HOW TO REBUILD U.S. MANUFACTURING

We’ve lost our practical engineering capacity to turn American discoveries and inventions into products.

There’s one indispensable ingredient for the success of American manufacturing: engineering know-how. While factors like taxes, trade, and regulations matter for the near-term competitiveness of industry, our ultimate success depends on the skills and inventiveness of our people.

America’s fundamental production skills and capabilities—what scholars call the “industrial commons”—are in decline. Following decades of an “invent here, manufacture there” paradigm among many U.S.-based firms, the nation has lost entire industrial sectors to overseas competitors. And with these losses in production activity, we’ve seen the loss of engineering and manufacturing know-how and, in turn, innovation capacity. A new paradigm for American industry is increasingly clear: “Invent there, manufacture there.”

It doesn’t have to be this way. America’s universities and federal labs continue to churn out world-leading expertise and game-changing discoveries and inventions. Yet many U.S.-based inventions languish in university technology transfer offices. We are willingly giving away the promising results of our basic research to other countries that can lead and scale-up production. Several factors contribute to this state of affairs.

America’s private sector, driven by quarterly profit reporting and other short-term considerations, has little appetite for the long-term investments in translational R&D needed to mature nascent but promising ideas resulting from basic research. The vast bulk of venture capital in the United States is funneled to software and biotech, leaving less than 4 percent of VC investments for manufacturing capacity.

Thanks to the U.S. federal government investments in basic research, we still lead the world across a broad spectrum of discoveries, as reflected in publications and citations. Being the best in the world in science is important—but it’s not sufficient to ensure success. We need to think seriously about a new national strategy to convert these assets into successful products and competitive industrial sectors.

Science is not engineering. Most of what the public perceives as “rocket science” is actually “rocket engineering.” World-class practical engineering, distinct from science, means not just analysis and discovery but also synthesis and innovation aimed at turning abstract ideas into tangible products. This is the innovation ecosystem. We need creative thinking and strategic investments to restore it.

The work starts with education and inspiration. While U.S. high schools commonly require students to dissect a frog, hardly any require students to disassemble a power tool. Exposure to real-world engineering will inspire and empower young people to pursue a diversity of manufacturing careers—through either four-year engineering degrees or vocational training. Maker Faires and FIRST Robotics are great examples to develop the underlying interest and the necessary creative mind-set.

Beyond education, America also needs new systemic thinking about promoting innovation.

When it comes to research, we have a major gap in our national innovation ecosystem: a lack of investment in translational R&D, the engineering and manufacturing research that can turn promising ideas from our universities into new products and processes. This is a market failure. Although the U.S. federal government invests about $150 billion annually (four times as much as Germany) in science and technology, we have a trade deficit in manufacturing of nearly $800 billion, whereas Germany runs a $300 billion surplus. Crucially, the German government invests about six times as much as the United States in “industrial production and technology”—essentially translational research.

We can do better. A report that I co-authored, entitled “Manufacturing Prosperity,” calls for significant investments in engineering and manufacturing process technologies research, including investment in Translational Research Centers. These are independent nonprofits affiliated with a single or group of universities to mature and commercialize ideas generated by the university researchers. The report also identifies the need to establish a new entity in the federal government, like a National Innovation Foundation, to serve as focal point for practical translational research investments in engineering and manufacturing.

We need both innovation and production on our shores if we want to retain essential know-how and build long-term national wealth and security. This means acknowledging, understanding, and addressing the systemic challenges facing America’s innovation ecosystems. We ultimately need to build an engineering infrastructure that mirrors our science infrastructure. When it comes to education and investment, other nations are taking action to win the industries of the future. The onus is on us.

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