

# A New Vision for Postal Reform in the E-commerce Age

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Congress should pass Postal Service reform legislation that focuses on two key things: freeing up USPS to make the kinds of reforms it needs to reduce costs, and establishing a Technology Innovation Fund to enable robotic last-mile postal delivery.

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## KEY TAKEAWAYS

- Absent significant reform and increased use of technology, USPS's finances will continue to be troubled. The solution is neither privatization nor government subsidies; it's reform and innovation.
- Because of continued declines in first class mail and the growth in package volume, Congress and the administration should not require USPS to raise its prices for package delivery.
- Congress should explicitly encourage USPS to close money-losing post offices and consolidate postal processing facilities to create the most efficient national processing network possible.
- Congress and USPS should support expanded work sharing in areas such as sorting and processing.
- Neither Congress nor USPS itself should expand the mission of USPS to new, non-postal-related services.
- The best way to reduce USPS costs would be to automate local delivery of the mail. Robots show promise but need more development. Congress should appropriate \$1 billion a year to support a USPS robotics development and adoption fund.

## INTRODUCTION

For the last 50 years, Congress has intermittently focused on postal reform, from 1970 when it changed the status of the United States Postal Service (USPS) from a government department to an independent government agency to the Postal Accountability and Enhancement Act of 2006 (PAEA). Given the dramatic changes in the business environment for USPS, especially in the last year, it is time for Congress to revisit reform, but this time to focus on two key aspects: first, freeing up USPS to make the right kinds of reforms needed to reduce costs; and second, to establish a major USPS Technology Innovation Fund to help drive future technological innovations, particularly to get to robotic last-mile postal delivery.

This report makes a number of recommendations:

- Ensure USPS can continue to take full advantage of its efficient national last-mile delivery network for mail and packages, in part by preserving six-day-a-week delivery.
- Congress and the administration should not require USPS to raise its prices for package delivery.
- Congress should explicitly encourage USPS to close money-losing post offices and, where appropriate, work with private-sector companies to provide acceptance services.
- Congress should explicitly encourage USPS to consolidate postal processing facilities in an effort to create the most efficient overall national processing network.
- Congress and USPS should support expanded work sharing in areas such sorting and processing. USPS and the Postal Regulatory Commission (PRC) should regularly update work-share discounts to reflect current network operations.
- Congress, USPS, and the postal unions should craft a grand bargain on retirement: In exchange for increasing the age of retirement for postal workers, Congress should wave at least a portion of the total amount of pre-funded payments USPS is delinquent in making to its retirement fund.
- Congress should give USPS more flexibility to adjust wages to reflect local costs of living.
- Neither Congress nor USPS itself should expand the mission of USPS to new, non-postal-related services.
- Congress should provide the Postal Service with the same kind of one-time funding as airlines and other private-sector employers that are facing a steep decline in demand due to the pandemic.
- Congress should pay for USPS to replace existing vehicles that are past their expected useful life with clean energy vehicles.
- Congress should appropriate at least \$1 billion a year dedicated to a USPS robotics development and adoption fund.

## 2020: A YEAR OF TURMOIL FOR THE NATION AND USPS

2020 was a year of turmoil, disruption, and tragedy, much of which impacted USPS. There was more public attention on the Postal Service than in decades. It was wrapped up in controversy, including over potential conflicts of interest with the Trump-appointed postmaster general and potential delays in vote-by-mail delivery (which did not, fortunately, come to fruition). At the same time, frontline postal workers had to cope with COVID-19, with a number of workers getting sick.

Notwithstanding these challenges, Americans continue to view USPS very favorably. A poll by the Harris corporation asking Americans to rank companies in terms of the essential role they played in the crisis finds that USPS ranks as the most favorable, ahead of such popular brands as Clorox, Google, United Parcel Service (UPS), and Walmart.<sup>1</sup>

However, the market environment for USPS was difficult in FY 2020, to say the least. First-class mail volume declined by 4.8 percent, following a decline in FY 2019 of 3.2 percent. And between 2006 and May 2020, volume declined 44 percent.<sup>2</sup> USPS marketing mail, which comprises most “other” mail volume, declined from 75.7 million pieces in FY 2019 to 64.2 in FY 2020, a decline of 14.7 percent. From 2007 to 2019, it declined 27 percent.<sup>3</sup>

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At the same time, package volumes and revenue increased significantly in FY 2020, by 25 percent and 19 percent respectively. This is not surprising given the significant growth in e-commerce, as more Americans relied on this channel for everything from medicines to food to clothing. Indeed, the pandemic accelerated key shifts in business and consumer behavior. While the technology for remote work, remote education, and remote commerce have long been developed, it took the pandemic to spur widespread adoption. As Microsoft CEO Satya Nadella stated last year with reference to the pandemic, “We’ve seen two years’ worth of digital transformation in two months.”<sup>4</sup> While much of this shift was moderate, it is likely that at a significant portion of the shift to digital and e-commerce will persist.

This has significant implications for the health of the Postal Service, particularly as “market dominant” products, especially first- and third-class mail, continue to decline and packages continue to increase. Historically, after economic recessions, mail has only made a partial comeback—and given the continued trend toward digitization, we can likely expect continued, moderate declines. Any efforts at reform need to take into account this critical trend, as packages provide the needed revenue to keep the Postal Service afloat.

## THREE MAIN APPROACHES TO REFORM

While effective postal reform by necessity involves delving into postal arcana—work-sharing discounts, pricing of market-dominant and competitive products, pension fund payment schedules, the structure of the Postal Regulatory Commission, and the like—much of the debate occurs at a higher and more fundamental level. The following are three main visions for postal reform, with proposed solutions logically following from each overarching vision and ideological goal.

## Competition and Privatization

One long-running view of postal reform is that more, if not all, USPS services should be privatized—even going so far as to privatize the entire enterprise. Many conservatives embrace this view because of their ideological suspicion of government and preference for market-based, business-led solutions.

These proposals can be as narrowly focused as requiring USPS to increase prices on competitive package services so that its market share shrinks (or even is eliminated) and the share of companies such as UPS and FedEx grows. This was a key goal of the Trump administration's postal reform efforts.<sup>5</sup>

Often the goals are broader, such as to bring competition to virtually all postal functions. Case in point: a recent Heritage Foundation report arguing that Congress should end USPS's universal service obligation and its letter-box monopoly so as to encourage competition with the private sector.<sup>6</sup>

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Some want to go beyond opening up USPS to competition and limiting its services to mail-only (and not packages); some want to privatize the organization itself. In a report for the Brookings Institution, Elaine Kamarck, proposed:

That future should begin with a decision to break the organization into two separate entities. One organization should be a public sector organization with the sole mission of delivering on the universal mandate—defined in a way that meets the reality of the information age. The other organization should be privatized so that it is out from under the laws and regulations that make innovation and flexibility all but impossible. This new organization should be allowed to compete with similar organizations in the private sector if and only if the subsidy issue can be worked out so that the new competitor does not have an enormous and distorting market advantage and if it is managed by people with private sector experience.<sup>7</sup>

To be sure, in most parts of the economy, competition and private-sector provision of goods and services maximize consumer welfare. But there are several factors that make the Postal Service different. First, postal delivery is a natural monopoly, and opening this up to competition would mean less efficiency, not more. Compare this with broadband Internet services, which some argue is also a natural monopoly. But this is not because of technology. Different wires that already go to households—cables for TV and copper wires for telephone—are both used to deliver broadband. And with 5G wireless and new low-Earth-orbit satellites, consumers will have even more options to get broadband.<sup>8</sup> But only one organization visits every household in America six days a week, and that is the Postal Service. Opening up the last mile to competition would only increase overall costs as multiple workers would visit each household every day, each delivering less mail than the average postal worker delivers.

Second, the universal service obligation of USPS is an important one that ties the nation together, including lower density and lower income parts of the nation. Privatization would make it harder to achieve this universal service obligation because private providers would only choose the most profitable routes, leaving the less profitable to USPS. Moreover, any implicit or explicit privatization would eliminate the ability of USPS to use its highly efficient integrated last-mile network to deliver packages, lowering efficiency and driving USPS into a death spiral of higher prices, even lower revenues from reduced demand, etc.

Any effort to open up the last mile of delivery to competition—or even to preclude USPS from serving some areas, as the Trump task force proposed—would hasten the decline and ultimate death of USPS. The result would be that USPS would be stuck with the least-profitable (in this case, unprofitable) homes to deliver to, while the private sector would get to “cream skim” (serving the most valuable customers), meaning that without a massive government subsidy, USPS would cease to exist.

This does not, however, mean every postal function should be operated by USPS. There are functions the private sector may be able to perform more efficiently, such as mail sorting or acceptance. Despite what some on the left argue, allowing some postal functions to be conducted by the private sector is not a slippery slope to full privatization. If anything, it is a bulwark against it because it can improve USPS’s financial performance.

### **Monopoly and Governmentalization**

In contrast to many on the right, many on the left want an even more expansive USPS. While the Right wants to privatize USPS, many on the left want to governmentalize it. Many proposals from the Left for postal reform are grounded in a social-democratic view that more of the economy should be government owned and operated, in part to create better jobs, reduce corporate profits, and boost equity. They would end all outsourcing and work sharing, as well as have USPS expand into other lines of business that have nothing to do with delivering the mail, such as consumer banking. If this were not enough to restore profitability (and it would not be), they would have the Treasury step in and provide ongoing operating subsidies from general revenues.

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One reason so many on the left want a larger USPS is because they believe government jobs are better than private-sector jobs, in part because a greater share are unionized. Economic Policy Institute analyst Monique Morrissey supports a larger USPS because “career jobs in the Postal Service are good jobs for workers without bachelor’s degrees. Postal workers are better compensated than many other workers with similar education, years of experience, and hours worked.”<sup>9</sup> Center for Economic and Policy Research analyst Max Sawicky agrees, writing, “One neglected angle of the service’s external benefits is the labor standards required by law. The service employs approximately 600,000 persons, including 100,000 veterans”<sup>10</sup>

But for them, USPS isn’t just a jobs program; it is something more than that. It is a pillar against privatization of much of the activities in U.S. communities. For example, Sawicky argues—with little logic or evidence—that in “the wake of the economic collapse, its [USPS] rejuvenation

could offer relief to bankrupted, suburban small businesses, including those conducted from the kitchen table.”<sup>11</sup>

To make USPS more financially healthy and to resist the pressure to outsource some work to more-efficient private-sector providers, “governmentalizers” rely on the largely dubious proposition that USPS could make substantial profits if Congress would only let it get into new lines of business. For example, Sawicky wrote,

“The more than 30,000 postal retail facilities could assist in vaccine distribution and other relief functions,” without saying why post offices, not known to be paragons of efficiency, would be better places to get a vaccine than local health clinics.<sup>12</sup> He even goes so far as to argue that Congress should give the new government postal department a monopoly over delivering email.<sup>13</sup>

Just as some privatizers would transform USPS into a private, for-profit corporation, some governmentalizers would go back to before 1971 and return USPS to government department status. Sawicky proposed that USPS “should be returned to a department of the federal government proper, opportunities for expansion explored, and any shortfalls in operating costs or promised benefits to postal workers should be covered by regular budget appropriations.”<sup>14</sup> And of course, he would end the self-funding mandate because “[t]he bane of a thriving postal service is the principle that it should be self-financing.”<sup>15</sup>

While there are parts of USPS that should absolutely be preserved as a core government function, especially last-mile delivery, governmentalizing the Postal Service would only increase its financial woes. If the private sector can perform some functions more efficiently, including sorting and acceptance, then the overall postal “system” is better off allowing and encouraging this. But rolling back these steps would make USPS’s financial hardship worse, not better.

Because they would not actually improve USPS finances, proposals to make USPS bigger are almost always accompanied with the proposal of federal Treasury subsidies. Sawicki noted, “We don’t ask the Department of Defense to organize bake sales to fund its activities,” ignoring the fact that the government relies on user fees for a broad array of publicly provided services, including national parks, roads, and some regulatory areas.<sup>16</sup> But the government purse is not bottomless, especially with the baby boom retirement crisis and the massive debt incurred during the COVID crisis. Nor should USPS be a jobs program. Postal inefficiency and excess spending have to be paid for by someone, and that someone is the U.S. taxpayer and mailer.

## **Innovation and Productivity**

Neither free-market privatization nor progressive governmentalization are the answer. In some aspects of USPS functions, such as mail processing and acceptance, more private involvement would be better. In others, such as mail and package deliveries, more USPS involvement would be better. The core goal of any reform agenda should be to ensure that core postal functions should be performed in the most efficient way.

If one rejects the ideological extremes of privatization and governmentalization—neither of which work, with each bringing its own set of new problems—one is left with a pragmatic focus on specific issues, including deciding which postal functions should be more private versus more governmental, and how to conduct functions in the most cost-efficient way.

Simply cutting services as a way to boost profitability can be an attractive answer in the short run. The problem is, depending on its form, doing so can lead to a death spiral. Worse service means diversion away from postal services, either to digital means of delivery or to competitor carriers for packages.

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This leads to the critical question. Absent ongoing subsidies on the one hand, or privatization and reduced service levels and quality on the other, is it possible for USPS to become financially stable? The answer is no one knows. Much of it depends on trends in demand for postal services and the overall level of economic growth. If there is continued and significant migration away from mail, the prospects for a healthy USPS are lower.

But changes in mail and package volume are largely out of policymakers' hands (assuming policymakers rightly want to keep the current level playing field between USPS and private companies for competitive mail products (e.g., packages)). And the notion that USPS can save itself by entering new lines of business where the private sector already provides services is dubious.

What policymakers can productively influence is innovation and efficiency. In other words, making postal functions more productive, including through increased use of technology, should be the central focus and goal of any upcoming congressional postal-reform efforts. This means putting an end to congressional efforts to block USPS from closing sorting stations or rural post offices (and moving the functions to retail stores). It also means launching a major initiative to use the Postal Service as test bed for innovation in such areas as alternative vehicles (e.g., electric or hydrogen fuel cell) and, most importantly, postal delivery robots. In an ideal world, within the next 20 years, smart machines would sort the mail, with self-driving trucks transporting it across the nation and robots ultimately making final delivery. Doing so would also dramatically cut USPS costs.

## **KEY ELEMENTS OF POSTAL REFORM**

To help ensure the long-term viability of USPS, there are number of principles Congress should abide by:

### **Leverage Network Strength**

Undoubtedly, the core strength of USPS is its integrated delivery network. The Postal Service efficiently delivers to over 157 million delivery points six days a week.<sup>17</sup> By taking advantage of its economies of scale, USPS is able to keep costs down for not only mail delivery, but package delivery as well.

As such, any proposals requiring USPS to structurally separate package delivery from market-dominant mail, or charge prices as though the two functions were separate, would raise costs for USPS package delivery. This would lead to fewer package shipments overall (i.e., package shipment prices would increase, leading to less demand) and if competitors do not raise prices by the same amount USPS prices increase, it would lead to reduced USPS package market share. Forcing USPS to raise package prices this way would also decrease gross domestic

product (GDP) by reducing the overall productivity of the package delivery industry because packages would shift from a more efficient low-cost production network to higher-cost ones.<sup>18</sup> It is also important to note that USPS's competitors such as UPS and FedEx take advantage of these economies of scale by hiring the Postal Service to deliver millions of packages to the last mile. This is particularly important in high-cost rural areas where USPS is able to deliver packages more cost-effectively than private companies that typically charge more for rural delivery.<sup>19</sup> Indeed, the universal service mandate and performance of USPS is critical, even as we move to an e-commerce world, in part because USPS enables low-cost and timely package to rural areas, as private package companies often charge more for rural delivery.

While USPS earns the majority of its revenue from regular mail, it increasingly utilizes its vast network to deliver competitive products, particularly e-commerce packages. As this portion of USPS business grows, maintaining a six day a week delivery schedule becomes even more important. If the majority of what USPS delivers were first- and third-class mail, it might be able to cut delivery to five or perhaps fewer days a week (although even then there would likely be some reduction in mail). But with packages making up an increasing share of both volume and revenue, cutting delivery days would threaten the viability of its package delivery services. As such, **any postal reform effort by Congress should ensure USPS can continue to take full advantage of its efficient national last-mile delivery network and not require it to deliver fewer than six days a week.**

### **Continue to Support the Package Business in Ways That Enable Fair Competition**

PAEA both forbids the Postal Service from cross-subsidizing packages to make sure it competes fairly with companies such as UPS and Fed Ex, and charges the Postal Regulatory Commission with enforcing this requirement.<sup>20</sup> The Act requires the Postal Service to ensure package deliveries cover all their attributable costs plus an appropriate share of overhead.

Despite this, UPS and FedEx continue to argue that USPS is unfairly cross-subsidizing packages and want Congress to require USPS to increase package prices and use different cost allocation models from those in use now. The Trump administration also sought such price increases, in part, to purportedly punish Amazon, the CEO of which President Trump disliked. In contrast, some on the left want USPS to charge more for packages, believing doing so would earn it even more money and help avoid cost cutting.<sup>21</sup>

Certain businesses argue, and some studies support, that USPS is becoming a package business, which is a shift away from its core mission. According to a study by economist Greg Sidek, who has represented UPS on regulatory matters, "In 2020, the Postal Service no longer faithfully adheres to the statutory mandate—that its 'basic function' be the delivery of the 'correspondence of the people.' From 2010 to 2020, first-class mail volume steadily decreased and package volume steadily increased."<sup>22</sup>

But letter mail still accounts for both the significant majority of items USPS delivers and the majority of its revenue. In addition, this argument ignores the fact that USPS already goes to every home in America, so it is efficient for USPS and American society to have it also deliver packages. If the day ever comes when the first- and third-class mail business shrink so much that this is not the case, then USPS's role in package delivery can and should be reevaluated. But that does not appear to be any time in the foreseeable future.

With regard to the issue that USPS is unfairly underpricing packages, USPS, PRC, and the courts have all said that they do not. In May 2018, the U.S. Court of Appeals for the District of Columbia ruled in favor of PRC in a complaint brought by UPS that asserted USPS was unfairly competing in the parcel marketplace. The court ruled that because “the Commission’s exercise of its authority [was] ‘reasonable and reasonably explained,’ we deny UPS’s petitions for review.”<sup>23</sup> Should the cost structure of USPS change such that packages support a higher share of overhead, PRC would be statutorily responsible and equipped to require such a change.

Sidek in particular argues for what is known as fully distributed costing (FDC), wherein each function pays the same share of overall costs, regardless of its contribution to those costs. As Panzer et al. wrote, “FDC, a discredited approach to costing that has been rejected by mainstream economists in virtually every other regulated network industry in the United States.”<sup>24</sup>

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Moreover, requiring USPS to raise package costs would result in fewer packages being delivered (as well as higher prices for consumers) and, depending on the elasticity of demand, potentially lower overall revenue. In a study sponsored by the Package Coalition, Panzer et al. argues, “The Postal Service has earned substantial profits serving this growing package business. It is able to do so because of the economies of scope between its letter and package delivery services that allow it to realize cost efficiencies in delivering mail and packages together. The Postal Service passes through the benefits of those efficiencies in the form of lower prices to businesses and consumers who use the Postal Service’s nationwide delivery network.”<sup>25</sup> Indeed, the study claims, “The package business is the silver lining of the Internet cloud that looms over the Postal Service.”<sup>26</sup> Likewise a report by Charles River Associates’ economists Debra Aron and Justin Lenzo, supported by the Package Coalition, finds that consumers and the Postal Service would be hurt by increases in package delivery prices.<sup>27</sup>

A principal reason USPS should be able to price packages in a way that neither subsidizes them nor treats them as a “cash cow” is by delivering packages through its efficient last-mile network, it maximizes efficiency. As economist John Panzer concluded:

A major reason for the success of the Postal Service’s package business is the fact that its package business uses the same last-mile delivery network used for its letter mail delivery business. Because of the substantial economies of scale in delivery, the Postal Service’s cost of package delivery is less than using a stand-alone delivery network. Similarly, the costs of the Postal Service’s letter delivery operations are less on a per-piece basis when provided along with packages than would be the case if letter service were provided using a stand-alone delivery network. Thus, economies of scale in its delivery network enables the Postal Service to enjoy *economies of scope* between its letter mail and package operations.<sup>28</sup>

**While there are a host of reforms Congress and USPS could make to improve efficiency and financial viability, requiring USPS to charge more for packages is not one of them.**<sup>29</sup>

## Reduce Operational Costs Smartly Without Adversely Impacting Service

The only way to make USPS financially sustainable would be to cut costs, increase revenue, or both. Revenue can be increased several ways, such as by hoping package growth continues; and while that is a desirable outcome, it is not likely to be enough to address the challenge. USPS could increase prices of either market dominant or competitive products. The challenge is this could accelerate diversion to other channels of competitors. Revenue could increase if the government simply subsidized USPS. However, while a one-time COVID-19 subsidy is justifiable and desirable (especially as other large industries such as airlines have received help), ongoing subsidies are likely not politically sustainable. And like price increases, subsidies reduce the pressure on USPS to take, and Congress to support, the steps needed to cut costs.

Finally, USPS could get into new lines of business, hoping that somehow they could make surplus profits to help offset postal losses. But it is not appropriate for USPS to compete with private businesses outside of postal functions. And even if one accepted that it were, the history of USPS with such efforts suggests the odds of success would be minimal.

This leaves cutting costs. There are two principal ways to cut costs: eliminate certain services, and improve efficiency while reducing labor benefits.

The risk of cutting services is doing so could lead to a downhill spiral, with mailers and shippers choosing other forms of delivery (e.g., electronic media or using private carriers for packages), which in turn would lead to fewer revenues and a requirement to cut services even more. At some point, equilibrium might be reached, but likely at a much worse service quality than consumers and mailers enjoy today. As previously discussed, solutions such as going to five day a week delivery run that risk.

## Increase Efficiency and Work Sharing With the Private Sector

Cost cutting should focus on improving system productivity, not just USPS productivity. According to the Bureau of Labor Statistics, USPS labor productivity fell by approximately 11 percent from 2010 to 2019.<sup>30</sup> (Interestingly, labor productivity for private couriers and messengers fell even more.<sup>31</sup>) Some of this may be due to difficulties in measuring output; some of it may be due to an inability to cut costs at the same pace as mail declines. But some of it may be limited investment in research and development (R&D) and capital equipment.

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Nonetheless, there are things USPS could do, especially if Congress gave it the ability to do so, which could cut costs without unduly hurting service. As the U.S. Government Accountability Office (GAO) stated, “Statutory requirements, however, limit USPS’s ability to make changes in areas such as certain service offerings, pricing, and its employee compensation and benefits.”<sup>32</sup>

One place to start is with post offices. According to GAO, USPS operates approximately 34,600 postal retail outlets, with about 36 percent of them being money losers.<sup>33</sup> USPS needs to close and sell redundant and underutilized post offices. In places where this would leave communities without adequate service, office stores, grocery stores, or other retailers could provide postal functions (selling stamps, accepting mail, and the like). Indeed, there is no reason office supply

and related stores shouldn't be allowed to open up postal counters, as long as PRC sets the rate in a way that provides USPS with at least some net revenue. While the Postal Service tried to institute a deal such as this with Staples' postal union workers picketed Staples stores until they pulled out of the program.<sup>34</sup> In fact, as GAO noted:

At the same time, some minimized this disruption by expanding retail access through alternatives such as Internet sales and partnerships with retail businesses such as grocery stores or pharmacies. We reported that these changes either reduced operating and labor costs or improved customer service, in some cases because the partner retail facility stays open longer, or both.<sup>35</sup>

Yet, in the past, when USPS has attempted to close retail facilities, Congress and unions have objected. Congress should explicitly encourage and allow USPS to close money-losing post offices and, where appropriate, work with private-sector companies to provide acceptance services. And whenever postal workers' unions engage in boycotts or picket against USPS retail partners that take over functions from closed post offices, USPS should not give in to pressure to reopen these post offices.

Early in the last decade, USPS undertook a plan to consolidate mail processing facilities called the Network Rationalization Initiative, which achieved only limited success due to stakeholder opposition, including from Congress.<sup>36</sup> Just as the e-commerce and package delivery sectors tend to be highly concentrated due to network economies and technologies that enable more scale and lower costs, there are cost-saving opportunities in consolidating mail-processing. **Congress should explicitly encourage USPS to consolidate postal processing facilities to create the most efficient overall national processing network.**

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Processing work does not need to be conducted exclusively by USPS. The Postal Service has had a long-standing program of work sharing, whereby private companies can receive work-share discounts for doing some of the work USPS would otherwise do. For example, some companies presort or drop-ship mail to USPS, thus both reducing the work USPS has to do and saving USPS money. USPS sets price discounts for this work based on the principle of "efficient component pricing," according to which work-share discounts are supposed to be set equal to avoided costs. To the extent that companies can do the work more efficiently than USPS, society is better off due to higher overall postal system productivity. In particular, this should be expanded to enable work-share discounts for more of the preparation and sorting for the Postal Service to do the final delivery point sequencing. **Congress should support expanded work-sharing in areas such as sorting and processing. At the same time, USPS and PRC should regularly update work-share discounts to fully and accurately reflect the efficiency gains to the network operations.**

USPS no longer has the time to wait and be blocked from making these kinds of facility rationalizations. Unless Congress wants to be on the hook for regular bailouts, it is time for it to get out of the way and stop meddling.

## Address Salaries and Benefits

A second way to improve USPS's financial situation is to focus on labor compensation. This can be done without directly cutting compensation. Rather, more can be done to reduce retirement payments, particularly by raising the retirement age at which USPS workers can receive retirement benefits. Postal workers are allowed to retire with full pensions after the age of 57 if they have worked 30 or more years.<sup>37</sup> This differs dramatically from Social Security, wherein most individuals are not subject to full benefits until they turn 67. As such, USPS should not pay retirement benefits until workers turn at least 65 or are forced to go on disability. Postal worker unions will obviously oppose this change. But unless reasonable steps such as this are taken, USPS finances will likely continue to be in crisis.

In addition, as GAO noted, negotiations between management and labor “take place against the backdrop of binding arbitration (and the arbitrators have historically been reluctant to deviate from the status quo), resulting in only incremental changes. We have long supported changing the laws regarding collective bargaining to require that USPS's financial condition be considered in binding arbitration.”<sup>38</sup>

**Congress should give USPS more flexibility to adjust wages to reflect local costs of living.** Federal workers on the GS schedule have wages and wage increases adjusted by local costs of living. A federal employee in Washington, D.C. has a much higher cost of living than one living in a small town in Arkansas. However, USPS does not do that. As USPS Office of Inspector General wrote:

given the Postal Service's nationally uniform pay scale, regional differences in cost of living affect real wages, and higher real wages are associated with higher productivity. While postal management must negotiate with its labor unions to collectively determine its pay schedules, the negative effects of unequal real wages on productivity is clear.<sup>39</sup>

The report argues that such changes would reduce costs and boost productivity.

## Stick to the Mail: Keep the Postal Service Out of Commercial Non-Postal Lines of Business

As noted above, for many members in Congress adding Postal revenues is politically easier than cutting Postal costs. This is especially true for some on the left who favor expanding the Postal Service because it is *not* a business.

One supposedly easy way to fill USPS coffers would be to let it operate new lines of business unrelated to postal services. A report for the Economic Policy Institutes states that USPS could offer more services to offset the fixed cost of maintaining post offices and daily delivery. Post offices, for example, could offer many printing and other services provided by FedEx Office and The UPS Store, and expand the use of parcel delivery lockers. Likewise, mail carriers could pick up and make deliveries from local stores, including groceries. The Postal Service could provide banking services to low-income communities underserved by financial institutions or high-speed internet access to rural areas.<sup>40</sup>

To be sure, there may be some ways for USPS to bring in additional revenue. But what should be the logic behind the decisions? First, any new business revenue opportunities should build upon USPS's existing advantages, including its network of post offices and delivery routes. Second,

new revenue opportunities should be postal related. Third, these opportunities should be low risk and address real unmet market needs. Fourth, the opportunities should generate considerable profits to help USPS make up for current losses.

Rural broadband, for example, as the Economic Policy Institute (EPI) argues for, fails on all four grounds: It does not build on any USPS advantages, is not postal related, meets an unmet market need, and is anything but low risk. And if highly specialized and technologically sophisticated broadband companies can't sell broadband in certain rural areas for more than it costs them to provide the service, what makes anyone think USPS could better?

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Many on the left now want USPS to get into the banking business.<sup>41</sup> Helping the unbanked would certainly meet a critical public need, but any efforts in this direction would have to be based on careful evidence that this business model would actually work—and that appears to be lacking.

Banks make money from lending, and if USPS were to get into lending, especially to a population that is on average a higher credit risk, it would increase risks to its financial solvency. Moreover, like broadband, the banking business involves considerable technological and managerial sophistication. There is no more reason to think USPS possesses these capabilities than Citibank could successfully enter the package delivery market.

Moreover, getting into the banking business is not costless. EPI wrote, “And offering such services—even at a low cost and for the benefit of the community—can serve to defray some of the post office’s fixed overhead costs.”<sup>42</sup> But this assumes that there would be no new fixed costs for USPS, when in fact it is likely a considerable share would be new fixed costs (e.g., setting up software systems to manage the banking functions) and new variable costs (hiring more counter workers to serve as bank tellers). Moreover, this would likely be “fighting the last war,” as private bank branches are shrinking as more and more people move to online banking and fintech apps on their smart phones. Finally, figuring out an entirely new and unfamiliar business would divert time and attention from management on focusing on their core line of business.

The Trump administration’s postal reform proposal at least wanted USPS to limit its efforts at gaining new revenue to “business opportunities that will allow it to extract value from its existing assets and business lines.” But some of its proposals were a bit far afield, such as the USPS exploring licensing to private companies the right to deliver directly to residential mailboxes and providing additional government services, such as licenses for hunting and fishing.” But it’s not clear how much revenue there is to be had from issuing hunting licenses, especially when that function can and will be provided over people’s smartphones through e-government apps.

Licensing access to the mailbox to private deliverers would mean an end to the Postal Service as we know it because the result would be private competitors leasing access to the most profitable

routes (densely populated and high-income neighborhoods), which would mean it would be virtually impossible for USPS to achieve its universal-service commitments.

As such, **Congress should not expand the mission of USPS to new, non-postal-related services.**

### **Embrace Robotic Automation**

Many, particularly on the left, want the federal government to provide massive subsidies to USPS, especially in upcoming economic stimulus packages. In contrast, many on the right reject that, rightly arguing that subsidies reduce the political imperative for real reform.<sup>43</sup>

There is a “third way” to solve this issue, and that is for Congress to provide limited funding to USPS, including one-time recovery funding, in addition to ongoing funding in areas that would not only help USPS but also encourage broader technological innovation.

Rather than agree to subsidize USPS to keep it afloat, **Congress should provide the Postal Service with the same kind of funding as airlines and other private-sector employers that faced a steep decline in demand due to the pandemic.**

Congress should also allocate funding for the next decade to support a postal innovation fund. One key reason for this is USPS invests relatively little in capital expenditures and R&D to help boost productivity. In 2019, it invested just \$1.7 billion, or 2.3 percent of revenue, in capital equipment.<sup>44</sup> In contrast, the private-courier and express-delivery industry invested \$10.3 billion, or 11.8 percent of sales. Likewise in 2019, USPS invested just \$26.7 million on R&D, or 0.04 percent of revenue, down over the previous 17 years, from \$55 million in 2003. In 2018, the transportation and warehousing sector invested \$942 million, or 0.4 percent of sales—ten times as much as USPS.<sup>45</sup>

Congress should tie such funding to the kinds of investments that help not just USPS but the overall economy and society. One key place to start would be with clean energy vehicles. The USPS fleet, which is more than twice the size of the largest U.S. commercial fleet, is well suited to the use of either hydrogen fuel cell or electric propulsion clean energy vehicles.

While electric or fuel cell postal vehicles could save USPS money in the long run (due to cheaper fuel and reduced maintenance), the higher upfront cost of such vehicles is the sticking point for USPS, given it is cash constrained. As such, **Congress should pay for USPS to replace existing vehicles that are well past their expected useful lives or wherever replacement is deemed necessary due to high maintenance costs with clean energy vehicles.** Doing so would not only help the finances of USPS but also accelerate the development and wider spread adoption of clean energy vehicles.

In addition, radical technological innovation has the potential to play a key role in the survival of USPS. Some of what USPS does, such as mail sorting, has already been subject to considerable automation—although new technologies would be presumably even more efficient. But at least with the state of current technology, local mail delivery suffers from Baumol’s cost disease: a difficulty in applying technology to boost productivity.<sup>46</sup> For industries and functions such as this—think health care and education—without increases in productivity to match overall economic productivity growth rates, prices rise much faster than the consumer price index. At some point, if they cannot find a way to boost productivity, these industries either must be subsidized, or prices get so high that demand falls.

One problem with the concept of Baumol's disease is it implies that some industries can never raise productivity. But with the emergence now of a fundamentally new technology system characterized by connectivity, autonomy, and intelligence, it is possible USPS could significantly boost productivity going forward.<sup>47</sup>

Of particular promise are sorting and delivery robots, which could sort mail, including into local delivery orders, deliver mail to homes, or both. One could imagine a postal worker driving to particular routes with a fleet of 10 or so robots, letting each one off to "walk" a particular mail route, and then picking them back up at the end of the route.

Clearly, robotics is not yet good enough or cheap enough to do this, but is progressing rapidly. For example, Ford Motor company is testing a robot that can deliver packages directly to people's homes.<sup>48</sup> The Toyota Research Institute in Silicon Valley has also tested similar systems.<sup>49</sup> The USPS Office of Inspector General wrote, "IG research suggests a new generation of smaller and nimbler robots could further help speed up processing and use space more efficiently."<sup>50</sup> The office added, with respect to delivery robots, that "it would still be worthwhile for the Postal Service to conduct small-scale tests and pilots, as other worldwide posts have done, to test how the technology fits into the Postal Service's unique operating environment."<sup>51</sup>

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### **Robotics promises to be the most important technology of the next 40 years in terms of its impact on U.S. productivity growth.**

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Moreover, robotics promises to be the most important technology of the next 40 years in terms of its impact on U.S. productivity growth.<sup>52</sup> A number of national governments are investing vastly more in robotic R&D than is the United States. The National Science Foundation's (NSF) National Robotics Initiative provides funding of between only \$30 million and \$50 million per year.<sup>53</sup> Compare that with China, which is investing billions annually in robotics technology.

Congress needs to allocate significantly more resources to robotic development. In particular, it should fund the development of a robotics "moonshot" for delivery robots. The advantage of moonshots is they fit squarely into what science policy scholar Don Stokes calls the "Pasteur's quadrant," which is basic and early-stage applied research directed at a specific challenge or problem.<sup>54</sup> It is this kind of research which often has the largest impact on societal improvement, including economic growth. The other advantage of moonshots is they hold the potential to bring about broad-scale societal excitement and political buy-in, thereby generating the increased funding needed to make dramatic and breakthrough progress.

**As such, Congress should appropriate at least \$1 billion a year to a USPS robotics development and adoption fund.** Just as NASA and the Department of Defense (DOD) receive funding from government to fund research at universities and companies, USPS should be in the same position. USPS should lead, perhaps in conjunction with DOD, the Department of Energy, and NSF, a robotics initiative focused on developing robotic systems that could cost-effectively and reliably sort, move, and deliver mail—at least to homes and outside mailboxes. In addition, these funds should be used to enable USPS to buy robotics systems (ideally made in the United States), configure plants to enable their use, and start and expand testing. Indeed, USPS could use this funding to design and build a completely new sorting center designed in ways to maximize the use of robots and minimize labor costs. Even if initial costs are somewhat high,

Congress should allocate the funds because if the United States develops and deploys robotic testbeds through USPS, the overall U.S. robotics industry and robotic users will benefit greatly. The central point here is not to maximize USPS efficiency only, at least in the short run, but to take advantage of synergies of having USPS be a lead developer and adopter of robotics technology to help not only USPS but the overall U.S. economy.

The risk of such an annually appropriated fund is it could set a harmful precedent for Congress to cover USPS's annual operating costs, thus reducing its incentive to maximize productivity. Therefore, any such fund should be limited and targeted solely at process technology development and adoption.

If successful, such an initiative would dramatically lower USPS delivery costs, and more importantly, lead to a significant advancement in robotics (and U.S. competitiveness in the industry), which would help a wide array of sectors. However, such an initiative should be focused on automation of USPS's core mission of delivering mail to all households in America six days a week, not on using robotics to compete with other companies involved in one-off deliveries.

Other technologies Congress should support USPS to experiment with and deploy are autonomous trucks for long-haul movement of mail (at least along freeways) and drone delivery, which could play a key role in delivery in more remote rural areas.

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A typical response to this idea is, "What about jobs?" This gets to a critical point about the goal of postal reform: should it be to keep jobs, or keep a financially viable system? If it's the former, it cannot be done in the long run without taxpayers subsidizing postal workers. That comes a cost to both taxpayers and the economy as a whole, as GDP growth would be slower than it would be otherwise. There is no reason such an advanced technology initiative could not be carried out with a policy of relying on attrition, rather than layoffs.

Finally, Congress has considered creating a position of USPS Chief Innovation Officer. Past consideration of this position has focused on how it could help USPS enter into new lines of business. Instead, reform legislation should establish such a position but make sure USPS puts the focus more on "process" innovation to boost postal productivity, especially robotics, and to manage the innovation fund.

## CONCLUSION

Given the ideological state of our nation, it should be no surprise that postal reform also suffers from significant polarization, with some wanting it to be privatized and others "governmentalized."

In reality, there are parts of the Postal Service wherein the private sector should play a larger role, and there are parts in which government should play a key role.

As Congress engages in postal reform, it needs to enable USPS to make the kinds of changes it needs to be sustainable in the long term, as well as provide temporary infusions of resources so USPS can make the kinds of investments that will help it transform technologically, while also boosting innovation and U.S. competitiveness overall—a true win-win situation.

Congress can and should enable USPS to be as efficient and innovative an organization as possible, including through stronger partnerships with the private sector and an embrace of radical technological innovation. That is the best insurance for its future.

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Robert D. Atkinson (@RobAtkinsonITIF) is the founder and president of ITIF. Atkinson's books include *Big Is Beautiful: Debunking the Myth of Small Business* (MIT, 2018), *Innovation Economics: The Race for Global Advantage* (Yale, 2012), *Supply-Side Follies: Why Conservative Economics Fails, Liberal Economics Falts, and Innovation Economics is the Answer* (Rowman Littlefield, 2007), and *The Past and Future of America's Economy: Long Waves of Innovation That Power Cycles of Growth* (Edward Elgar, 2005). Atkinson holds a Ph.D. in city and regional planning from the University of North Carolina, Chapel Hill.

## About ITIF

The Information Technology and Innovation Foundation (ITIF) is an independent, nonprofit, nonpartisan research and educational institute focusing on the intersection of technological innovation and public policy. Recognized by its peers in the think tank community as the global center of excellence for science and technology policy, ITIF's mission is to formulate and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress.

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## ENDNOTES

1. “U.S. Postal Service, Clorox, Google, UPS, Walmart Top List Of Americans’ Most Essential Companies During Covid-19,” *The Harris Poll*, June 12, 2020, <https://theharrispoll.com/u-s-postal-service-clorox-google-ups-walmart-top-list-of-americans-most-essential-companies-during-covid-19/>.
2. U.S. Government Accountability Office (GAO), *U.S. Postal Service: Congressional Action Is Essential to Enable a Sustainable Business Model* (Washington, D.C.: GAO, 2020), <https://www.gao.gov/products/GAO-20-385#summary>.
3. Ibid.
4. Jared Spataro, “2 years of digital transformation in 2 months,” *Microsoft*, April 30, 2020, <https://www.microsoft.com/en-us/microsoft-365/blog/2020/04/30/2-years-digital-transformation-2-months/>.
5. U.S. Department of the Treasury, “Postal Task Force Releases Report,” press release, December 4, 2018, <https://home.treasury.gov/news/press-releases/sm566>.
6. Romina Boccia et al., “Congress Should Free the Postal Service, Not Bail It Out” (The Heritage Foundation, May 2020), <https://www.heritage.org/budget-and-spending/report/congress-should-free-the-postal-service-not-bail-it-out>.
7. Elaine C. Kamarck, “Delaying the inevitable: Political stalemate and the U.S. Postal Service” (Center for Effective Public Management at Brookings, August 2015), 14, <https://www.brookings.edu/wp-content/uploads/2016/06/usps.pdf>.
8. Starlink, accessed February 3, 2021, <https://www.starlink.com/>.
9. Monique Morrissey, “The war against the Postal Service: Postal services should be expanded for the public good, not diminished by special interests” (EPI, December 2020), <https://www.epi.org/publication/the-war-against-the-postal-service/>.
10. Max B. Sawicky, “The US Postal Service Is a National Asset: Don’t Trash It” (CEPR, September 2020), 9, <https://cepr.net/report/the-us-postal-service-is-a-national-asset-dont-trash-it/>.
11. Ibid, 3.
12. Max B. Sawicky, “The Mail Must Go Through” (CEPR, December 2020), <https://cepr.net/the-mail-must-go-through/>.
13. Sawicky, “The US Postal Service Is a National Asset,” 5. To strengthen USPS, he would also allow it to get into new lines of business, including email, writing, “suppose the USPS was granted a monopoly on the transmission of email, as it enjoys with first-class mail?”
14. Ibid, 23.
15. Ibid, 3.
16. Sawicky, “The Mail Must Go Through;” GAO, “Federal User Fees: Key Considerations for Designing and Implementing Regulatory Fees” (Washington, D.C.: GAO, 2015), <https://www.gao.gov/products/GAO-15-718>.
17. United States Postal Service (USPS), Delivery Points Since 1905, in Millions (accessed June 6, 2018), <http://about.usps.com/who-we-are/postal-history/delivery-points-since-1905.htm>.
18. Robert D. Atkinson, “Why the Postal Service Is Not Subsidizing Package Delivery” (ITIF, June 2018), <https://itif.org/publications/2018/06/18/why-postal-service-not-subsidizing-package-delivery>.
19. Robert D. Atkinson, “Postal Reform for the Digital Age” (ITIF, June 2013), <http://www2.itif.org/2013-postal-reform.pdf>. In 2012, more than 21 percent of FedEx deliveries were dropped off by a USPS postal carrier, and approximately one-quarter of UPS packages were also delivered by USPS.
20. Postal Accountability and Enhancement Act (PAEA) of 2006, H.R. 6407, 109th Cong. (2005–2006), <https://www.congress.gov/bill/109th-congress/house-bill/6407>. PAEA “[d]irects the PRC

[Postal Regulatory Commission] to promulgate (and from time to time revise) regulations to: (1) prohibit the subsidization of competitive products by market-dominant products; (2) ensure that each competitive product covers its attributable costs [defined as “the direct and indirect postal costs attributable to such product through reliably identified causal relationships”]; and (3) ensure that all competitive products collectively cover what the Commission determines to be an appropriate share of Postal Service institutional costs.”

21. Morrissey, “The war against the Postal Service.”
22. J. Gregory Sidak, “How the COVID-19 Pandemic Accelerated the Transformation of the U.S. Postal Service into a State-Owned Package-Delivery Enterprise—and Why Policymakers Must Respond,” *The Criterion Journal on Innovation*, vol. 5 (2020): 202, <https://www.criterioneconomics.com/docs/sidak-covid-19-and-us-postal-service-package-delivery.pdf>.
23. United Parcel Service (UPS), INC. v. Postal Regulatory Commission, 2018 DC, App. No. 16-1354 (2018).
24. John C. Panzer, “Protecting the Package Delivery Market and the Economy from Distortions Resulting from Fully Distributed Cost Pricing” (Georgetown Center for Business and Public Policy, October 2020): 1, <https://www.packagecoalition.org/resources/other/file/PP-2020-10-Panzer-Protecting-the-Package-Delivery-Market-from-FDC-Pricing-distortions.pdf>.
25. Ibid, 1.
26. Ibid, 5.
27. Debra J. Aron and Justin Lenzo, “The Damaging Effects of Large Postal Service Price Increases on Online Retailers, Consumers, and the U.S. Postal Service” (Charles River Associates, 2020), <https://www.packagecoalition.org/resources/coalition-documents/file/Aron-Lenzo-White-Paper-2020-09-28.pdf>.
28. Panzer, “Protecting the Package Delivery Market,” 5.
29. Atkinson, “Postal Reform for the Digital Age.”
30. Bureau of Labor Statistics (BLS), Databases, Tables & Calculators by Subject (Annual index of labor productivity (2007=100) for NAICS 492, couriers and messengers, U.S. total; accessed February 3, 2021), [https://data.bls.gov/timeseries/IPUIN491\\_\\_\\_L000000000?amp%253bdata\\_tool=XGtable&output\\_view=data&include\\_graphs=true](https://data.bls.gov/timeseries/IPUIN491___L000000000?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true).
31. Ibid.
32. GAO, *U.S. Postal Service: Congressional Action Is Essential*.
33. Ibid, 10.
34. Alexandra Bradbury, “Staples Removed: How Postal Workers Defeated a Privatization Scheme,” *Labor Notes*, February 6, 2017, <https://www.labornotes.org/2017/02/staples-removed-how-postal-workers-defeated-privatization-scheme>.
35. GAO, *U.S. Postal Service: Congressional Action Is Essential*, 25.
36. Ibid, 9.
37. USPS, “583 Annuities,” in *Employee and Labor Relations Manual Issue 49* (USPS, 2020), [https://about.usps.com/manuals/elm/html/elmc5\\_058.htm](https://about.usps.com/manuals/elm/html/elmc5_058.htm).
38. GAO, *U.S. Postal Service: Congressional Action Is Essential*, 32.
39. USPS Office of Inspector General (USPSOIG), “Geographic Variation in Productivity” (Arlington, VA: USPSOIG, 2019), 1, [https://www.uspsoig.gov/sites/default/files/filefield\\_paths/RISC-WP-19-006.pdf](https://www.uspsoig.gov/sites/default/files/filefield_paths/RISC-WP-19-006.pdf).
40. Morrissey, “The war against the Postal Service.”

41. U.S. Senate Committee on Banking, Housing, and Urban Affairs, “Brown Introduces New Legislation To Help Hardworking Americans In The Coronavirus Relief Package,” press release, March 24, 2020, <https://www.banking.senate.gov/newsroom/minority/brown-introduces-new-legislation-to-help-hardworking-americans-in-the-coronavirus-relief-package>.
42. Morrissey, “The war against the Postal Service.”
43. Romina Boccia, David Ditch, and James L. Gattuso, “Lawmakers Need to Reform Postal Service, Not Provide Massive Bailout,” *The Heritage Foundation*, April 14, 2020, <https://www.heritage.org/budget-and-spending/commentary/lawmakers-need-reform-postal-service-not-provide-massive-bailout>.
44. USPS, “Integrated Financial Plan, Fiscal Year 2021” (Postal Regulatory Commission, submitted 11/24/2020), 7, <https://www.prc.gov/docs/115/115156/FY2021%20IFP%20FINAL.pdf>.
45. National Center for Science and Engineering Statistics (NCSES), *Business Research and Development: 2018* (Alexandria, VA: National Science Foundation, 2020), Figure 17, <https://nces.nsf.gov/pubs/nsf21312/>.
46. “Baumol’s cost disease,” Wikipedia, accessed February 4, 2021, [https://en.wikipedia.org/wiki/Baumol%27s\\_cost\\_disease](https://en.wikipedia.org/wiki/Baumol%27s_cost_disease). Named after economist William Baumol.
47. Robert D. Atkinson, “The Task Ahead of Us: Transforming the Global Economy With Connectivity, Automation, and Intelligence” (ITIF, January 2019), <http://www2.itif.org/2019-task-ahead.pdf>.
48. “Ford’s new robot can deliver packages to your doorstep,” *CNN Business*, <https://www.cnn.com/videos/business/2019/05/22/ford-autonomous-delivery-robot-orig.cnn-business/video/playlists/business-robots/>.
49. Greg Nichols, “Postal robots take to the streets with backing from Toyota AI Ventures,” *ZDNet*, June 11, 2019, <https://www.zdnet.com/article/postal-robots-take-to-the-streets-with-backing-from-toyota-ai-ventures/>.
50. USPSOIG, “Autonomous Mobile Robots and the Postal Service” (Arlington, VA: USPSOIG, 2018), 1, <https://www.uspsoig.gov/sites/default/files/document-library-files/2019/RARC-WP-18-006.pdf>.
51. Ibid.
52. Robert D. Atkinson, “Why Federal R&D Policy Needs to Prioritize Productivity to Drive Growth and Reduce the Debt-to-GDP Ratio” (ITIF, September 2019), <https://itif.org/publications/2019/09/12/why-federal-rd-policy-needs-prioritize-productivity-drive-growth-and-reduce>.
53. Ibid.
54. Donald E. Stokes, *Pasteur’s Quadrant: Basic Science and Technological Innovation* (Washington, D.C.: Brookings Institution Press, 1997).