

RESEARCH SPOTLIGHT

Procuring Innovation

BY DAVID A. PRICE

In late 1958, a startup company called Fairchild Semiconductor in Palo Alto, Calif., had a serious problem. It had contracted to produce transistors for the Minuteman missile program, which required transistors that were hundreds of times more reliable than the state of the art. But Fairchild's devices were randomly failing. Testing revealed a force as gentle as a pencil tap could dislodge specks of metal that would cause an electrical short. The frantic efforts of Fairchild's engineers to solve the problem led to an invention early the next year: the planar process, the first commercially practical process for making integrated circuits.

Thus, although the integrated circuit wasn't the product of a federal research lab or a research grant, the federal government indirectly had a hand in it through its procurement spending. The electronics technologies Fairchild created as a subcontractor for the missile program became the foundation of the semiconductor chips that are ubiquitous today.

The case isn't an isolated one: Economic research has indicated that public procurement spending can induce research and development spending and stimulate innovation — adding to research and development, not just redirecting activity that would have taken place anyway. For example, a 2012 paper by economist Mirko Draca, now of the University of Warwick, found that the procurement spending of the Reagan administration's military buildup significantly boosted both patenting (which is often used as a measure of innovation) and research and development activity.

But what kind of public procurement has the greatest effect on research and development? Intuition — and history — might suggest that the answer is spending on high-technology goods and services. A recent article in *American Economic Journal: Macroeconomics* by two German economists, Viktor Slavtchev of the Halle Institute for Economic Research and Simon Wiederhold of the Ifo Institute, finds empirical support for this idea.

Slavtchev and Wiederhold created a dataset of company-sponsored private research and development expenditures in the United States at the state level for 1999-2009 as well as the "technological intensity" of federal procurement spending in each state during the same period. They included all federal prime contracts valued at more than \$2,500. For information on research and development spending, they relied on the U.S. Survey of Industrial R&D, a National Science Foundation survey. To determine the technological intensity of procurement contracts, they

exploited the fact that procurement information from the U.S. General Services Administration procurement database includes the industry classification of each contract in the form of NAICS (North American Industry Classification System) codes.

The authors test a theoretical model in which the technology intensity of public procurement has a positive relationship with private research and development. They test this model using regressions that evaluate relationships between the amount of company-funded research and development spending in a state, on one hand, and a number of variables they theorize to be relevant. In their main regression, these variables include the technology intensity of federal procurement within the state in the

previous year (roughly speaking, the federal government's spending on high-tech industries in the state as a share of all its procurement in the state), the total amount of federal procurement in the state in the previous year, and the state's population the previous year.

"Does the Technological Content of Government Demand Matter for Private R&D? Evidence from U.S. States."
Viktor Slavtchev and Simon Wiederhold.
American Economic Journal: Macroeconomics,
April 2016, vol. 8, no. 2, pp. 45-84.

Slavtchev and Wiederhold find that company-funded research and development has a positive and statistically significant relationship with the technology intensity of federal procurement. In particular, the researchers estimate that "each dollar that the government takes away from low-tech industries to spend it in high-tech industries relates to an increase in private R&D of about 21¢."

On the basis of further analysis, they conclude that the relationship is causal: Shifts between low-tech and high-tech in the government's shopping basket brought about the changes in research and development spending.

The authors acknowledge, however, that it is unclear whether a strategy of increasing private research and development through high-tech public procurement would be more efficient than other policies, such as direct subsidies or favorable tax treatment. Moreover, they note that to the extent the government skews its spending in favor of high-tech products and services for the sake of stimulating research and development, rather than looking only at its own needs in deciding what to buy, the government's cost-efficiency in providing public services would be hurt. In addition, they point out that there is a question of which industries such a strategy should target — and the government has a mixed record in picking winners. Consequently, they indicate, federal spending as a tool for promoting innovation could push research and development resources in the wrong direction. **EF**