

the Federal Government provides about two-thirds of all funds for the performance of R. & D. the predominant share of the work itself is performed not by the Government but by private industry. Appendix table 1 indicates this more fully.

Digging beneath the surface, further analysis reveals that the performance of R. & D. is highly concentrated—almost regardless of the index of concentration employed. In 1959 (this is the latest year for which detailed information is now available) the 406 companies with 5,000 or more employees (3 percent of the total number of firms with R. & D. programs) accounted for 86 percent of aggregate R. & D. activity. At the other extreme, the 10,600 companies with less than 1,000 employees (90 percent of the total number of firms with such programs) performed only 6 percent of industrial R. & D.

Furthermore, most small companies have no R. & D. programs at all and of those that do, their outlays for this purpose are extremely small (nearly half of these companies spent less than \$10,000 on research in 1959). The big companies thus do most of the work, and indeed, the biggest of the big companies do almost all of the R. & D. And this concentration of activity is even more intense than is concentration generally. For instance, while the 100 corporations with the largest R. & D. programs accounted for 81 percent of aggregate R. & D. these same firms accounted for only about 41 percent of total sales within their respective industrial categories. Related data are contained in appendix table 2.

One finds as well that the bulk of R. & D. outlays are concentrated within a very few industrial categories and have rather specialized scientific objectives. In 1959, of \$9.6 billion spent on R. & D. in industry, over \$3 billion were in aircraft and parts, with another \$2.2 billion in electrical equipment and communication. The heaviest emphasis is on development and applied research as distinct from basic research. About 70 percent of total outlays in this sector are for development and another 20 percent for applied research. Basic research, by contrast, receives less than 10 percent of the total. Moreover, the physical and mathematical sciences dominate the scene, making up about 60 percent of total funds for basic research in 1959, and accounting, of course, for virtually all of the expenditures for development and applied research.

What emerges, therefore, in this kind of picture: amounts spent for R. & D. have been rising rapidly in recent years, with most of the funds flowing from the Federal Government; the bulk of the actual performance is done by private industry; within industry a small number of firms do most of the work and get most of the money appropriated by the Federal Government for this purpose; the principal portion of our attention is focused on a very few industrial sectors, principally those related to missiles, aircraft, and electronic and communication equipment; and little work is being done on basic research and very little on the life sciences.

Putting up two-thirds of the funds and engaging in considerable research on its own, the Federal Government rather obviously is principally responsible for the character of contemporary R. & D. In the present fiscal year it is estimated that the Federal Government will spend \$12.4 billion for this function, with \$7.2 billion, or 58 percent, of this originating with the Department of Defense; NASA will add another \$2.4 billion, or 19 percent; and the AEC an additional \$1.4 billion, or 11 percent. Together, then, these three agencies account for nearly 90 percent of all Federal outlays for R. & D. and it is their interests which naturally exert the largest influence on R. & D.

The way in which these agencies, particularly the Department of Defense, handle their contracting for R. & D. is thus of critical importance in evaluating the position of smaller firms in the overall picture. Here, for the sake of brevity, I will look primarily at the performance of the Military Establishment.

Just 6 years ago, in the fiscal year 1956, expenditures for EDTR (experimental, development, test, and research work—the military terminology for R. & D.) accounted for only 13.5 percent of all military procurement. Gradually this has increased, spurred on by missile and space-related projects, with the result that by fiscal 1959, EDTR accounted for 22.6 percent of total procurement. Since then it has risen less sharply to 25.7 percent in 1961. Among the individual services there are sharp differences in the relative importance of research activity. In fiscal 1961, although the Army spent merely 12 percent of its money on EDTR and the Navy 20 percent, the Air Force spent 36 percent and accounted for about two-thirds of all military funds allocated for this purpose.