

The theory on market structure and R&D suggests that monopoly power is conducive to innovation, particularly when advances in the knowledge base occur slowly. But very high concentration has a positive effect only in rare cases, and more often it is apt to retard progress by restricting the number of independent sources of initiative and by dampening the firms' incentive to gain market position through accelerated R&D. What is needed for rapid technical progress is a subtle blend of competition and monopoly, with more emphasis in general on the former than the latter, and with the role of monopolistic elements diminishing when rich technological opportunities exist.

In sum, the qualitative evidence supports a preliminary conclusion that no single firm size is uniquely conducive to technological progress. There is a place for firms of all sizes. Technical progress thrives best in an environment that nurtures diversity of sizes and that keeps barriers to entry by technologically innovative newcomers low.

2. Output Effect on R&D

An increase in demand for the product normally increases short-run profits, which in turn stimulates R&D activity. That is, the "pull" of demand increases inventive effort. There is evidence that higher R&D activity follows increases in profitability with typically short time lags. Nadiri and Bitros⁷⁹ find that in the long run, for five U.S. industries, an increase in output of 1 percent generates a 0.7 percent increase in R&D capital. In Canada, Bernstein⁸⁰ estimates the long-run effects to be around unity. In the short run, however, when output increases by 1 percent, the U.S. subsidiaries increase their demand for R&D capital by 0.25 percent, compared with 0.37 percent for the Canadian-owned firms.

Scherer⁸¹ classifies patent data for U.S. manufacturing industries according to the industries of use. He finds a positive, significant relationship between patents by use and the user output. Scherer finds almost a one-to-one relationship between the growth rates of patents and sales. In other words, a 1 percent increase in sales leads to a 1 percent increase in patents.

⁷⁹ M.I. Nadiri and G.C. Bitros, "Research and Development Expenditures and Labor Productivity at the Firm Level: A Dynamic Model". In *New Developments in Productivity Measurement*, edited by J.W. Kendrick and B.N. Vaccara. Chicago: National Bureau of Economic Research, 1980.

⁸⁰ Jeffery I. Bernstein, *Research and Development, Production, Financing and Taxation*. Toronto: University of Toronto Press for the Ontario Economic Council, 1984.

⁸¹ F.M. Scherer, "Inter-industry Technology Flows and Productivity Growth", *Review of Economics and Statistics*, 64, 1982: 627-34.