programs.<sup>42</sup> Congress could expand such loan programs to support Black entrepreneurs and inventors and would then receive interest payments on its loans in return. While loan programs provide a revenue stream back to the government in exchange for taking some of the risks of funding new technologies, they limit the opportunity to share in above-average gains. The government receives a predetermined interest rate, no matter how well a technology will perform in the future.

Federal equity and debt financing would need to be self-financing to some degree to support the innovation dividend over long periods of time by establishing an ongoing portfolio of companies. Currently, loan programs depend on congressional appropriations since they initially cost money, as some funded companies will inevitably fail. The Department of Energy's loan program, for example, received bad headlines and political backlash as several companies with loans went bankrupt, even though the entire program ultimately produced a positive result.<sup>43</sup>

A second method would generate revenues without the federal government getting directly involved in businesses by either lending to them or taking an ownership stake. One such alternative would impose fees on licenses. For example, Congress could establish a fee on licenses and patents when they are sold. A similar financing stream would be a royalty fee proposed by Jeffrey Bluestone, a professor of endocrinology from the University of California, San Francisco; David Beier, managing director of Bay City Capital; and Laurie Gilchmer, CEO and president of the Dana-Farber Cancer Institute. They suggest such a royalty fee in exchange for licenses from the NIH to finance its High-Risk, High-Reward Research Program, effectively establishing a dedicated revenue stream for future R&D financing.<sup>44</sup> Importantly, such a fee should not create a financial hurdle for African Americans, who generally have fewer economic resources in their businesses. The fee could be waived for Black applicants if they do not have sufficient financial resources.

An alternative funding stream would require that legal settlements of patent infringement cases would accrue to the federal government that financed much of the new technologies in the first place. Yet another approach has been proposed by professors Jonathan Gruber and Simon Johnson from the Massachusetts Institute of Technology.<sup>45</sup> In their strategy, the federal government would reap additional capital gains and higher rental incomes from federal properties located near research centers and universities that would receive new R&D funds in the future. Because research centers and universities create localized spillover effects into neighboring real estate markets, property values and rents will rise. The federal government could use the ensuing capital gains and additional rental income to finance an innovation dividend.

The indirect financing approaches follow in the spirit of the Community Reinvestment Act, whereby a share of deposits is reinvested into the community.<sup>46</sup> The same could apply here, whereby firms that received publicly financed research would have to equitably share a portion of their gains with the public by reinvesting in novel innovations.

Lastly, an innovation fund could also follow the model of the Alaska Permanent Fund, which is funded by royalties from Alaska's oil production.<sup>47</sup> The Alaska Permanent Fund Corp. has fiduciary responsibility for the investments, while the Alaska Department of Revenue is responsible for the annual disbursement of dividends to all residents of the state.

It is critical to establish the innovation dividend independent of the pay for solution. The dividend should be paid out as a stable, predetermined amount and thus not depend on the earnings of an innovation dividend fund in any given year. Furthermore, it is important to ensure the financing of the dividend does not reduce the benefits of increased R&D investments to Black communities—that is, broad-based financing approaches such as innovation royalties or fees on patent violations should only reduce the benefits of innovation to the Black research community to a small degree or not at all.

# Conclusion

African American workers, families, and communities are too often shut out of the opportunities for sustained income and wealth growth. Access to public R&D investments is not an exception. The origins of federal R&D are rooted in an understanding that government has an important role and responsibility to support both research talent. It is long overdue for the U.S. government to pursue new ways to leverage R&D investments with a focus on investing in Black scientists, entrepreneurs, and HBCUs. By deploying a more equitable and intentional R&D model, the federal government can not only stop the inequitable distribution of federal research dollars, but can also have a positive impact on closing the racial wealth gap across generations.

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