

3. R&D and Factor Prices

R&D capital consists of the output of scientists, engineers, technicians and the activity of commercializing the invention. Physical capital is made up of inputs like equipment, machines, structures and offices. R&D and physical capital tend to be substitutes in the short run but complement each other in the long run, while each type of capital is a substitute for labour. Factor prices affect the cost of physical capital and knowledge capital in a similar way. The capital cost consists of two components: the financing (rate of return) and the utilization of capital (rate of depreciation). The demand for R&D capital is directly affected by the cost of doing R&D. This direct effect is enhanced by the indirect effect on R&D from changes in cost of physical capital. For example, an increase in the rate of return (i.e., financing cost) renders financing capital formation more expensive and thereby dampens the demand for R&D capital.

The demand for R&D capital is three times more responsive to changes in output, compared with changes in its factor price. Thus, in an expanding economy R&D expenditures will increase; and if labour costs increase, the production process will become more capital intensive in terms of both physical and R&D capital.

4. R&D and Tax Incentives

Tax incentives generate positive effects on R&D expenditures. Canada has had a varied and extensive set of tax incentives directed at stimulating R&D capital formation. Although the statutory tax credit in Canada compares favourably with that in other countries⁸², the effective tax credit is only slightly above half the statutory rate for the major R&D investors in Canada. This implies that the problem of unutilized tax credits is particularly acute. It is of little value to increase the statutory rate when constraints hinder firms from taking advantage of existing credits.

Bernstein⁸³ estimates that a doubling of the effective tax credit rate generates a 3 to 6 percent increase in the long-run demand for R&D capital for both U.S. subsidiaries and Canadian-owned firms. In the short run, the effect is about 1.4 percent (1.1 percent substitution and 0.3 percent output effect). Policy initiatives toward R&D investment through tax incentives generally lead to a dollar-for-dollar increase in R&D expenditures. A dollar spent by the government in the form of tax expenditure causes the firm to increase R&D expenditures by one dollar.

⁸² Donald G. McFetridge and Jacek P. Warda, *Canadian R&D Incentives: Their Adequacy and Impact*. Toronto: Canadian Tax Foundation, 1983.

⁸³ J.I. Bernstein, 1984, *op. cit.*