

markets. Moreover, the end use, user-oriented nature of much new telecommunications technology suggests that opportunities are favourable for developing new products at the customer, as opposed to the central office, level.

The creation of a Single Market for telecommunications and computer products will require the industries producing many of these products to restructure. Where economies of scale are important, a few large firms with worldwide operations will evolve in the long run to dominate world as well as European markets for products such as central office and transmission equipment. This process is abetted by the fact that rapid technological change is increasing the cost of R&D, which firms must offset by selling across larger markets. In the more intermediate run, the EC will be mainly served by 4 or 5 large telecommunications equipment suppliers, rather than the 10 or 11 nationally based suppliers that have served their respective markets to date. In addition, numerous small firms will fill product niches and provide the specialization that even the largest multinationals must rely on outsiders to perform.

Structural change is already moving the industry in these directions. Mergers and acquisitions (M+A) and joint ventures (JV) in recent years have created giant firms (Alcatel NV and GPT) and have assured an important Community position for Siemens, AT&T and Philips (See Table 13). The activity in the field is part of a general upswing in M+A activity in the EC during the past few years, as Table 14 illustrates.

2.3 Research and Development Programs

a) European R&D Programs

The EC has not relied solely on deregulation and economies of scale as a means of increasing the competitiveness of the European telecommunications and

computer sector. An additional pillar of the EC strategy to reshape European markets for telecommunications and information technologies are scientific and technological support programs. The EC has budgeted 5.4 billion ECU (equivalent to about C\$7 billion) for R&D over five years.⁹ Telecommunications, computers, and microelectronics research account for over 40 per cent of the budget.

The two major programs relating to scientific advance in the sector are RACE (Research in Advanced Communications Technologies in Europe) and ESPRIT (European Strategic Program for Information Technologies). The emphasis of RACE is on the next generation of telecommunications network infrastructure, while ESPRIT's present emphasis is on microelectronics technologies. ESPRIT projects are joint projects between a firm and a government or academic research lab, where co-operation crosses national frontiers.

The combined five-year budget for RACE and ESPRIT is C\$3.2 billion; when matched by private sector contributions, the total of C\$6.4 billion swamps any comparable programs in Canada.¹⁰ Moreover, EFTA countries have an advantage over other non-EC countries because they are allowed limited involvement in a number of the EC technological support programs. Whether extra-EC, extra-EFTA firms will be eligible for ESPRIT or RACE grants is not altogether clear, but at a minimum eligibility is dependent on having an EC subsidiary or subcontracting to an EC consortium member.

The ESPRIT and RACE programs and the restructuring of EC telecommunications and computer industries should be viewed against a background of spiralling research and development costs, especially for major telecommunications products such as central office switches. For example, Philips privately estimates