INDUSTRIAL R&D

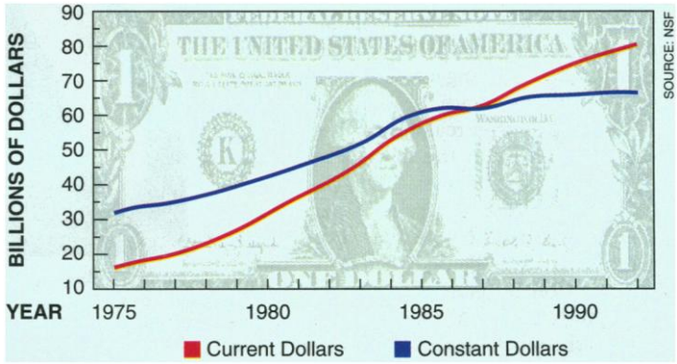
National Science Board Sounds a Wake-Up Call

The U.S. economy as a whole may still be struggling to lift itself out of a recession-induced funk, but one industry, at least, has experienced remarkable growth: the publishing of reports that predict dire consequences for economic competitiveness if domestic firms don't invest more in research and development. Over the past 3 to 4 years, groups as varied as the Carnegie Commission, the National Academy of Sciences, the Council on Competitiveness, the Office of Science and Technology Policy, and several congressional committees have produced a pile of literature on the subject that a strong man would be hard-pressed to lift. Now comes a new report,* this time from the National Science Board, warning that without concerted government action the United States risks losing its technological leadership.

While this report echoes the concerns of many of its predecessors, it is unusual in at least two respects. First, it forthrightly lays part of the blame for U.S. industrial decline at the door of industry itself, although its authors also argue that corporate CEOs are merely responding rationally to hostile financial conditions. Second, while the report recommends a stepped-up federal role in supporting industrial technology, it does not call for the creation of a civilian agency analogous to the Defense Advanced Research Projects Agency to coordinate this work, as have a number of other reports.

Furthermore, the report highlights the generally poor quality of statistics on industrial R&D, particularly in terms of assessing the quality and commercial results of R&D spending, and explicitly recommends upgrading the collection of such data. As a result of these data gaps, the report's authors are reduced to arguing that trends in aggregate R&D spending translate directly into trends in innovation—an assumption that several R&D analysts have criticized. Still, members of the science board committee—co-chaired by Rensselaer Polytechnic Institute president Roland Schmitt and TRW vice president for science and technology Arthur Bement—say their report is an important wake-up call to the policy establishment. "We are spending too little, not spending it the right way, and getting too little for our money," Schmitt says.

Shrinking investment. The new report cites an array of statistics to support that notion. For instance, while U.S. industrial R&D expenditures grew at an average, inflation-adjusted rate of 7.5% a year from 1980 to 1985, such investments tapered off in the late 1980s, growing by only 0.4% a year from 1986 to 1991. The report doesn't directly compare U.S. industrial R&D with industrial R&D in other Western nations. But it notes that growth in *total* U.S. R&D spending—that is, research performed in the United States by industry, government, and academia—has been slower than in many of the nation's major industrial competitors. Japan, in particular, has increased spending on total nondefense-related R&D much faster than the United States: In 1990, the United States spent only 1.9% of GDP on nondefense R&D and Japan spent 3.0%, whereas in 1980 the United States spent 1.7% compared with Japan's 2.2%.



Cause for alarm? R&D expenditures by corporations in the United States have barely grown since the mid-1980s.

What's worse, the report argues, is that U.S. firms haven't been investing wisely. For instance, the report notes that U.S. firms allocate a much smaller fraction of their R&D budgets to process technology than do their Japanese counterparts, a trend that has slowed the conversion of innovations into products and widened the Japanese lead in a variety of industrial technologies. Similarly, it cites a recent survey of corporate R&D managers as evidence that U.S. corporations have overly short time horizons that hinder the development of technologies with long-term payoffs.

"Our overriding concern was that these trends are fatal to the technological competitiveness of the United States in the long run," Bement says. To reverse them, the report endorses a national technology policy that would: Offer a grab bag of tax incentives to improve the financial investment climate and consequently boost corporate R&D; reorient defense research toward industrial needs; and provide direct government support for the development of process technology, basic engineering research, and generic technologies. "The private sector can be nudged [into increasing R&D investment] by fine-tuning existing programs and through fiscal policies," says Bement.

Where direct federal spending is necessary, the report recommends expanding existing programs such as the Commerce Department's Advanced Technology Program, which provides federal assistance for technology development at small and medium-sized companies. Many of these programs were resisted by the Reagan Administration and have only recently won the support of the Bush Administration (*Science*, 20 March, p. 1500).

Sour notes. While some in Congress and academia were quick to applaud the report, others have given it mixed reviews. Arno Penzias, director of research at AT&T Bell Labs, faults it for emphasizing an apparent shortfall in corporate R&D and for blaming the failures of management on the investment climate. "The problem is not one of not inventing enough stuff, it's how we invent stuff, how we use it, and how we get it to the market," Penzias says. Furthermore, he says, it makes no sense to argue that a hostile financial climate forces managers to make "rational" decisions that slight R&D. "If people don't know how to drive and they run their car off the road, you can't say they're irrational—they just don't know how to drive."

Harvard political economist Robert Reich also argues that the report misses the point in focusing on a perceived gap in R&D expenditures. "Two measurements are more appropriate [than levels of R&D funding]—the speed of new innovations and the speed at which they're utilized.... There we do have a problem, and not one that's necessarily rectified by throwing more money into R&D."

But Harvard professor of science and technology Lewis Branscomb says the report is remarkable as a watershed in the evolution of technology policy. When he was director of the National Bureau of Standards more than 20 years ago, he says, he tried to get the National Science Board to consider funding applied research with industrial potential. "They didn't want anything to do with the idea." Whether or not the new report has a major influence on national policy, its release by that same National Science Board is a clear sign that those days are long gone.

–David P. Hamilton

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