CHAPTER VII

RESEARCH IN THE INDUSTRIAL CORPORATION: II*

What things can come into being, what things cannot – in short, what is the principle by which each thing's potentialities are marked out, its boundary stone set deep down within itself. – LUCRETIUS, *On the Nature of Things*, Book I.

I

It is not easy to obtain any very exact idea of the scale on which corporations engage in research for the purpose of increasing the stock of invention. Most quoted figures of expenditure are for 'research and development'; that is to say they group together the costs of invention, of development (including pilot plants) and of routine testing, production control and a wide variety of everyday tasks, often minor but sometimes very important, commonly known as 'trouble shooting'. The proportion of this total directly devoted to real innovation will, of course, vary from case to case but it tends to be low.¹ Most industrial laboratories are small – in the United States, for example, more than one-half of them employ less than fifteen scientific workers – and in many of these it is more than likely that the whole, or the overwhelming proportion, of such costs are incurred in development or routine work. The number of firms in the world which, year in and year out, devote more than one per cent of their total costs to activities likely to emerge as inventions must be very limited.

II

Nevertheless the statistics regarding research and development throw some light upon the matters under investigation here and establish

* [Later and more complete statistics of the kind discussed in this chapter are given in Chapter X. It may be said that the later figures add emphasis to the conclusions drawn from the earlier.]

¹ In the United States in 1953 4·1 per cent of the total industrial research and development costs could be attributed to 'Basic Research'; the proportion for the chemical industry was 10·5 per cent; for petroleum 7·6 per cent and for scientific instruments 6·8 per cent (National Science Foundation, *Science and Engineering in American Industry*, Table A.12.) In a few cases where individual manufacturers have tried to separate research costs and development costs, the proportion of research costs varied widely from nothing to 70 per cent of the total.

J. Jewkes et al., *The Sources of Invention*  
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certain presumptions about the occurrence of industrial research. The broad conclusions to be drawn from them are, therefore, summarised here.¹

The spectacular increases in expenditure on research and development since 1940, before which year statistics are almost non-existent, have been largely due to the direct financing of the research activities of corporations by governments for the purpose of defence. In the United States and Great Britain between one-third and one-half of corporation expenditures are met by the government. This, of course, explains why a high proportion of these costs are found in such industries as aircraft, guided missiles, atomic energy and electrical and electronic equipment. In the United States 84 per cent of corporation expenditure in Aircraft is met by the Federal Government; in Electrical Equipment, 54 per cent; in Scientific Instruments, 45 per cent; in Telecommunications and Broadcasting, 52 per cent. It may be argued that preparations for war on this scale must now be regarded as normal. But to do so takes the matter outside the range of economic calculation; decisions about expenditures for war purposes are military and political decisions. Any study of the occurrence of research which is to include government-assisted research would lead to very simple and obvious answers: the industries which conduct the greatest amount of research are those which get the largest government grants and those which get the largest government grants are those whose efforts are, or are supposed to be, most intimately bound up with national defence.

Excluding government grants, American manufacturing industry seems to be spending something over $2,000 million on research and development (0.7 per cent of the national income). In Great Britain the corresponding figure is perhaps 0.5 per cent of the national income. Statistical evidence of research and development carried out in other countries is fragmentary. It seems likely, however, that the proportionate rate of expenditure on industrial research is highest in the United States and Great Britain,² and that there are other countries, notably Switzerland and Sweden, where although much less proportionately is spent, it is generally considered that the flow of invention is nevertheless strong and technical achievement great.³

It is only in very recent years that thorough statistical studies have been made of expenditure by manufacturing industry. But the series which