



## The Innovation Economy

### *Paving the way to a Prosperous Future*

October 31, 2018

#### INTRODUCTION

The Joint Economic Committee held three hearings on innovation this year. The first hearing focused on the importance of technological progress in driving and sustaining higher productivity and economic growth and set the stage for the second hearing which highlighted how unnecessary regulation hinders tech companies. The third hearing explored how tech companies access capital. Taken together, the main findings are:

- Innovation has thrived in the United States with the help of clear and dependable property rights, market competition, and light government regulation.
- Continued path-breaking technologies are likely if overbearing regulation is avoided.
- Other countries are making concerted efforts to build their own innovation ecosystems and the United States must guard against losing new tech firms to them, especially by reducing obstacles to raising capital.

The key to sustaining strong economic growth ultimately is productivity-enhancing technological progress. The economy can grow with more labor and capital but is confined by the ways in which they are put to use. While more and better inputs—such as more workers, more tools, and improved skills—can bring about economic growth, they eventually run into diminishing returns. The United States has experienced continuing technological change, but the slowdown of productivity growth in recent years has puzzled experts and policymakers. Among the theories to explain the slowdown is that technological progress no longer delivers the productivity gains it once did. To highlight and illuminate this apparent paradox, the Joint Economic Committee sought expert analysis on possible reasons for the productivity slowdown, and the role of innovation in increasing productivity and economic growth.

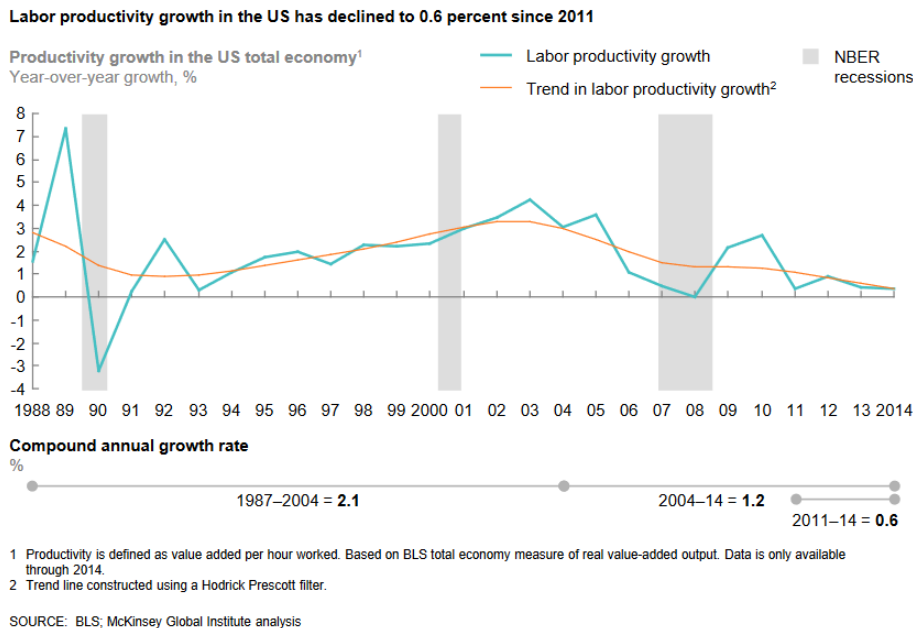
Labor productivity growth began to decline significantly in 2004. Labor productivity had been growing at an average rate of 2.1 percent, but in the

#### ***Findings:***

- ***Innovation is the most important driver of productivity and economic growth.***
- ***Innovation can thrive with***
  - ***Strong property rights,***
  - ***Market competition,***
  - ***Light regulatory touch.***
- ***Path-breaking advances are likely, unless misguided regulation stifles them or drives them abroad.***
- ***Lowering barriers to capital access is critical to innovation.***
- ***International competition for technological breakthroughs has intensified.***

years after 2004 it averaged a low 1.2 percent. Figure 1 shows how productivity growth in the U.S. has changed from 1988 to 2014 and indicates that, other than a short-lived spike from 2009 to 2010, the growth rate has been historically low in recent years.<sup>1</sup>

Figure 1



***The productivity slowdown of recent years must be reversed for the sake of faster and sustained economic growth going forward.***

Witnesses at the first hearing presented evidence and advice supporting the conclusion that the economy still has the capacity for impactful innovation and growth and that government policies ought to encourage innovation and incentivize potential innovators. Building on these insights, witnesses testifying at the second hearing discussed how misguided regulation may be stifling technological progress, and made recommendations on how to develop a regulatory environment that nurtures tech startups and growth. Witnesses at the third hearing added that regulations can hinder access to capital in particular and that easing financial regulations could greatly enhance the availability of capital to fund innovative ideas. The experts testifying at the three hearings unanimously agreed that fostering innovation and technological progress is crucial to growing the American economy long-term, and as Congress and the Administration move to accelerate economic growth, encouraging innovation is a necessary step in achieving this goal.

***The economy still has the capacity for impactful innovation and growth.***

Government policy aiming to encourage innovation has already begun with recent regulatory changes and the passage of the *Tax Cuts and Jobs Act* (TCJA). Experts testifying before the Joint Economic Committee during a [hearing](#) on

***Fostering innovation and technological progress is crucial to growing the American economy.***

<sup>1</sup><https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Employment%20and%20Growth/New%20insights%20into%20the%20slowdown%20in%20US%20productivity%20growth/MGI-The-productivity-puzzle-Discussion-paper.ashx>

tax reform applauded the new tax law for reducing the corporate tax rate and allowing equipment purchases to be expensed, which lowers the cost of capital and encourages business investment. These changes are expected to raise wages and boost U.S. competitiveness globally, since the U.S. corporate tax rate previously was the highest in the developed world. The old tax law induced distortions in corporate organization and operations. For the purpose of lowering their U.S. tax liability, corporations would inflate the cost of inputs imported from their foreign affiliates. Alternatively, multinational companies would sell patents for products conceived domestically to an affiliate in a low-tax country and avoid having the profit on future product sales taxed in the United States. These kinds of maneuvers also bias U.S. output and productivity data downwards.

Furthermore, the House of Representatives recently passed three bills as part of Tax Reform 2.0, one of which focused on encouraging startups and innovation. The *American Innovation Act* aims to encourage new business formation by allowing qualified new businesses to deduct up to \$20,000 of the cost of starting a business in the year the costs are incurred. Another provision, discussed under “Barriers to capital access” below, would provide startups with relief from limits on net operating losses and the use of innovation-related tax credits.

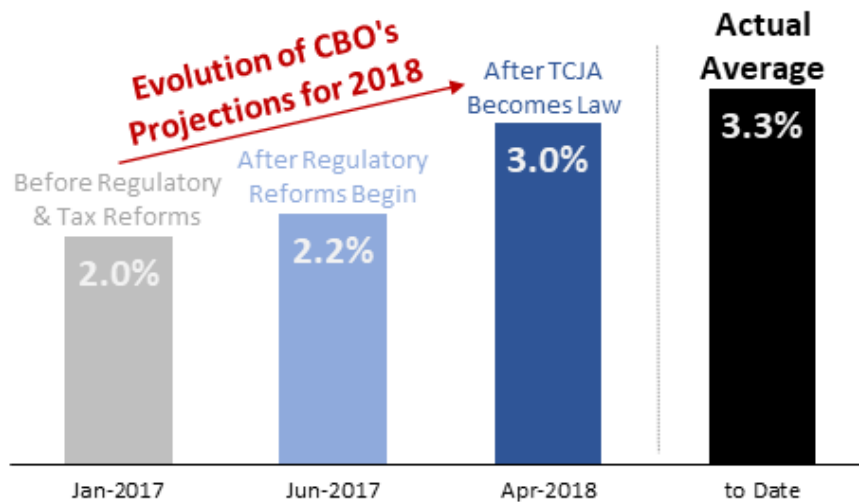
Preliminary evidence suggests that recent reforms enacted by Congress are already having positive effects on productivity and economic growth. Figure 2 shows how Congressional Budget Office (CBO) projections for real GDP growth changed from January 2017 to April 2018. Prior to tax and regulatory reform, CBO projected 2 percent growth for 2018, which it increased to 2.2 percent once regulatory reforms began, and which it increased again to 3.0 percent after tax reform became law. The actual average growth rate to date in 2018 is 3.3 percent, surpassing projections.

***Experts applauded the new tax law for reducing the corporate tax rate and allowing more expensing of business investments. These changes are expected to raise wages and boost U.S. competitiveness globally.***

***GDP growth is already improving.***

Figure 2

## Expected Real GDP Growth in 2018



*CBO's projections for real GDP growth were revised upwards with tax and regulatory reform. Actual average growth still surpasses projections at 3.3 percent.*

Source: BEA/CBO's last three Budget and Economic Outlooks.

**Is technological progress really the key?** In his book *The Gifts of Athena*<sup>2</sup>, economist and historian Joel Mokyr describes the origin and drivers of innovation. He illustrates how the origin of technological progress is the process of people overcoming the tendency to merely accept that production techniques work without questioning why they work. In other words, people delving into the set of what he defines as “propositional” knowledge to better understand what he defines as “prescriptive” knowledge leads to a broader knowledge base, more technological progress, and economic growth.<sup>3</sup>

Some have questioned whether innovation will truly be the key to economic growth going forward.<sup>4</sup> This view is fueled by the curious phenomenon that the recent decline in the productivity growth rate occurs at a time of rapid technological change and rising education levels in the labor force.<sup>5</sup> However, the apparent paradox may be resolved by considering several possible explanations.

- *Inadequate Measurement* – Professor Joel Mokyr explains that current measures of economic growth do not accurately reflect the state of the economy, much less give indication of the innovation that is yet to take

<sup>2</sup> Mokyr, Joel. *The Gifts of Athena: Historical Origins of the Knowledge Economy*. Princeton and Oxford, Princeton University Press, 2002.

<sup>3</sup> Mokyr distinguishes between propositional knowledge, which deals with beliefs about natural phenomena and regularities, and prescriptive knowledge, which is the application of propositional knowledge to create instructional knowledge or techniques. One can think of additions to the first set as “discoveries” and additions to the second set as “inventions.”

<sup>4</sup> Larry Summers has talked about secular stagnation; Robert Gordon has said that we should not expect massive growth that we have seen historically.

<sup>5</sup> “23 economics experts weigh in: Why is productivity growth so low?” Focus Economics, April 20, 2017. <https://www.focus-economics.com/blog/why-is-productivity-growth-so-low-23-economic-experts-weigh-in>

place.<sup>6</sup> GDP measures that were developed and designed in the early part of the 20<sup>th</sup> century for a “wheat and steel” type of economy do not accurately reflect the type and quality of output produced in today’s information economy.<sup>7</sup>

- *Tax-induced distortion* – The high U.S. corporate tax rate of 35 percent before TCJA took effect gave companies a strong incentive to shift profits to lower-tax jurisdictions, which negatively affected domestic national output and productivity data.
- *Technology diffusion takes time* - Research by the McKinsey Global Institute on the role of technology in driving economic value finds that productivity gains do not come from information technology (IT) itself but rather from a combination of IT with process, organizational, and managerial changes. Thus, recent technology advances may not yet be reflected in productivity numbers because large sectors of the economy are still only starting to implement them.<sup>8</sup>

## INNOVATION DRIVES ECONOMIC GROWTH

As Dr. Michael Strain explains in his JEC [testimony](#),

*Economic output is a function of economic inputs. The growth rate of output, therefore, is determined by how quickly capital and labor grow, along with technology and the skill and knowledge with which factors of production are employed. Especially over longer time horizons, the most important driver of growth is innovation. And fundamentally, innovation is driven by letting loose the creative power of individuals to invent new and better ways of producing goods and services and, of course, new goods and services themselves.*

***Economic theory firmly establishes that technological progress is essential for long-term economic growth.***

The Solow Growth Model, which was developed by 1987 Economics Nobel laureate Robert Solow and Australian economist Trevor Swan, shows the importance of technological progress for economic growth, but treats it as something that is determined outside the model. In other words, the Solow Growth Model tells us technological progress is critical but it does not specify a process by which research and new knowledge generate labor-augmenting technologies. Paul Romer, 2018 Economics Nobel laureate, later modeled technological progress as an integral driver of economic growth by specifying a relationship to human capital that creates a mutually reinforcing feedback effect between economic growth and technological advancement. His model specifies

---

<sup>6</sup> “Has Innovation Peaked? Interview with Joel Mokyr”. <https://www.youtube.com/watch?v=h5x3rdD0tSU>

<sup>7</sup> For example, consumer surplus rises when technology causes the price to drop but GDP as recorded goes down.

<sup>8</sup> Mayika, James, et al., “The Internet of Things: Mapping the Value Behind the Hype,” McKinsey & Company, June 2015. <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/The%20Internet%20of%20Things%20The%20value%20of%20digitizing%20the%20physical%20world/The-Internet-of-things-Mapping-the-value-beyond-the-hype.ashx>

that technological progress increases the efficiency of inputs that are used to produce output while increasing the marginal productivity of workers in the labor force, leading to higher economic growth.<sup>9</sup>

Mr. Mark Mills [testified](#) that productivity and economic growth are not stagnant: “[W]hat appears to be an end to innovation is often a pause between eras as engineers and industries perfect and begin to adopt new foundational technologies.” He referred to three sectors as examples of radical progress in technology: energy, where the fracking revolution is in full swing; manufacturing with metamaterials, 3D printers, and industrial robots, which are poised to deliver great leaps forward; and healthcare, where notoriously lagging productivity leaves much room for improvement and bioelectronics also may enable futuristic-seeming personalized treatments. Mills strongly believes that innovation will spur future productivity increases and faster economic growth and notes, “The closest economists get to having a law of physics is in the truism that increasing productivity is the primary force driving economic growth.”

***“What appears to be an end to innovation is often a pause between eras as engineers and industries perfect and begin to adopt new foundational technologies.”***

**Mark Mills**

**Recipe for success.** Dr. Harold Furchtgott-Roth set forth three basic conditions for a robust technology sector in his [testimony](#).

- *Property rights* - Strong property rights provide incentives to innovate by rewarding those who have and implement successful ideas. He attributes much of the development of the American software industry to strong U.S. intellectual property laws.
- *Light regulatory approach* - Government regulation can substantially delay the development and dissemination of new technologies. Dr. Furchtgott-Roth cited the case of cellular technology; the first application dated back to the 1950s but it was then held up for 30 years by regulation.
- *Market competition* - What is true for the supply of familiar goods and services also applies to new technologies; in competition the best tend to succeed, costs and prices tend to decline, and choices for customers tend to increase.

---

<sup>9</sup> Romer argues that technological change derives from “intentional actions taken by people who respond to market incentives” and therefore should not be taken as given but rather should be determined within the model (JPE, 1990 article). To model the “technology” concept explicitly, he splits it into two distinct factors. The first is the rival component of technology, H (one can think of this as human capital). The second is the non-rival technological component, A (one can think of this as the stock of accumulated knowledge that builds up over time). Both H and A are quantifiable and can be reliably measured. In Romer’s model, H and A are closely related because they are both inputs in the production of new knowledge/better designs for more efficient production. This new knowledge is then combined with accumulated capital to produce producer durables. In the last step, these producer durables, labor, and human capital combine to produce final output. Thus, knowledge affects production in two distinct ways: (1) it is used to create intermediate inputs for the production of final output, and (2) when H and A combine in a given period to create new knowledge, the total stock of knowledge increases in the next period, raising the productivity of human capital (i.e., the marginal product of H is a function of A, so if A increases, the marginal product of H increases). Romer shows that the growth rate of output is an increasing function of H (and not of population or labor force size as has often been implied by other models).



## THREATS TO INNOVATION

**Misguided government intervention.** Regulation and antitrust enforcement can facilitate a competitive market process but often such intervention has unintended consequences, serves special interests, or focuses on misguided objectives such as firm size. Monopoly power and firm size are not necessarily related. Some tech firms have grown to a relatively large size because they offer enormous conveniences and cost savings, not because they exercise monopoly power. Dr. Strain’s [testimony](#) warned against government taking aim at Big Tech and strongly advised against antitrust action to break up major technology companies:

1. Major tech companies are not anticompetitive when one considers consumer welfare. In an anticompetitive environment, one would expect high prices and low quality of goods, but this isn’t the case. Many products and services offered by tech companies are free (consider the Google search engine, Facebook, and other apps people use every day). Furthermore, it is difficult to argue that quality has decreased when many of these products and services are incredibly innovative and translate into massive value for consumers.
2. The fear that Big Tech dominates the industry and may prevent new innovators from cultivating newer and better products may be well intended but is ill founded. There is a lot of churn in the tech industry and the giants of today are unlikely to be the giants of tomorrow. Just as Google replaced Netscape and Gmail replaced American Online, the big companies today will probably be displaced by future generations of innovators.

In his work, Mokyr offers an explanation for the kind of government intervention that holds back innovation. He explains that because of an innate distaste for and fear of change, societies may err on the side of overregulation and stifling possible progress. In spite of this tendency, Mokyr insists that, “[w]hat is needed for technological change is a system in which people are free to experiment and reap the fruits of their success if their experiment works.” He also stresses that while some regulation is necessary to avoid total chaos, “systems...that are too conservative will end up in stasis.”<sup>10</sup>

Local, state, and federal regulations of varying kinds have been accumulating in the United States, and according to Mr. Christopher Koopman, are not only stifling innovation at home but also driving innovation overseas where the regulatory climate may be more welcoming. In fact, earlier this year, Bloomberg

***“What is needed for technological change is a system in which people are free to experiment and reap the fruits of their success... While some regulation is necessary to avoid total chaos, systems...that are too conservative will end up in stasis.”***

***Joel Mokyr***

---

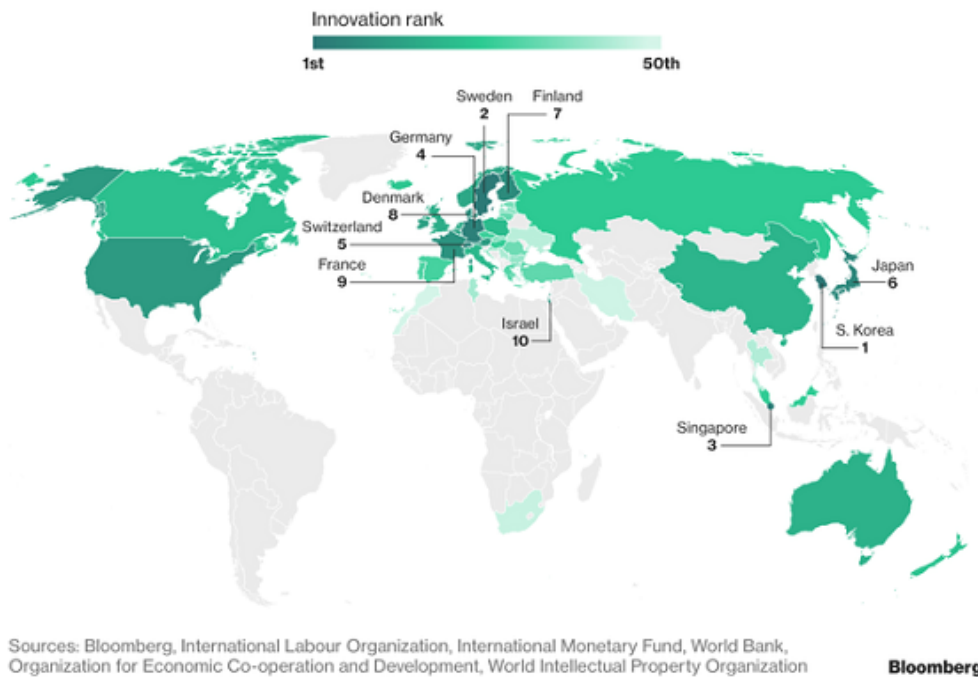
<sup>10</sup> Mokyr, Joel. *The Gifts of Athena: Historical Origins of the Knowledge Economy*. Princeton and Oxford, Princeton University Press, 2002.

reported that the U.S. dropped out of the top echelon in the 2018 Innovation Index for the first time in six years. Figure 3 shows the top ten most innovative economies and the U.S. is conspicuously absent. While the JEC is confident that the United States can and will reclaim its place at the top, we ought to heed this warning sign and take the necessary measures to encourage innovation at home. Koopman’s [testimony](#) reminds us that a culture of “permissionless” innovation allowed the internet to develop rapidly. He also highlights parts of the aviation industry as an example of the opposite regulatory culture hindering advancements and driving innovators overseas.

***Mr. Koopman’s testimony reminds us that a culture of “permissionless” innovation allowed the internet to develop rapidly.***

Figure 3

South Korea, Sweden and Singapore top the list; U.S. drops out of top 10.



***The U.S. has fallen off the list of top 10 innovative economies in the world.***

However, in light of efforts by the current Congress and Administration to remove unnecessary regulation, recent news is more favorable. A recent article in the *Wall Street Journal* reports that according to the World Economic Forum rankings, the U.S. is now the world’s most competitive economy for the first time in a decade.<sup>11</sup> Clearly, the U.S. has embarked on the right path, spurred greatly by regulatory reform.

<sup>11</sup> <https://www.wsj.com/articles/u-s-is-worlds-most-competitive-economy-for-first-time-in-a-decade-1539727213>



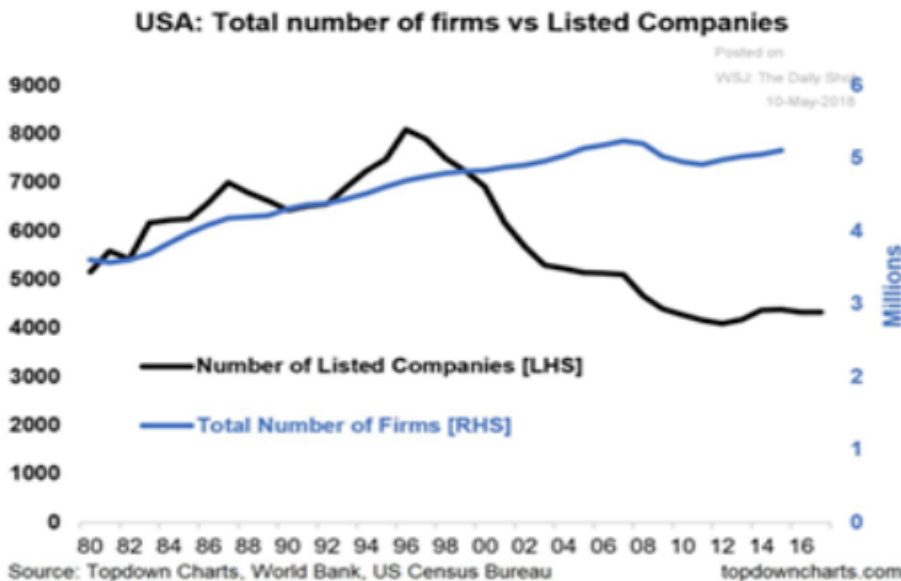
**Barriers to capital access.** The ability to raise capital for the development of new ideas and unproven technologies is especially sensitive to regulatory conditions for three reasons:

1. Tech companies are developing new products and services with uses and value that have not yet been determined, which entails greater uncertainty and involves higher risk. The lack of a record of performance can make it difficult to raise debt capital and means entrepreneurs must try to attract equity capital with the promise of higher returns.
2. Valuation of a tech startup is often complicated by long payoff periods. For example, as Ms. King pointed out in her [testimony](#), biotech company working toward the development of a new drug may spend years testing and improving the drug, engaging in clinical trials, and waiting for approval before finally releasing it. During this process, the company has no product and no clear way to assess the value of the company.
3. New tech companies may need very large amounts of capital upfront, which entrepreneurs often cannot furnish themselves.

These challenges induce tech startups to seek angel investors and venture capital firms prepared to take on greater risks on the promise of higher returns far in the future. Some also turn to crowdfunding, which mitigates risk by spreading it across many investors.

Eventually issuing stock to the public has historically been the best way for young firms to accelerate their expansion. Going public offers early investors the option to recover some of their investment and helps the valuation of the company. However, in his [testimony](#), Mr. Mackintosh highlighted the recent decline in the number of companies going public, shown graphically in Figure 4.

Figure 4



Source: World Bank, US Census Bureau

*The number of companies going public has declined in spite of the steady increase in the number of firms.*

Mr. Phil Mackintosh cites excessive regulatory burdens as having played a significant role in the decline. Regulation has changed the costs involved in going public, making the optimal way forward unclear, and startups must carefully consider a cost-benefit analysis before choosing to go public.

Recent reforms have already begun to address the problem of inadequate access to capital for new businesses and innovators. In July of 2018, the House passed the bipartisan *JOBS and Investor Confidence Act of 2018* which was intended to further ease regulations on small businesses. The bill focuses particularly on helping businesses raise capital and go public. Specifically, the bill eases regulations on angel investors and expands the definition of “accredited investors,” which makes it easier for investors to invest in startups. Also, the bill expanded onramp exemptions for emerging growth companies, giving them more time to afford the costs of going public.

Furthermore, Chairman Erik Paulsen of the Joint Economic Committee has led efforts to make changes to section 382 of the tax code. These changes are included in the *American Innovation Act*, mentioned earlier. Section 382 was originally intended to prevent “loss trafficking,” by which a company with taxable profits buys a company with losses in order to reduce its tax liability. However, it can unintentionally hinder startups—which tend to experience losses in the first years of operation—in seeking more equity investment for continued growth. Thus, section 382 can discourage innovation, especially in research-intensive industries such as the biotech industry. For example, a biotech startup

can take years to develop a marketable product, during which time the startup invests heavily in R&D but has no revenue, resulting in net operating losses (NOLs). Since changes in ownership can trigger a section 382 limit on the future tax deductibility of NOLs, raising new capital can become more difficult. The provision championed by Chairman Paulsen in the *American Innovation Act* reforms the limitations imposed by section 382 to make it easier for losses and certain tax credits to transfer with changes in ownership for qualifying startups. This should improve access to equity capital by startups for more R&D investment and expansion, which in turn will increase jobs and economic growth.

## FOSTERING INNOVATION

**Enlightened regulation.** Innovations often encounter existing regulations that were written for a different technological and industrial framework. The result is an incongruence between the rules and the context in which they are applied. The problem is not regulation per se but overly prescriptive regulation. Well-conceived regulation can be helpful to market function because it introduces predictability in the way market participants interact and provides certainty about the government’s long-term expectations. In his [testimony](#), Mr. Scott Brinkman described how a united effort to reform regulation by his state has helped revitalize Kentucky’s economy. The Governor’s “Red Tape Reduction Initiative” repealed irrelevant regulations, while amending and modernizing others to make them simpler and less strict. According to Mr. Brinkman, “[t]he purpose of the Red Tape Reduction Initiative . . . includes helping to foster technological and engineering innovation.” The result has been remarkably successful; unemployment has decreased, labor force participation has increased, and private investments in upgrading technology have increased.

“Smart” regulation is adaptable to new technologies. According to Dr. Joe Kennedy, “[r]eforms that improve market competition, possibly by reducing barriers to entry, increasing the flow of information, or allowing new approaches to comply with existing regulations, can significantly increase productivity by speeding the adoption of innovations.”

**General principles.** In his [testimony](#), Dr. Kennedy recommends a set of general principles that support innovation:

- Write rules to anticipate and encourage innovation.

*In his testimony, Dr. Kennedy recommends a set of general principles that support innovation.*

- Make the regulatory process more transparent to Congress, regulated entities, and the general public.
- Place more trust in consumers who, given sufficient information, will make the best decisions for themselves.
- Actively seek ways to reduce the cost of complying with regulations.
- Use quantitatively backed studies (as much as possible) to conduct a cost/benefit analysis on every major rule being implemented.
- Focus on competition and avoid rigid regulations that reduce the U.S. competitive advantage.

Combining Dr. Kennedy's recommendations with those of the other witnesses outlines a roadmap for pro-innovation regulatory reform:

- Reassess regulations and implement reforms heeding Dr. Kennedy's general principles.
- Reduce regulation and other barriers to technological progress (Dr. Strain).
- Avoid excessively high tax rates (Dr. Strain).
- Maintain a position of openness to the rest of the world through international trade (Dr. Strain).
- Support basic research (Dr. Strain, Dr. Kennedy).
- Upskill the workforce, notably by emphasizing work-based learning for workers with high-school degrees and increasing high-skill immigration (Dr. Strain, Dr. Kennedy).
- Promote STEM education (Dr. West).

**Financial regulatory reform.** Mr. Mackintosh and Ms. King had a number of recommendations for regulatory reform that reduces barriers to capital access:

- Increase the flexibility of reporting obligations (Mr. Mackintosh).
- Enhance the transparency around activist investing (Mr. Mackintosh).
- Deploy intelligent minimum price movements, or tick sizes, for small- and medium-growth companies (Mr. Mackintosh).
- Reform section 382 of the tax code, which unintentionally hinders startups because they tend to accumulate net operating losses (NOLs) in early years and experience ownership changes as new capital investment is raised (under section 382, this triggers limitations on a company's ability to use its NOLs in the future) (Ms. King).

- Simplify and expand section 1202 of the tax code, which provides capital gains tax relief for investing in certain small corporations (Ms. King).
- Advance patent litigation reform legislation (Ms. King).

### **CONCLUSION**

Historically, the United States has provided a prime environment for innovation. Dr. Furchtgott-Roth reports that much of the innovation in the information technology sector has come from the United States, and he credits strong property rights, a light regulatory approach, and competition for America's leading role in innovation on an international stage. However, ill-conceived regulation often makes it difficult for innovators to carry out their critical work, and this can slow down or even prevent technological progress. This is detrimental to American living standards because technological progress is the key to productivity and economic growth.

The United States has a legacy to uphold and must reexamine regulations and taxes that hold back innovation. Progress has been made with the *Tax Cuts and Jobs Act* which already has produced noticeable results. Further work is necessary to boost U.S. competitiveness, and Congress can play a central role by ensuring that burdensome regulations are no longer a threat to American prosperity.

Beila Leboeuf  
Senior Economist