Good afternoon Chair Laughlin and members of the Senate Majority Policy Committee. My name is John Swartley and I am the Chief Innovation Officer at the University of Pennsylvania where it has been my privilege to shape and lead technology development and translation efforts for the last 17 years. Thank you for providing me with the opportunity to participate in today's hearing on the critical role of innovation in Pennsylvania.

The United States has long been a global leader in innovation, a status underpinned by a robust ecosystem fueled in significant part by university-based research. This type of research is not solely an academic exercise; it is a critical component of the nation's economic engine, creating well-paid jobs, fostering an environment conducive to the establishment and growth of high-tech industries, and helping to maintaining our global competitiveness. In partnership with the private sector, university-led innovation efforts contribute directly to the development of new technologies, processes, start-up companies, and services that drive economic growth and advance societal progress. The commercialization of research outcomes, through technology transfer and the formation of start-up companies amplifies this impact, further contributing to regional economic diversification and resilience. This is certainly true in the state of Pennsylvania, where critical discoveries and advancements made by institutions like the University of Pennsylvania lead to significant impacts on both the local and state economies.

As one of the leading recipients of research grant funding in the world and the largest private employer in the city of Philadelphia, Penn's research initiatives have not only advanced knowledge but also fueled regional economic development. The university's commitment to fostering technology development and commercialization has made it a major economic driver. Here are just some of the ways in which Penn contributes to the economic vitality of Philadelphia and the broader Pennsylvania state economy:

Research and Innovation: Penn is a world-class center for research, scholarship, and innovation, supporting a translational research pipeline that has far-reaching economic implications, evidenced by the steady flow of discoveries, patented inventions, license agreements, and new companies constantly being spun out of Penn. Over the course of the last ten years alone, commercial translation of innovations made at Penn has resulted in the filing of over 8,000 patents and execution of nearly 7,000 commercialization agreements, including numerous multi-year, multi-million dollar partnerships with both established industrial players and well-funded Penn startups.

Employment: As the largest private employer in the City of Philadelphia, Penn plays a crucial role in job creation and sustains a substantial workforce, contributing to the economic stability and growth of the region. A particularly important and often overlooked contribution of academic research to the innovation economy is the development of human capital. Universities are not only centers of research but also hubs of education and training where the next generation of scientists, engineers, and entrepreneurs are equipped with the skills and knowledge necessary to drive future innovations. This symbiotic relationship between research and education ensures a continuous flow of talent into the workforce, ready to apply cutting-edge knowledge to real-world challenges.

Industry Collaboration: Penn is deeply committed to increasing interactions between the university and industry, including fostering research collaborations, translational research partnerships, and corporate-sponsored research. These efforts ensure that taxpayer-funded

discoveries are developed into new products and services that benefit the public good. The university's initiatives, such as the Penn Center for Innovation (PCI), have helped create more than 250 new companies over the course of the last decade, attracting early-stage capital and fostering an environment conducive to high-tech industry growth. This has a direct impact on regional economic development as these companies have collectively raised or received more than $4B in capital investment, a substantial portion of which is reinvested in the Greater Philadelphia region.

Societal and Patient Impact: Well-known examples of impactful products, technologies and companies developed based on innovations created at Penn include Spark Therapeutics and Luxturna, the first directly administered gene therapying the US, CAR-T technology and Kymriah, the first approved gene therapy modified cell therapy, AAV gene therapy for multiple approved indications, as well as nearly two dozen other FDA approved new medicines. Penn was of course also the source of the foundational mRNA technology created by Nobel Laureates Drew Weissman and Kati Kariko that led directly to the creation of the highly successful COVID-19 vaccines.

Economic Diversification: University research contributes to more than just the development of medical technologies, it also plays a foundational role in helping to drive the development of other critical industries such as robotics, data management, AI, clean energy, and environmentally friendly production methods, just to name a few, helping to position states like Pennsylvania as potential leaders in these areas.

Healthcare System: Penn's large hospital and vibrant healthcare system is not only a cornerstone of the region's medical infrastructure with a direct patient catchment impact of over five million people, but also a significant economic entity in its own right, providing jobs and contributing to the economic health of the area.

In spite of these successes, the path from academic research to commercial and societal impact continues to be fraught with significant hurdles and challenges. The so-called "valley of death", the gap between early and promising research findings and the many different steps and investments required to ensure their full development into market-ready products, continues to pose a significant barrier to establishing academic-industrial partnerships, particularly in emerging technological fields and those which require intensive capital investment. Gap funding programs, small companies, SBIR/STTR type programs are all helpful, but are often insufficient to move promising technologies to a point where they are sufficiently attractive to larger investments from established private sector players. Companies spun out of research centers are often slowed by the need for both skilled and unskilled labor, as well as regional resources, such as contract manufacturing, that they can partner with to efficiently accomplish R&D goals. In addition, a foundational underpinning of the entire university-based technology transfer industry, the Bayh-Dole Act, is currently under attack by proponents of drug-pricing controls pushing for a dramatic expansion of walk-in rights to federally sponsored research discoveries. While institutions like Penn are strongly supportive of fair and equitable drug pricing and access, unfortunately the proposed changes to the Bayh-Dole Act will not accomplish this price-control goal and will instead create significant uncertainty and risk that will negatively impact the interest of potential industrial and private-sector collaborators from partnering with academic institutions reliant on federal research grants.

What can this committee do to help bridge some of these enduring challenges? Here are a few recommendations:

- Support budgetary commitments for expanded STEM education and workforce development, including support for entrepreneurs and managers/serial-CEOs
- Support increased financial commitments/matches for gap funds supporting early-stage technology translation and business development
- Support strategic investments in the development of key regional resources such as manufacturing hubs
- Oppose the currently proposed federal changes to the Bayh-Dole Act

In conclusion, university research is more than just an academic endeavor; it is a vital component of the Pennsylvania and broader US economy. It fuels innovation, drives economic growth, and will continue to position the state and nation as a global leader in technology and industry. As we continue to navigate the unique challenges of the 21st century, university research is a key foundation upon which the future prosperity of the commonwealth and nation will be built.