SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

Subcommittee on Science, Manufacturing, and Competitiveness
"Measuring What Matters: Science, Standards, and Strategic Competition"
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REPUBLICAN QUESTIONS FOR THE RECORD

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COVER PAGE

CHAIRMAN TED CRUZ (R-TX)

1. **Congress currently measures American scientific strength by counting R&D dollars and publications. However, we need metrics that tell us whether we are winning in competition with China.**

    a. **If Congress wants to know whether federally funded research is strengthening U.S. competitiveness, what should agencies be required to measure separately from policy-compliance goals?**

There are a number of metrics that can help with this.

First, recipients of federal funds (e.g., federal labs and universities) should be required to report the amount of funding they receive from industry. Labs and universities that do not perform well on this metric should see modest funding cuts, with the savings going to labs and universities that better engage with industry.

Second, all research awards should be coded as to whether they are conducting research in one of the ten critical technology areas identified in the Chips and Science Act.

Third, Federal labs have a series of performance metrics, but the indicator for technology commercialization counts for very little in their evaluation. This indicator should have significantly more weight.

Finally, Under the Bayh-Dole Act (35 U.S.C. §200-212), any patent resulting from federally funded research must include a "government interests" or "government rights" clause. A federal agency (perhaps Department of Commerce) should be responsible for tracking these every year and ranking labs and universities in patents per million dollars of federal funding and ranks federal agencies on their "patent productivity."

    b. **How should Congress distinguish scientific outcomes, such as technical capability, standards influence, workforce depth, and technology diffusion, from metrics that do not measure competitiveness?**

New research shows that at least half the benefits of federally funded science "spillover" to foreign nations. So simply counting awards and peer reviewed articles is not a good indicator of effect on national competitiveness.

For standards, there are many "standard essential patents." Again, Commerce should analyze these every year and identify government-supported research that helped generate such a patent.

Workforce depth, while a useful indicator, is very difficult to measure. One measure might assess universities based on the amount of federal funding as a share of total STEM graduates. especially those most related to Chinese competitiveness (e.g., engineering, biosciences, chemistry, CS and math)

Technology diffusion is another indicator that is difficult to measure, in part because companies that use technologies can get them from anywhere.

I believe that key metrics should be mostly related to the development of new products, including the creation of startup companies that stem from federally funded research.

Overall, Commerce, perhaps in conjunction with NSF, should produce an annual ranking of federal labs and research universities in terms of the most and least significant contributions to the U.S. China techno-economic competition, using the indicators described above. These scores should be controlled for institution size.

Ideally, the rankings would have an impact on federal funding, but even if they don't, they should produce some behavioral changes, as many labs and universities would seek to boost their rankings.