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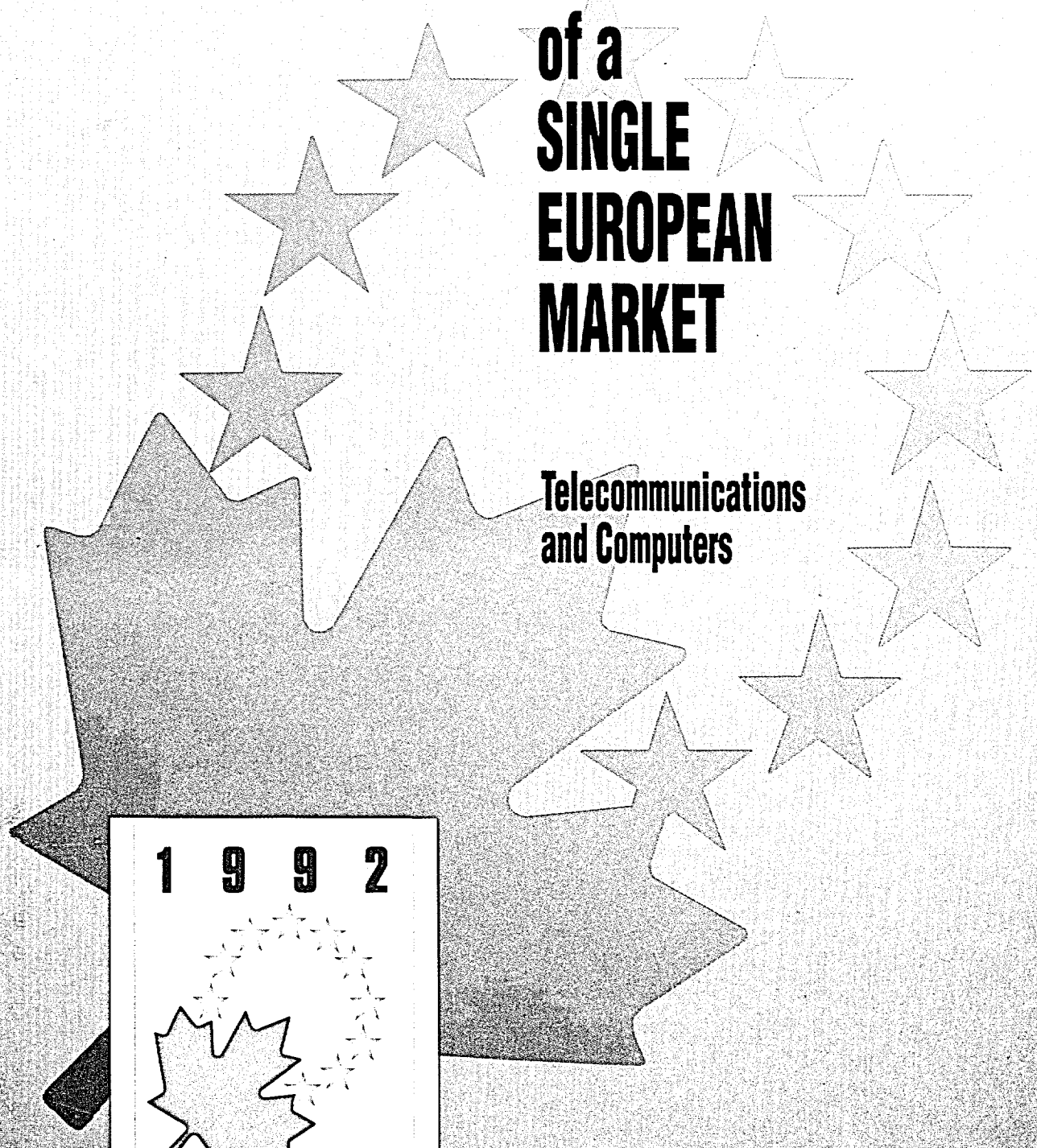
1992 IMPLICATIONS of a SINGLE EUROPEAN MARKET

Telecommunications and Computers



1992

CANADA EUROPE

External Affairs and International Trade Canada

Canada

1992

IMPLICATIONS

OF A SINGLE EUROPEAN MARKET

TELECOMMUNICATIONS AND COMPUTERS

December 1989

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FOREWORD

The European Community (EC), with a GDP similar to that of the United States, is Canada's second-largest trading partner and source of investment and technology. Canadian companies therefore have a particular interest in the completion of the European Community's internal market. The goal of the Single Market program, or Europe 1992 as it is often called, is the complete removal of barriers to the movement of goods, services, labour and capital within the 12 states of the Community to create a dynamic and rapidly growing market.

External Affairs and International Trade Canada (EAITC) is pleased to present this study as part of a series of reports on the implications of a Single European Market on Canada's trading, investment and technology interests. The areas to be covered by these reports include (in publication order):

Agriculture and Food Products
Consumer Goods and Cultural Industries
Telecommunications and Computers
Automotive Industry
Minerals and Metals
Forest Products
Defence, Aerospace and Transportation
Specialty Chemical Products, New Materials, Pharmaceuticals and Biotechnology
Industrial Products and Services
Financial Services
Fisheries Products
Professional and Consulting Services

These reports, prepared by Raymond Chabot International Inc., BIPE (Bureau d'Informations et de Prévisions Économiques) and Informetrica Ltd. analyse the trends, export impact, competition, investment implications and technological acquisitions arising from the EC Single Market of 1992.

This series of reports complements an earlier study published by EAITC, *1992: Effects on Europe*, which details the major economic and trade effects of the integration. Now in its third printing due to popular demand, the report provides a clear picture of the unification legislation and implementation measures and the general expectations and response of European industry.

Following the publication of these sectoral reports, EAITC will focus on subsectors of Canadian industry in which particular opportunities arise from the Single Market. These studies will go into much more detail on the trade ramifications specific to each subsector.

Together these reports, the overview presented in *Effects on Europe*, the sectoral analyses of this series of studies, and the subsector details of the next phase of Europe 1992 reporting, are not simply an information base for Canadian business people, but can be seen as a call to action. Europe 1992 is happening now. It will affect the way we do business. We have to know about it. And we have to plan to profit from it.

CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

B-L	Belgium-Luxembourg
CDFI	Canadian direct foreign investment
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CO	Central office (equipment)
CPE	Customer premises equipment
Comp	Computer
Comp Svc	Computer services
DOC	Department of Communications
Dom Mkt	Domestic market
EC	European Community
ECU	European Currency Unit (= C$1.30: November 1989)
EFTA	European Free Trade Association
Elec	Electronic
Elec T & Semi	Electronic tubes and semiconductors
ESPRIT	European Strategic Program for Information Technologies
ETSI	European Telecommunications Standards Institute
EUREKA	European Research Co-operation Agency
F.R.G.	Federal Republic of Germany
FTA	Canada-U.S. Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
INSEAD	Institut européen d'administration des affaires
IP	Intellectual property
ISDN	Integrated services digital network
ISTC	Industry, Science and Technology Canada
ITAC	Information Technology Association of Canada
JV	Joint venture
M+A	Mergers and acquisitions
MOU	Memorandum of understanding
NTB	Non-tariff barrier
Off Mch	Office machinery
ONA	Open Network Architecture
ONP	Open Network Provision
PABX or PBX	Private (automatic) branch exchange
PTO	Public telecommunications operator
RACE	Research in Advanced Communications Technologies in Europe
R&D	Research and development
SIC	Standard Industrial Classification
TA	Telecommunications administration
T&C	Telecommunications and computer
Tele Eqp	Telecommunications equipment
Tele Svc	Telecommunications services
TOEP	Technology Opportunities in Europe Program
VAN	Value-added network

EXECUTIVE SUMMARY

This report investigates the ways in which the Canadian telecommunications and computer sector may be influenced by the European Community's (EC) attempt to complete its common internal market by 1992 -- a program called Europe 1992 for short.

The telecommunications and computer sector is a very important element of Europe 1992. It is an aim of the EC to oversee the development of a European information economy in which Community telecommunications and computer firms establish themselves as world leaders. Although only a small proportion of Canada's current trade in telecommunications and computer goods and services is with the EC, Canadian firms cannot afford to overlook the important developments now taking place in the EC.

These developments are first and foremost the reduction and elimination of technical barriers to trade that have balkanized telecommunications and computer goods and services markets in Europe. In addition to equipment non-compatibilities, technical barriers to trade include different standards, differences in certification and testing procedures, and non-transparent regulations. An additional barrier, of particular applicability to trade in these goods and services, is government procurement policies, which tend to favour each EC Member State's home suppliers.

Europe 1992 aims to reduce or eliminate these barriers. Numerous directives harmonizing standards, promoting transparency, and opening up government procurement to EC-wide bidding have either been agreed to or are under intensive discussion. The prospects are now good that Europe 1992 will succeed sufficiently to create a single internal market for many telecommunications and computer products. Already some individual EC firms such as Siemens, Alcatel, and Philips are restructuring to take advantage of the economies of scale and greater specialization made possible by a single EC market comprising 325 million people.

Europe 1992 is expected to provide opportunities for Canadian firms. In addition to an expected growth in the EC market of 4.5 per cent, Europe 1992 creates a very large market in which Canadian firms with technological and market know-how should be able to find niches. This is particularly true of firms producing and marketing telecommunications equipment, especially terminal equipment or customer premises equipment, and of computer software and service firms.

To make the most of the opportunities provided by Europe 1992 Canadian telecom and computer firms will require some form of EC presence. Even small- and medium-sized Canadian firms will have to take on, to some degree, a multinational character if they wish to take advantage of an EC-wide market. Given the additional risks, as well as headaches, entailed by a foreign (EC) presence, many Canadian firms may not avail themselves of EC opportunities. But they cannot ignore the fact that Europe 1992 is likely to create new world-scale, European-based firms that will be in a position to challenge for a share of North American markets.

In sum, Europe 1992 will test Canada's capability and willingness to compete internationally. But without the benefit of a pact such as the Canada-U.S. Free Trade Agreement, firms wishing to make foreign sales will need to be more than trade-competitive. Success in Europe is likely to require a European presence and high quality goods.

INTRODUCTION

> Information, exchange of knowledge, and communications are of vital importance in economic activity and in the balance of power in the world today.... Telecommunications is the most critical area for influencing the "nervous system" of modern society.... The convergence of telecommunications computing, and applications of electronics in general, has now made possible a variety of new services.... National frontiers should not be allowed to hamper the development of a consistent communications system within the European Community.
>
> *Towards a Dynamic European Economy*, Green Paper, Commission of the European Communities, June 1987

This report is about the Canadian and European Community telecommunications and computer sector, which comprises the telecommunications, computer and related electronics goods and services industries. These industries provide the equipment and services for transmitting, processing, storing, retrieving and integrating information.

The report investigates ways in which the Canadian telecommunications and computer sector may be influenced by major developments taking place in the European Community. The Commission of the European Community is currently proposing changes that will dramatically increase the economic integration of its Member States by 1992 (hereafter Europe 1992). A major thrust of Europe 1992 is the Community-wide harmonization of telecommunications and data processing and transmission networks.

How will Europe 1992 affect Canadian firms in the Canadian telecommunications, computer and electronics fields? One thing is clear: before even digesting the Canada-U.S. Free Trade Agreement (FTA), Canadian firms must begin to think about, and ultimately cope with, the imminent creation of the world's largest common market. This common market of 325 million persons has a gross domestic product (GDP) of almost C$5 trillion (1988), making it the world's second-largest economic "player." Even a North American-oriented Canadian economy will have to take notice.

The telecommunications and computer sector is an important element of Europe 1992 of which a major goal is the development of a European information economy in which Community firms establish themselves as world leaders. It is one of the two or three sectors that can unequivocally be described as "high-tech." Others include (a) the "bio-chemical" sector, which includes pharmaceuticals and biotechnology as well as chemicals and materials such as plastics and ceramics, and (b) the military aircraft and electronics industry catering to government buyers.

The importance of the sector is clear. The convergence of the telecommunications, data-processing, and office and business information systems sectors is not only transforming the ways in which most of us work, but the nature of many of the next generation of products and services exchanged in both financial and non-financial markets. In fact, it is the Commission of the European Community's concern that European firms and nations might fall behind in the development, use, and sale of new technologies that is a prime

motivation for Europe 1992, in general, and for far-reaching proposals to open up the telecommunications sector to competition, in particular.

The new wave of communications technologies is led by the digitization of telecommunications and the ability to manufacture increasingly complex integrated circuits. Together these technologies make possible the integration of voice, data and image transmittal services over common telecommunications networks. New technologies have also made possible increasingly "intelligent" network and terminal equipment. One implication of the technological revolution in communications is that it opens up a wide variety of new and future opportunities for many firms capable of supplying information products and services to their producers or ultimate users.

Before proceeding, it is useful to draw some distinctions or dividing lines. In telecommunications it is customary to distinguish between services and equipment, even if technology is blurring the boundaries between them. Within services, a further distinction is made between basic or "reserved" services (chiefly telephony and Telex), which will remain the domain of the mainly publicly owned (in Europe) natural monopolies, and "value-added network" (VAN) services (e.g., electronic mail, message storage, data processing and information retrieval), which Europe 1992 would open up to competition.[1] The equipment category can also be subdivided, the chief distinction being between central office switches, transmission, and customer premises equipment.[2]

With respect to the computer industry, the main distinction is between hardware and software services. The latter is further divisible into data processing, software packaging, and professional (information and management technology) services.

1. BACKGROUND AND TRENDS

1.1 Canadian Context

a) Sector Description

The focus of this report will be the four subsectors of the telecommunications and computer sector: communications equipment and electronic components; computers, peripherals and business machines; telecommunications carriers; and the computer services industry. Table 1 provides a statistical description of the Canadian sector, with a sketch of the main economic aggregates for the four subsectors. It indicates that Canada is active in each of these subsectors, and shows as well that some of the major players in the sector are foreign-owned. However, domestic ownership predominates in the telecommunications equipment industry, led by Northern Telecom, and in the telecommunications carrier and computer services industries. (See Table 2.) The heavy dependence of the computers, peripherals and business machines subsector on imports reflects the lack of Canadian production of printers and copiers and a dependence on imports of key inputs: microelectronic components and printed circuit boards. Exports form a significant proportion of domestic production in each subsector.

b) Trade Flows between Canada and the EC

Figures 1 and 2 and Table 3 show that Canada engages in extensive trade in telecommunications and computer goods and services. However, except for telecommunications services, currently only a relatively small proportion of Canada's trade in such products is with the EC. Figure 3 and Table 4 show that, overwhelmingly, Canada's exports of telecommunications and computer products go to the U.S., while an important source of its imports of computers, semiconductors and other electronic equipment is the Pacific Rim, mainly Japan. Figure 4 shows that, except for electronic tubes and semiconductors, the EC has historically been the destination of only a small share of Canada's exports, although due to the greater market, computers and office machinery, make up the bulk of Canada's trade with the EC (Figures 5 and 6). During the nine-year period from 1978 to 1987, the constant dollar value of total Canadian exports in this sector has doubled, while imports have increased more slowly (Figures 7 and 8).

Table 5 presents the distribution, in 1987, of Canadian exports to EC member nations by subsector, and Figures 9 and 10 the overall view of Canadian trade with the Member States. It is a very uneven picture. Except for sales of electronic tubes to France and office machinery to the Netherlands, most Canadian telecommunications and computer exports are to the U.K. Canadian suppliers have been closed out of much of the rest of Europe. In part this shut-out is due to barriers that also inhibit intra-EC trade, barriers that Europe 1992 will attempt to eliminate.

Trade figures understate the extent of Canadian involvement in European markets. An alternative to arms-length trade is direct investment within the EC in production and distribution facilities, either as wholly owned subsidiaries or as joint ventures. The existence of barriers to trade, not only between the EC and other countries, but within the EC itself, is a potentially powerful factor influencing the decision to invest rather than trade. Important barriers (other than tariffs and quotas, which have been eliminated within the Community and are regulated by GATT rules for extra-EC trade) continue to exist where telecommunications and computer products are concerned. They take the form of (a) differences in technical regulations

between countries; (b) delays at frontiers for customs purposes and related administration burdens for companies; (c) restrictions on competition for public purchases; and (d) restrictions on freedom to engage in certain service transactions.[3] Europe 1992 aims to eliminate these barriers. Hence, by locating a subsidiary within a specific EC member country an extra-EC parent firm could benefit as intra-EC trade opens up.

c) Canadian Investments in the EC

While published data confirm a sharp rise in Canadian direct foreign investment (CDFI) abroad in the 1980s, the data are far too aggregated to indicate the role played by Canadian firms in the telecommunications and computer sector. In 1988, CDFI stock in the EC was $8.8 billion compared to $23.1 billion of EC investment in Canada. CDFI in the EC is only 15 per cent of total CDFI. Of the CDFI in the EC, 60 per cent ($5.5 billion) was in the U.K.

Published data do not indicate what proportion of CDFI in the EC is made by the firms in the telecommunications and computer sector. Northern Telecom has a number of facilities in Europe, (including the U.K., Ireland, Germany, Holland and Switzerland, and a plant being built at Verdun, France). Mitel, partially owned by British Telecom, has a U.K. base to service European markets. DMR has acquired firms in Belgium and Holland, while Memotec has acquired one in Belgium. But few, if any, of the mostly smaller Canadian firms have establishments in Europe. Exceptions include Gandalf Technologies and GEAC. As we shall see, if Europe 1992 provides an incentive for greater European involvement by Canadian telecommunications and information technology firms, it is likely to take the form of presence rather than arms-length trade.

d) Conclusion

There are two reasons why Canadian firms have a role to play in the information revolution that the EC wishes to bring about with Europe 1992. First, the transmittal, storing and processing of vast amounts of both general and highly specific information play an increasingly important role in a modern industrial, but service-oriented, economy.[4] The production of these information services and the technology that produces them represent an increasing share of the GDP of the EC and other economically advanced nations. A rapidly expanding market provides plenty of opportunities for capable new entrants.

Second, Canadian firms have played a role in this revolution, and some such as Northern Telecom and Mitel have played major roles. For example, Northern Telecom pioneered the digitization of telecommunications networks, which is the chief factor behind the convergence of the telecommunications and data processing sectors. Nevertheless, from the standpoint of commercial interaction with the European Community, the role, to date, of Canadian firms is small, as Table 4 and Figure 4 indicate.

1.2 European Community Context

a) Sector Description

The limited role played by Canadian telecommunications and computer firms in the EC is attributable to at least two factors. In the telecommunications subsector European markets have been *national*, each country served by a single publicly owned or regulated public telecommunications operator (PTO). In turn, these PTOs have been traditionally served by one or more favoured, domestic telecommunications suppliers, making it difficult for outsiders to break into the market.

In the computer-electronics field, a degree of protection in the form of various "industrial policies" aimed at promoting each nation's technological capabilities has also hindered Canadian sales of products and services to the EC. Compounding the problem for outsiders are technical barriers in the form of equipment non-compatibilities.

The existence of technical barriers to trade has been an important constraint on intra- as well as extra-European trade. A survey of business people in Europe ranked technical barriers to trade in electrical engineering products, particularly telecommunications equipment, as of "great" importance and technical barriers to trade in office and data processing equipment as of "medium" importance.[5] An example of high technical barriers to intra-EC as well as extra-EC trade are the standards and certification procedures applied to business telephone switching devices, known as private automatic branch exchanges (PABX). Despite *earlier* efforts to harmonize EC Member State standards for PABX, important differences still exist. One result is that PABX prices are more than twice as high in Germany as in France. Nevertheless, exports from France to Germany are almost non-existent. It has been estimated that a cost reduction in the neighbourhood of 6 per cent of total German expenditure on PABX could be realized if French manufacturers were allowed to capture a 10 per cent share of the German market.[6]

The promise of Europe 1992 is that the EC will become one large market, suppressing the various non-tariff barriers (NTBs) such as firm-specific technologies, national (rather than EC-wide) standards, non-transparent technical regulations, procurement policies, etc., which have tended to balkanize the EC despite its tariff-free profile. This promise is, of course, a promise only; the degree to which it will be fulfilled is still a matter of debate and conjecture.

b) Extra-EC Trade Flows

What is the situation in European equipment markets on the eve of Europe 1992? Figures 11, 12 and 13 (see detailed figures in Table 6) illustrate the magnitude of the market and production of the EC and of five of its leading members. The figures indicate overall self-sufficiency in telecommunications equipment, but a net dependence on imports of data processing equipment and semiconductors. Much the same picture is indicated in Table 7, which presents production to domestic market ratios for four different categories of products. Table 7 indicates that in addition to telecommunications equipment, the leading EC members come close to overall self-sufficiency in the production of data processing equipment. However, as Tables 8 and 9 show, overall self-sufficiency in telecommunications equipment masks substantial extra-EC exports and imports.

c) Leading Firms

Tables 10 and 11 tell us something about the identity of the world's major players in the supply of telecommunications and computer products. Table 10 indicates the leading producers of telecommunications equipment, data processing equipment and semiconductors. Except for Alcatel NV and Siemens these markets are dominated by U.S. and Japanese firms. Table 11 lists the major suppliers to EC (and other European) countries, the average number of leading suppliers doing business per EC member, and the relative importance of economies of scale. The average number of central office and transmission equipment suppliers per country substantially exceeds what economies of scale would otherwise allow.[7]

2. EUROPE 1992: SECTOR-RELATED CHANGES

2.1 Measures Being Implemented

How does Europe 1992 change the trade-investment environment for Canadian as well as EC-based firms? It is useful to keep in mind that, to date, the EC is a customs union in which the 12 members try to achieve common external policies vis-à-vis the rest of the world, and, as far as possible, a common internal market in which there are no explicit tariffs inhibiting intra-EC trade.

a) Elimination of Intra-EC Trade Impediments

The European Community's common market is far from complete. Important technical barriers to trade continue to exist. In addition to price and entry regulations governing telecommunications services there are more subtle barriers in the form of heterogeneous national standards, such as for PABXs as described above, certification procedures and local procurement policies. These impediments to trade can be very important, particularly for goods and services whose domestic (local) production a member government wishes to protect. Among the "protected" industries are the government-owned telecommunications monopolies, the privately owned suppliers of telecommunication equipment and other high-tech firms in the computer-electronics field.

A number of policy instruments for removing technical barriers are now a part of the Economic Community's arsenal of weapons. These include (a) a "mutual recognition" principle, such that products lawfully produced and marketed in one Member State can have access to all Member States, based on the landmark "Cassis de Dijon" case; (b) harmonization of national technical requirements via directives specifying only *essential* requirements that manufacturers must meet; (c) expansion of the role of two Western European-wide standardization bodies, the European Committee for Standardization (CEN) and the European Committee for Electrotechnical Standardization (CENELEC); and (d) advance mutual information directives that require each Member State to publicize any changes in regulations and standards to standard-making bodies in other states before these regulations and standards are adopted.

With this arsenal, Europe 1992 aims to reduce, and as far as possible eliminate, the remaining technical barriers to EC trade. For the telecommunications and computer sector the most important EC directives (year and number in parentheses) aimed at reducing barriers to trade involve:

1) Changes in the extent of regulation over telecommunications services -- i.e., limiting the right of a national monopoly over telecommunications services to telephony and Telex, while opening up to intra-EC competition the provision of value-added services, such as electronic mail, data storage and retrieval services (87/290/EEC).

2) Agreement in principle that telecommunications tariffs should be based on a common set of principles (88/825/EEC).

3) Agreement that while the telephone administrations (TAs) which currently regulate and operate the national telephone networks will continue to have a monopoly over network infrastructure, the TAs must (a) clearly separate their regulatory and operational activities and (b) submit to Community-wide standards that would

be imposed on networker *users*. These are essential components of the EC's proposal for Open Network Provision (ONP), which would establish a common intra-EC market for telecommunications services (88/825/EEC).

4) Agreement to open up the telecommunications equipment market, both for network and terminal equipment, to intra-EC competition. In principle the telecommunications equipment market would be opened up to extra-EC competition as well. In practice, however, EC content rules will apply to governmentally procured equipment; non-EC firms wishing to sell central office or transmission equipment in the EC will still have to meet local content requirements. This means non-EC firms will have to locate subsidiaries in the EC. In some countries, such as France, it is virtually impossible to sell customer premises equipment (CPE) even to *private* purchasers without a French presence. However, Europe 1992 will allow a subsidiary located in one EC member state to sell anywhere in the Community as long as local content thresholds are met (88/301/EEC).

5) Free intra-EC trade in computers and microelectronics. However, extra-EC manufacturers may continue to face local content rules. For example the EC currently mandates that for a chip to be conferred EC origin, thereby giving its integrated chip manufacturer free access to customers in all 12 Member States, the diffusion process of the chip, not merely its assembly, must be performed in the EC.

6) Agreement that standards, certification and testing procedures must be harmonized to effectively open up the telecommunications and computer equipment markets to competition. The means of achieving these goals include:

   a) legislative harmonization of technical standards (87/95/EEC);
   b) mutual recognition of tests and certification on the basis of common conditions and codes of practice (87/95/EEC);
   c) the creation of the European Telecommunications Standards Institute (ETSI) to speed up the establishment of common telecommunications standards and specifications (87/290/EEC);
   d) "transparency" of regulations and regulatory procedures, including advanced notification of draft regulations and standards (83/189/EEC).

7) The opening up of government procurement to all firms whose products meet an EC content threshold, currently envisioned as a 50 per cent local content rule. As indicated above, this rule would imply that extra-EC firms will have to locate a subsidiary in Europe and meet local content rules if they wish to sell to the TAs (88/378/EEC).

8) Reduced border costs, achieved by speeding up the procedures for granting clearance to goods entering a particular Member State. These changes are perhaps best characterized by the Single Administrative Document provision which, since January 1988, has allowed truckers to cross borders with only one document, in contrast to as many as 70 import-export declaratory documents previously required (85/179/EEC).

9) Elimination of barriers to capital flows, in particular, and to ad hoc government-arranged impediments to foreign investment in specific

industries or sectors (88/178/EEC).

10) Proposals for more unified laws relating to intellectual property (IP). There is recognition that existing differences between EC Member States in the treatment of IP (patents, trademarks, copyrights, protection for microcircuits) could act as a barrier to a single market in the development and production of many high-tech goods and services. The treatment of IP is also a matter of great concern to extra-EC countries wishing to penetrate EC markets (85/844/EEC).

11) Agreement on a common future telecommunications technology for Europe. In April 1989, the telecommunication authorities of Cyprus and all EC and EFTA countries except for Iceland signed a memorandum of understanding (MOU) which provides that several services and features will be available in Europe on a standardized basis by the end of 1992. The MOU is a step towards the idea put forward in the Green Paper to promote development of value-added services throughout Europe. The document follows the recommendations of the ETSI European Telecommunications Standards and is part of the harmonization efforts necessary to promote value- added services. The MOU is not subject to enforcement procedures as it is not a directive of the Council. Further it involves a number of countries that are not parties to the Treaty of Rome (86/659/EEC).

b) Adoption of a Common Technology (ISDN)

The EC has adopted the digitally based ISDN (integrated services digital network) technology. An ISDN telecommunications network allows voice, data, and image signals to be sent digitally along the same telephone line in a configuration called 2B+D. (The two B channels are high speed -- 64 kilobits per second -- channels for voice and data respectively. The D channel permits static image transmission and various kinds of message-monitoring services such as call-waiting.) ISDN will also allow transmission of very large amounts of data, for which capacity can be adjusted to user needs.

ISDN opens up a variety of uses for the typical telephone subscriber, dispensing with the need to lease dedicated lines if one wishes to transmit data or image. For example, ISDN will allow the family telephone line to accommodate a facsimile machine and transmit images for television home shopping. A common telecommunications technology in Europe not only increases the number of firms that can compete to supply equipment to the national telecommunications administrations (TAs), but also will allow firms to reduce costs by lengthening production runs and greatly increase the scope for niche firms to supply new products that interface with the ISDN technology.

c) Liberalization of the Intra-EC Telecommunication Equipment Market

Beyond agreeing on a future technology, how far has the EC proceeded in achieving agreement among Member States to dismantle barriers to the free flow of trade and investment in telecommunications and computer goods and services? There is acceptance of a liberalization of the intra-EC telecommunications equipment market by 1991, facilitated by directives calling for the harmonization of standards and certification procedures. Less clear is how the common EC approach to standards and certification procedures will apply to non-EC states. There is also agreement in principle on a liberalization of government procurement policies. However, proposed requirements

for a certain percentage of EC content, if adopted, would hurt non-EC firms.

d) Protection of Intellectual Property

Still at the proposal stage are Community directives relating to IP. Although a directive relating to the harmonization of national rules on trademarks has been adopted, and protection for integrated circuits has been finalized and implemented, a single Community trademark, copyright issues relating to piracy, home copying, and protection of computer programs and data bases, and a Community patent convention are still at the proposal stage.

Firms may be hesitant to enter markets where their new processes and designs are relatively unprotected. They will prefer to serve markets where secrecy is possible and IP protection is provided and will pressure home governments to act accordingly. Although some differences exist between Canada and the EC regarding IP, they are not wide and are currently under negotiation. Nevertheless, there is growing concern about the protection of IP and the potential shortcomings of the patent as an instrument of protection. The main problem is that patent-type protection requires meeting exacting criteria. Patents require disclosure, often take years, and sizeable legal fees to obtain. Copyrights, on the other hand, are immediately attainable, are relatively inexpensive to obtain, and are the designated mode of protection for software and chip design.

e) Liberalization of the "Value-Added" Services

Far from resolution is where to draw the line between the telecommunications services, which will be "reserved" to the national public administrations that currently monopolize the provision of telecommunication services, and the "value- added" services, which will be opened up to intra-EC competition. Compounding the problems is how to prevent the national regulators of the "reserved" services from imposing high charges on competitors who wish to use the network to provide value- added services, a problem addressed by the ONP proposal. (See section 2.1a, Item 3.)

f) Elaboration of a Principle of Reciprocity

In addition, non-EC firms may be excluded from participating in the "liberalized" provision of value-added services unless their home country reciprocates vis-à-vis EC-based firms. The EC has already begun to articulate a so-called principle of reciprocity. One variant, reflecting a mirror-image or "tit for tat" approach, is that access will be given to foreign suppliers on the same terms that the foreign nation gives access to EC companies. Another variant, and the one toward which the EC currently seems to be leaning, is that of "national treatment" or "similarity of opportunities." It would provide that the EC give access to foreign suppliers in a particular industry so long as the foreign nation does not discriminate against EC companies in that industry.

An EC policy of reciprocity, particularly if it were of a "tit for tat" sort, might pose problems for some Canadian firms. In the service area, problems could arise if a deregulated telecommunications sector in Europe left Canada in a relatively regulated position. At the moment, however, this does not appear to be a problem for firms wishing to supply value-added services, because in Canadian federal jurisdictions, at least, entry is relatively unrestricted. Although reciprocity would not seem to pose problems for most firms supplying computer products, it could conceivably pose a problem for at least some suppliers of telecommunications equipment. Until a recent Supreme Court

of Canada decision, a firm in Manitoba that wished to acquire a PBX had to do so from the government-owned Manitoba Telephone System. The purchaser did not have the option of buying directly from an equipment manufacturer, which would have left European telecommunications equipment firms out in the cold. Only time will tell if and how reciprocity is applied and how Canadian regulatory authorities, provincial as well as federal, will respond.

g) Conclusion

Europe 1992 has achieved a wide degree of agreement among EC Members States that the balkanization of telecommunications markets must end. But there is much less agreement on the details, particularly the effective powers that national telecommunications administration (TAs) will retain. Among outside observers there is scepticism about how much "deregulation" and "liberalization" will, in fact, be achieved by 1992. There is also some doubt (particularly but not only because of the local content rules) whether Europe 1992 will indeed open markets to extra-EC firms without a European presence. In the view of some observers, Europe 1992 might have the effect of discriminating in favour of intra-EC trade, thereby doing more to dampen extra-EC *trade* in telecommunications and computers than it does to stimulate it. Whether or not this "Fortress Europe" concept is tenable is still widely debated.

2.2 Effects on the EC: Ongoing Restructuring

How will the changes that Europe 1992 is designed to effect influence the various subsectors of the telecommunications and computer sector? Table 12 provides a qualitative answer to this question. Overall, the proposed changes will have their most profound effects on the telecommunications equipment sector. Of particular importance will be the harmonization of standards and certification procedures and the opening up of government procurement. To date, these have conjoined to limit intra-EC trade to less than 10 per cent of total demand.

The fact of largely closed markets in telecommunications equipment is attributable to three factors: (1) selective procurement policies employed by national governments as part of an industrial policy aimed at building up the country's technology base; (2) restrictive certification policies and incompatible national standards that reflect the different specific technology orientations of the public administrations responsible for providing telecommunication services; (3) "buyer or input specificity" in which the good or service supplied is customized to the user's specification, again a reflection of differences in national telecommunication technologies particularly for central office equipment.

The balkanization of telecommunications markets has prevented most firms from attaining full economies of scale. This is particularly so in central office (CO) equipment production and somewhat less so in the production of transmission equipment. It is estimated that a firm operating at one-half of minimum efficient scale incurs production and development costs 5 to 15 per cent higher than those incurred by an efficiently scaled firm.[8] Economies of scale are least important in the production of customer premise equipment (CPE).

Europe 1992 would allow leading equipment suppliers to reduce costs via greater specialization in the production of CO and transmission equipment and permit some of the smaller players in these markets to gain via longer production runs. For small- and medium-sized Canadian telecommunications equipment firms, the best opportunities are therefore likely to be in specialized CPE

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

that by the mid-1990s it will take 15 to 18 per cent of the world market to cover the underlying costs of R&D in a new generation of central office switches compared to only 3 to 4 per cent of the global market in the early 1980s.

b) The Canadian Response

The matter of R&D raises some thorny issues. One issue is how Canada could respond if, as some expect, the EC requires companies to locate R&D facilities in Europe. Such a requirement would tend to erode intramural R&D spending in Canada, whether by Canadian-owned firms or by Canadian subsidiaries of foreign (usually U.S.) firms, wishing to enter the EC market. There is probably little Canada could do short of negotiating some form of exemption for Canadian firms. Another issue is whether the Canadian government should provide financial support for R&D projects undertaken by Canadian firms who wish to participate in R&D ventures with European firms. This is an issue that the Canadian government has addressed, by implementing, in 1986, the Technology Opportunities in Europe Program (TOEP).

The impetus for TOEP, an R&D program with a European focus, was the decision in 1985 by 18 European governments to launch EUREKA, a program to sponsor co-operative research between European high-technology firms and research institutes. The focus of EUREKA projects included, among several technologies, that of information and telecommunications. If Canadian companies wish to participate in a EUREKA project, an understanding must be reached with the European industries involved. TOEP was set up in 1986 to provide financial support to Canadian firms wishing to (a) explore opportunities for participating in EUREKA projects and to (b) undertake collaborative R&D with European partners.

It is widely acknowledged that TOEP was not a clear success. It attracted little interest from Canadian firms and has been criticized on organizational and program delivery grounds. Large firms evidently did not need TOEP and small firms found it too expensive to participate in a EUREKA project with or without TOEP. When TOEP's sunset date in the spring of 1989 arrived there was little support for its continuation.

The need for a geographic focus on Europe was clearly a policy question that had to stem from a strategic objective of encouraging collaborative R & D ventures with European firms. TOEP's termination does not settle the question of whether some sort of Canadian initiative to support co-operative R&D is a necessary complement to efforts by Canadian high-tech firms to take advantage of Europe 1992. For example, Canada engaged in a large co-operative telecommunications program under the auspices of the European Space Agency. One result of this co-operation was the launch of the Olympus satellite.

In the case of telecommunications and computer firms, attention naturally focuses on the means of facilitating Canadian participation in RACE and ESPRIT. As already noted, participation in RACE and ESPRIT by extra-EC firms will, short of some negotiated agreement between governments, require having an EC subsidiary. Although the subsidiary requirement may shift some economic activity to EC soil which might otherwise be undertaken in Canada, it is not clear that any Canadian government program could improve the opportunities for R&D co-operation. It is also not clear whether participation in RACE or ESPRIT would be of much use to small- and medium-sized Canadian firms wishing to penetrate niches in a much-expanded EC market.

3. EUROPE 1992: EFFECTS ON CANADA'S TELECOMMUNICATIONS AND COMPUTER SECTOR

There are two general ways in which Europe 1992 may have impact on the Canadian sector. First, the creation of a Single Market may create new opportunities for Canadian firms. Second, the stimulus to efficiency, competitiveness and world scale induced by Europe 1992 may increase the opportunity for EC-based firms to invade North American markets and take away business from existing domestic suppliers.

We begin with the opportunities for Canadian firms created by a Single EC Market. The discussion applies chiefly, although certainly not exclusively, to Canadian-owned firms. It is least likely to apply to Canadian subsidiaries that are little more than manufacturing locations or local marketing arms of a foreign parent. But where the subsidiary is fighting to maintain a worldwide mandate for designing, producing and marketing a product the discussion is applicable.

These distinctions apply to the telecommunications and computer sector. In Canada the leading computer and office equipment firms are largely foreign-owned, their role being to produce components for export to parent operations. Thus, the chief opportunities created by Europe 1992 are likely to reside with telecommunications equipment and computer services and software firms.[11] In addition, a new breed of firms experimenting with and developing various microtechnologies, such as automatic identification equipment (bar codes, automatic deal-making, etc.), may find niches in a giant EC market.

What sort of environment will Canadian firms encounter in a single-market EC, post 1992? It will be an environment in which intra-EC trade rapidly expands as national barriers crumble. As well, it is likely to be one in which extra-EC trade grows slowly, at best, and declines in relative terms, as newly scale-efficient, import-competing, European firms capture greater market share. However, the overall EC market for goods and services should increase by 4.5 per cent as a result of Europe 1992, and probably a good deal more in information and telecommunications technologies, whose rapid expansion has been particularly hampered by intra-EC trade barriers. Rapid market expansion will create opportunities for new entrants to these high-tech industries. Nevertheless entry by extra-EC firms will require, in most cases, establishing a subsidiary, or some other "presence," in the EC.

3.1 Telecommunications Equipment

Telecommunications equipment firms perhaps best exemplify firms in the sector that are in a position to take advantage of Europe 1992. Northern Telecom's pioneering of digital telecommunications and Mitel's one-time North American leadership in small analog PBX telephone systems are relatively well known. Less well known are the successes of small- and medium-sized telecommunications firms. NovAtel, formed by Alberta-based Nova Corporation and Alberta Government Telephones, is a rising star in the cellular phone field. It has forged agreements to supply cellular equipment in the U.S. and to various Pacific Rim countries and is actively pursuing strategic alliances with EC partners.[12]

The success of small- and medium-sized telecommunications equipment companies resides in their technology and their ability, to date, to identify and fill market niches. Many of them, such as Norpak, an Ottawa-based producer of

videotex and Teletext equipment, and a manufacturer and licenser of specialized chips, engage in R&D. As a whole, the telecommunications equipment sector accounts for 20 per cent of industrial R&D done in Canada.[13]

The success of telecommunications equipment firms is reflected in sales abroad, as Tables 1 and 3 indicate. However, exports, most of which are to the U.S., no longer provide an adequate picture of the involvement of Canadian firms in foreign markets. Increasingly, Canadian suppliers of telecommunications equipment are serving the U.S. market from production facilities located in the U.S. The globalization of firms as well as markets is driving a wedge between a firm's exports and its foreign sales.

The factors leading Canadian firms to invest in, rather than export to, the U.S. are likely to operate far more strongly for Canadian firms wishing to make sales in the EC. For one thing the EC external tariffs on telecommunications equipment, which range from 5.1 to 7.5 per cent, will be unaffected by Europe 1992. For another, even the expected liberalization of government procurement policies will only apply to suppliers with some substantial ratio of EC content. But perhaps most compelling is the fact that it is not enough to simply employ scientific know-how to find and develop niches in a technological sense. It is also important to identify and find niches in a market sense -- which will require the appropriate contacts and market savvy as well as marketing organizations, demonstration facilities, and an ability to provide after-purchase services. Language and marketing differences require a local base of operations. Being there, having a "presence," may count as much as having something to sell there. In short, the European market requires a "presence" that the American market often does not. We shall return to this issue later.

Developments in the telecommunications equipment sector also illustrate one of the potential hazards of Europe 1992 -- the possible loss to Canadian firms of foreign and even domestic markets to world-scale firms based abroad. For example, in recent years Japan's share of Canadian telecommunications equipment imports has doubled, chiefly at the expense of U.S. imports. (Incidentally, the EC's telecommunications equipment trade position with Japan has also deteriorated since 1983, with over 50 per cent of the deficit due to EC imports of facsimile equipment.) If Europe 1992 accomplishes its aim of creating world-scale and internationally leading telecommunications and computer firms and of putting the Community at the forefront of technological developments in the field, not only will sales in Europe by Canadian firms be threatened but the Canadian telecommunications equipment market may be invaded by EC as well as Japanese and U.S. firms.

The loss of domestic markets need not mean a decline in employment. If Europe 1992 succeeds in creating world-scale firms, they are as likely to "invade" Canadian markets via investment in facilities as through exports to Canada from EC-based plants. Something similar has happened in the EC itself, helped along by trade policy instruments; the EC has used anti-dumping complaints and rules of origin based on the concept of "most substantial transformation" to curtail Japanese exports of facsimile, VCR and photocopier equipment. As a result Japanese corporations have begun to invest heavily in the EC.

3.2 Computer Services and Software

The other important subsector for which Europe 1992 should create opportunities comprises the computer services and software equipment industries. These are the fastest growing segments of the computer industry, as Figure 14 and Table 15 indicate. In the process of growth, a

number of Canadian software and professional (systems) services firms have gained an international recognition and foothold. The software firms have successfully grown by finding niches, the service firms by globalizing in tandem with the giant firms they serve.

Because of the customized characteristics of most computer services and specialized software, firm size is of little consequence and economies of scale are necessarily limited, or non-existent, except possibly in the marketing function. Only in the case of mass market software, such as games and word processing, with its expensive packaging and development costs, are economies of scale important. Thus entry into the sector is relatively easy, as the large number of small- and medium-sized computer services and software firms in Canada testifies. The prerequisite for successful entry and survival are (a) knowledge of new technologies; (b) the development of a reputation as a supplier of high-quality services and materials; and (c) the creation of an organization that is credibly viable and sufficiently mobile to provide "on the spot" software "repair" services.

Because of the very large number of specialized uses of computer services and software, most firms in this sector develop and occupy niches. There are numerous examples of firms that have developed niches in which they now play an important if not dominant role. They include GEAC in the library services market, including a U.K. presence; Cemcorp and its distributor Unisys in the educational materials field; LOGIBEC in the health care sector; and Brant in the artificial intelligence field.

The prospects for further expansion of the computer services and software sector are bright as the standardization of equipment and the development of new technologies increase the demand for software, systems integration and new value-added services. Examples include electronic forms software and increasingly sophisticated systems for electronically dealing in currency and other commodities. Moreover, the decision by the Commission of the EC to officially adopt ISDN as the basis of a future EC telecommunications-information network opens up numerous opportunities for new software and integrated systems development. However, because ISDN requires end-to-end digitalization of the network, it is likely to be years before it is the operative technology in anything more than geographical pockets.[14]

While software development can be carried out in Canada it will take European contacts to effectively market in the EC. In the case of professional services, which include consulting services and custom software development, sales in Europe will require a "local" (European) presence. Leading firms such as the Montreal-based DMR Group, are already locating in foreign markets via mergers, acquisitions and consortia. For such firms Europe 1992 means an increase in opportunities for expansion.

3.3 "Value-Added" Telecommunications Services

The component of the telecommunications sector whose EC opportunities are most difficult to assess is that which provides value-added telecommunication services or networks (VANS). The provision of VANS requires access to the public telecommunications network. VANS are services that use the basic telephone network to provide access to information in alphanumeric, video and voice form. Most VANS involve data handling. They include on-line electronic information (NEWS) services, data processing services such as interbanking and airline-reservation systems, electronic funds transfer, and messaging services such as electronic mail. The world market for

VANS is already large and is expected to quadruple by 1995, as Table 16 indicates.

An important question, however, is who in Europe will have access to the public telecommunications networks and on what basis? As indicated above, the EC has yet to agree on where to draw the line between reserved (monopolized) and "value-added" (competitive) telecommunications services. Nor is there a decision on the terms on which extra-EC based firms would gain access to the network. It is highly unlikely that both issues will be resolved by 1992, or that when they are they will provide many opportunities for Canadian firms in the near future.

What does appear to have been agreed upon is that the EC will approach competition in telecommunications services differently than the U.S. The EC will permit each Member State's TA to retain its monopoly over the provision of network infrastructure. A recent EC directive assures that voice telephony and telexes remain TA monopolies. This policy contrasts with the U.S. Open Network Architecture approach, which is aimed at opening up network provision to competition. The EC approach is closer to Canada's, which has retained the monopolies of the franchised carriers of public message-voice services, such as Bell Canada, while allowing competitors to interconnect with the public network to provide data transmittal and private line services.

To achieve a more competitive supply of telecommunications services, the EC has adopted an Open Network Provision (ONP) approach. The idea behind ONP is that all intra-EC firms wishing to lease lines or to supply "value-added" telecommunications services within or between Member States will face a common set of (minimum) requirements. Nevertheless the national TAs would be permitted to license firms wishing to provide "value-added" services and to compete in the provision of these services themselves.

These developments suggest that in the near future Canadian firms may have greater opportunities supplying information to EC-based firms on *how* to provide increasingly sophisticated information services rather than actually providing the services themselves which would require access to the public network. An example of a sophisticated new service is airline reservations kiosks. They provide ticketing services in much the same way as automated teller machines provide banking services. Canadian telecommunications service providers with know-how may have a foot-up in the European market as advisers to, or consortia members with, European firms wishing to provide a variety of new services.

In addition to VAN providers, Canadian firms such as Cantel and Bell Cellular, Canada's two leaders in the cellular telephone field, may be able in the future to enter EC markets as consortia members. Already the U.K. has adopted a duopoly model — similar to that in Canada -- for the provision of cellular services, one firm being a subsidiary of the regulated telecommunications carrier British Telecom, the other an independent operator. If other EC Member States follow the U.K. model, Canadian firms, in alliance with EC firms, could bid to become independent cellular operators. B.C.E. Mobile, parent firm of Bell Cellular, has been actively investigating the possibility of alliances in several EC nations, including France, F.R.G. and Italy.

4. EUROPE 1992: SMALL- AND MEDIUM-SIZED BUSINESS STRATEGIES

Within the Single Market there will be plenty of niches for small- and medium-sized high-tech firms. Although for most immediate impact of Europe 1992 will be the rationalization of European firms, there will be opportunities for many smaller firms as well. Since most Canadian firms in the telecommunications and computer sector are relatively small their opportunities will almost certainly be limited to product niches where the up-front R&D costs do not require large scale and market share. Thus, we approach the issue of strategies available to small- and medium-sized firms wishing to enter the EC market by asking what factors contribute to niche firm success in a high-tech market.

4.1 Elements of Success of a Niche Strategy

In an age of giant mergers and globalization, it is important to understand that in many high-tech industries economies of scale (sheer size) are not always present. The muted role of economies of scale in many high-tech industries is attributable, in part, to two factors: (1) product-specific learning often outweighs sheer firm scale and (2) unless development costs are great, there are limited economies of scale in the innovation process. For example, there is much evidence that large firms spend *proportionately* less on R&D than do small- and medium-sized firms, although the likelihood that a firm does R&D rises with firm size. Moreover, in high-tech industries more and more innovation is being done by smaller firms. In this regard small- and medium-sized Canadian telecommunications equipment firms have an excellent record.

The type of economies particularly important in the production of many telecommunications and computer products are production run-learning economies. The fall in unit cost that results from a doubling of cumulative production is estimated to be on the order of 30 per cent for electric components and microcomputing.[15] A doubling of cumulative production implies longer production runs and should be distinguished from a doubling of the *rate* of production, which is the basis for determining the existence of economies of *scale*. One reason why there are cumulative output economies is learning-by-doing. It is contended that once artificial barriers to trade in telecommunications equipment are eliminated, production costs will fall simply as a result of the assembly line and quality control economies associated with learning. The obvious implication is that high-tech firms which specialize, find their niche, and concentrate on expanding the market for their product can achieve unit cost reductions comparable to or greater than those associated with the mere size of plant or firm (economies of scale proper).

Where have niche firms succeeded in the telecommunications and computer sector? Chiefly in the CPE, microelectronic products, and computer services and software markets. How have these firms succeeded? Often by using learning economies, new ideas, acquired know-how, and marketing capabilities as means of gaining a substantial share of, or even dominating, their niche market.

4.2 Learning to Dominate

We can think of niche firm success as "learning to dominate" a market. When there are learning curve economies and when a firm's ideas, know-how, contacts and marketing capabilities allow it to successfully move into a highly specific market, it is likely that the firm will for a time have a significant market share of, if not dominate, its market.

The firm need not be the first in the market. It may be second or third to enter, capitalizing on the mistakes of the forerunners. But once a firm with a new product is well located, has forged the appropriate contacts, and is sure of the commercial viability of its product, learning curve economies give it a cost advantage over its actual or potential rivals. The cost advantage allows the firm to cut prices and increase its market share. The larger the firm's market share, everything else equal, the greater its cost advantage. In turn, the greater the cost advantage, the greater the ease with which the firm can achieve and maintain a dominant share until, inevitably, a better product or service comes along.[16]

An example of a niche firm that succeeded by "learning" to dominate a market is Cognos, the largest Canadian-owned package software firm. Cognos achieved a 70 per cent world market share in fourth generation language software employed in Hewlett-Packard computers. The Cognos example is apt in that it illustrates that success can come from what to outsiders may appear as undue narrowness. Of course, if the narrowness that a niche implies were to carry over to the firm's ability to develop new products for the future, then niche strategies will eventually backfire.

4.3 Two Essential Types of Knowledge

Success in high-tech niche markets depends on having two types of knowledge. First there is what can be called "scientific knowledge," associated with invention and technological innovation that is the basic output sought from formal R&D expenditure programs. Its fruition takes the form of new goods and services and new and improved production processes.

Second there is "time and place specific" knowledge, knowledge that is neither general nor can be known to everyone. Instead it exists in dispersed form and is usually known only by those with a direct *interest* in that particular bit of knowledge. Much economic knowledge is of this sort. For example, the price, quality, quantity and other relevant dimensions of product x at point a (one of literally thousands of products or services at just as numerous geographical points) will be known to those who wish to sell or purchase x, but not to others whose interest is in y, z, w, etc. at points b, c, d, etc.

While most academic attention naturally focuses on "scientific knowledge," it is clear that in the economic-business realm "time and place specific" knowledge is of at least equal importance. Being able to take advantage of opportunities as they arise is knowledge of the second type. Success in the market involves not only having a good idea, which may be characterized as "scientific knowledge," but the "time and place specific" knowledge of where, when and how to commercially exploit that idea.

For Canadian firms wishing to exploit opportunities created by Europe 1992 both types of knowledge are crucial. Scientific personnel can provide the basis for new products and services. Public and private agencies can provide information on the new rules of the game. But only the firm itself is in a position to take advantage of a new idea within the newly defined rules of the game.

4.4 Importance of an EC "Presence"

The distinction between types of knowledge has some implications for firms wishing to take advantage of Europe 1992. First, the importance of "time and place specific" knowledge implies that high-tech firms will need some form of EC presence, even if there is no legal requirement (as there will be for government procurement) of EC content. Thus, Canadian firms are unlikely to have the luxury of simply relying on arms-

length trade. At the very least marketing organizations and demonstration facilities will likely need to be established within the EC. In some cases EC production facilities will also be necessary. Firms without a well-known name may find that a production presence is as useful in establishing a reputation as an imaginative marketing strategy and a well-trained and knowledgeable sales force. Evidence that a foreign firm is "involved" in Europe and can provide engineering support to clients may be vital parts of its marketing effort.

It follows, then, that firms wishing to make sales in the EC will almost certainly have to have a presence in Europe. In many cases this will be most easily accomplished by teaming up with European-based firms. Small- and medium-sized firms in particular will find it more economical to link up with a European partner than to establish a wholly-owned subsidiary. The possibilities are numerous: they include acquisition, merger, joint venture, consortia, or some other form of alliance or contractual agreement with European firms, or with Canadian firms with an established EC presence.

Large, well-established firms are more likely to establish production-oriented subsidiaries. There are numerous reported examples. The *Financial Times* (of London) is filled with articles about U.S. and Japanese firms with plans to purchase or locate plants in Europe. These include U.S. chip manufacturers, INTEL and AMD, and Japanese electronics manufacturers Seiko-Epson and Matsushita Electric.[17] Whether their decision to invest in Europe is a defensive reaction to the intra-EC trade orientation of Europe 1992 or a sizing up of the new opportunities that a Single European Market creates, (or both), is hard to discern.

4.5 Danger of a "Wait and See" Attitude

The second implication of the distinction between "scientific" and "time and place specific" knowledge relates to a firm's leadership-followership strategy -- that is, whether a firm will attempt to be an innovator or an imitator. Where scientific knowledge is concerned, a firm may have the luxury of choosing between being the leader or a follower.[18] In some cases, however, smaller firms will be forced to follow an imitation-adaptation strategy. Where development costs are huge, as is the case with many new telecommunications technologies, small- and medium-sized firms are in no position to play a leadership role, unless they are members of a consortia. The AT&Ts, Northern Telecoms and Siemens of this world will take the lead.

"Reverse engineering" is a good example of the potential gains that may accrue to a firm that seeks to imitate or build on what others have achieved. Those gains arise because the imitator avoids the expenditure and risk associated with undertaking basic R&D, although it must also forego the extra profits that usually accompany being first in a given field. While a shortened product cycle and learning curve economies often weight the advantage in favor of an innovator, imitation complemented by adaptation may well be an appropriate strategy for a firm. But where "time and place specific" knowledge is concerned, being first is usually essential. Waiting for others to lead means, almost by definition, giving the market to others. The implication here is that Canadian firms, with a bona fide product to sell, and who are considering whether to get into an enlarged European market, would probably make a mistake to adopt a "wait and see" attitude. It makes sense to forge contacts and build the necessary organization earlier rather than later.

The restructuring of major EC firms in the sector that has already occurred, is

recognition that being first is important. While a niche firm has a very different product innovation strategy from an AT&T, Alcatel, Siemens, Northern Telecom, Fujitsu, it is unlikely to have any greater latitude in identifying and forging the appropriate market contacts. Thus small- and medium-sized Canadian telecommunications and computer sector firms should be discovering Europe sooner rather than later.

5. EUROPE 1992: OPPORTUNITIES AND RISKS

What dangers as well as opportunities does Europe 1992 create for Canadian telecommunications and computer firms? It is, of course, the potential opportunities created by the development of a giant common market in Europe that chiefly interests investors. But there are certain dangers, too. There are two types of dangers that can be broadly characterized as "errors of omission" and "errors of commission." The main error of omission has been alluded to above: not responding to a process that is likely to produce a number of new world-scale firms in Europe which will be in a better position to take away North American markets served by Canadian firms. One of the advantages of the Canada-U.S. Free Trade Agreement is that it has already put Canadian firms on alert to external threats.

The main error of commission would be for Canadian firms to simply rush in to fill what is predicted to be a much enlarged market for imports as a result of Europe 1992. A widely quoted estimate of the macroeconomic impact of Europe 1992 is that it will increase EC gross domestic product by 4.5 per cent (Cecchini Report). This amounts to an increase of almost a quarter of a trillion dollars. Even with low import elasticities, this means a substantial spur to European imports of foreign goods and services. But what may be true in total may not apply to most individual firms, at least those located outside the EC. It takes little political savvy to recognize that Europe 1992 is viewed as a spur to European firms as well as a gain to European consumers. It would be highly surprising if the European Community does not do all it can to assure that European-based firms are the chief gainers, via rationalization, from a much-expanded European market -- one free of the border, standards, investment, tax and other irritants that have often hindered intra-EC trade.

Canadian firms wishing to take advantage of the Single Market must make some important strategic decisions. These include determining whether there is a product "niche" which they can conveniently fill, and, if so, *how* to serve these markets. Broadly, the latter decision can be viewed as one between (arms-length) trade and (foreign) investment, or some combination of the two. Where some form of foreign presence is necessary, there are crucial decisions involving whether to directly invest in new facilities, to merge with or acquire an EC-based firm, or to form an alliance or joint venture with a successful EC firm or firms. The globalization of firms as well as markets has combined with a revolution in (firm) organizational form to offer numerous options to a newly expanding firm. These options are compounded by other decisions such as technology-sharing, licensing, or marketing agreements. While the increase in options (or choices) suggests numerous opportunities, there are also pitfalls. The "correct" choice for a specific firm often depends on highly specific (local) circumstances, and is therefore not easily predictable in the abstract. Thus Canadian firms, especially small- and medium-sized ones not yet involved in the EC, must be on their guard against overly optimistic predictions of gain or incautious urgings to "get involved" in the EC.

It is often observed that for a firm to go global, size -- a "critical mass" -- is essential. If this is so, then the opportunities offered to small- and medium-sized Canadian telecommunications and computer sector firms by Europe 1992 would be few and far between. But the conclusion that size is essential overlooks the possibility that a firm, however small, with a specialized good or service that fills a niche, has something more than its product to sell. It is

literally in a position to "sell itself" to a larger, acquisition-minded firm. While selling out may not appeal to all entrepreneurs, it has its compensations in the form of substantial capital gains.[19] Moreover, the process creates an incentive to new entry by entrepreneurs with an idea worth developing -- and, if successful, a firm which in its turn is profitable to sell.

In sum, Europe 1992 is likely to offer opportunities to many Canadian firms, small as well as large. But it is not possible to confidently predict which firms stand to gain, although as the preceding section suggests, it is possible to outline the likely terms on which gain is possible.

SUMMARY AND CONCLUSIONS

Europe 1992 is part of a general restructuring of the world economy. Geopolitical, financial and technological factors are among the chief causes of world economic change. There are no more important technological developments than those taking place in telecommunications and microelectronics. Europe 1992 is in no small part an attempt to take advantage of these technological changes to both promote the further integration of Europe while boosting the world-wide role of European firms in an all-important high-technology field. This report has attempted to assess the likely impact of these developments for Canadian telecommunications and computer sector firms.

By breaking down its Member-State telecommunications monopolies, Europe 1992 is transforming the structure of those equipment industries serving suppliers and consumers of telecommunications services. What is likely to evolve is a European and world sector which resembles the current structure of the Canadian telecommunications equipment industry. Just as Northern Telecom, and to a lesser extent Mitel, dominate the Canadian telecommunications equipment industry, a few multinationally based telecom equipment firms will dominate European and world markets a decade hence. This process is already under way and is accelerating, in the EC, as is indicated by the number and importance of acquisitions and other corporate restructuring to date. In some subsectors such as central office equipment the initial stage of the process is almost complete. And just as a number of small- and medium-sized Canadian firms have developed to fill the many niches that are continually being created by new and dynamic telecom technology, so will literally thousands of small specialist firms fill niches left by, and feed the specialist needs of, the handful of world leading firms.

But it would be a mistake to picture the impact of Europe 1992 as that flowing purely from trade liberalization. In telecommunications and computer products markets where governments are the main buyers, Europe 1992 opens up intra-EC trade while leaving them largely closed to extra-EC trade. In markets where the private sector is the main purchaser, Europe 1992 leaves things much as they were, so far as extra-EC trade is concerned. If anything, Europe 1992 would indirectly reduce imports from extra-EC countries by reducing import substitution by those Community firms which become world-scale efficient as a result of the opening up of intra-EC trade. Thus from the standpoint of non-EC firms, Europe 1992 is biased more toward involvement in Europe than arms-length trade.

To make the most of the opportunities created by Europe 1992 even small- and medium-sized Canadian firms will have to take on, to some degree, a multinational character. In high-tech industries the opportunities for sales of goods and services abroad will require at least some investment abroad. Except where a local firm is simply producing components for a multinational manufacturer, telecommunications and computer sector firms wishing to sell abroad will need to have a foreign presence. For smaller firms such a presence involves risks and headaches -- risks and headaches many will not wish to undertake.

The decision of the EC to adopt ISDN as the future technology for European telecommunications is of great significance for firms supplying telecommunications products and services. First, the adoption of ISDN means there will be a degree of harmonization or standardization in future EC

telecommunications technology.[20] This implies that equipment markets will be less balkanized, more competitive and capable of supporting longer production runs at lower unit costs than they have in the past.

Second, by assuring the widespread use of a digital technology that allows the transmission of voice, data and image over the same line, the EC is opening up a myriad of niches for firms with innovative ideas on how to provide new services to telephone users. For example, ISDN facilitates the development of electronic banking, shopping and education. As a result, ISDN will create a plethora of new business opportunities for small firms who do not have the hundreds of millions of dollars of up-front funding required to develop a new switch. One Canadian firm which has already begun to use its expertise to develop networks that can take advantage of ISDN is Newbridge Networks.[21] There is little doubt that numerous other Canadian firms have the technological expertise and know-how to fill the niches that ISDN will create.

In meeting the challenge of Europe 1992, Canadian firms will have to take advantage of both scientific expertise and "time and place specific" knowledge. For most firms, success will reside in finding and filling appropriate niches. At the *industry* level little *structural* reorganization is anticipated. At the *firm* level reorganization may be very important. To find one's spot, it may be desirable, and in many cases, necessary to contemplate joint ventures, consortia and other means of spreading risks as well as responsibilities. These should be viewed as contractual aids to Canadian firms wishing to compete in a small but global way.

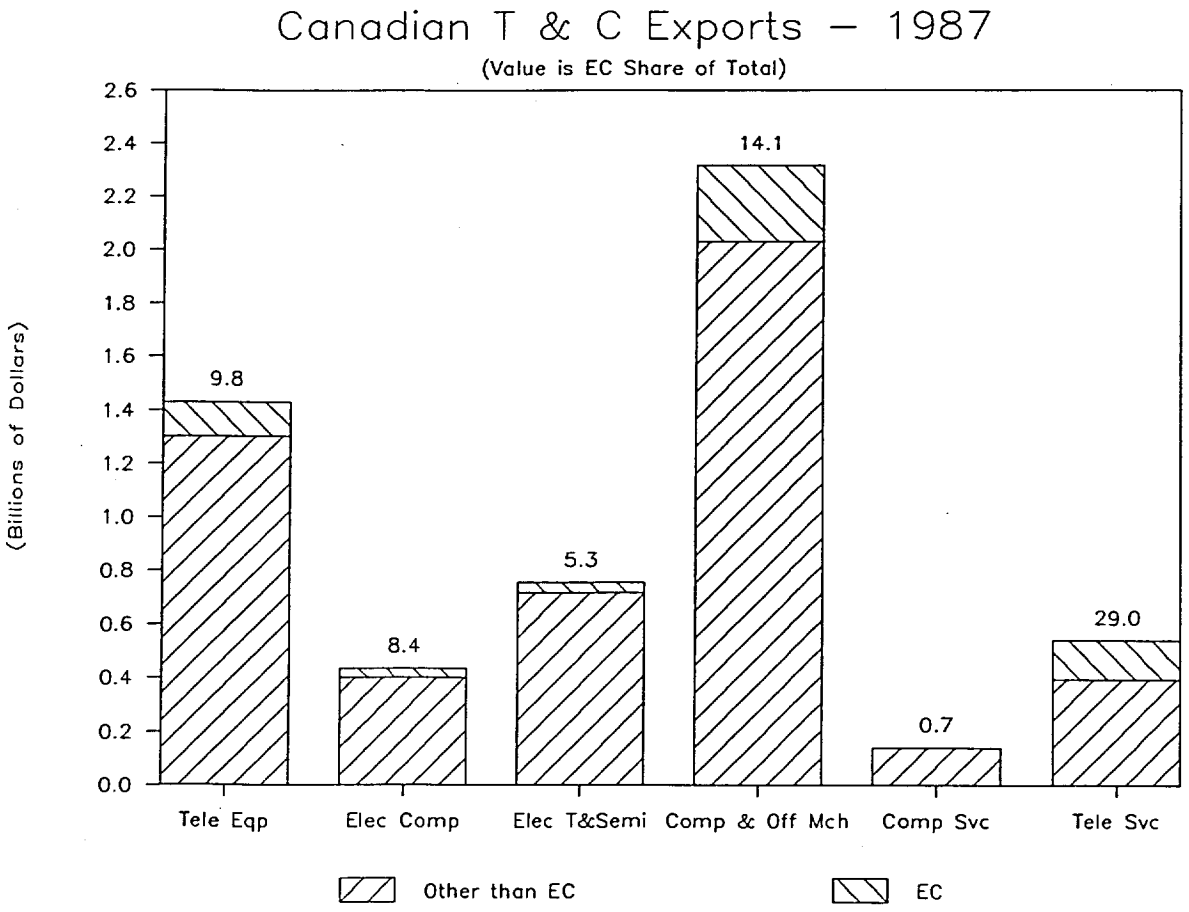
For many small, individually oriented high-tech firms such reorganizations may not be welcomed. In some cases inter-firm attachments may even be successfully avoided. But in most cases firms wishing to make sales abroad will have to become directly involved abroad too. When "abroad" means something more "foreign" than the U.S., it may well be wiser to join with others more familiar with the local scene. Doing so successfully may turn out to be one of the most important challenges faced by small- and medium-sized Canadian telecommunications and computer firms.

Europe 1992 is another test of Canada's capability and willingness to compete internationally. But unlike the Canada-U.S. Free Trade Agreement, which concentrated on trade issues, Europe 1992 is as much about investment or some other form of "presence" as it is trade -- at least for high-tech industries. An investment-starved, employment-lagging Europe, which spent much of the 1980s exporting capital to a savings-deficient U.S., will use Europe 1992 to attract capital as well as stimulate domestic investment in industries of the future. Telecommunications and computer-related industries are a major part of the EC future. How large a part will be played by Canadian firms depends not only on having high-quality products to sell (which Canada does) but a willingness to have a "presence" in Europe.

APPENDIX

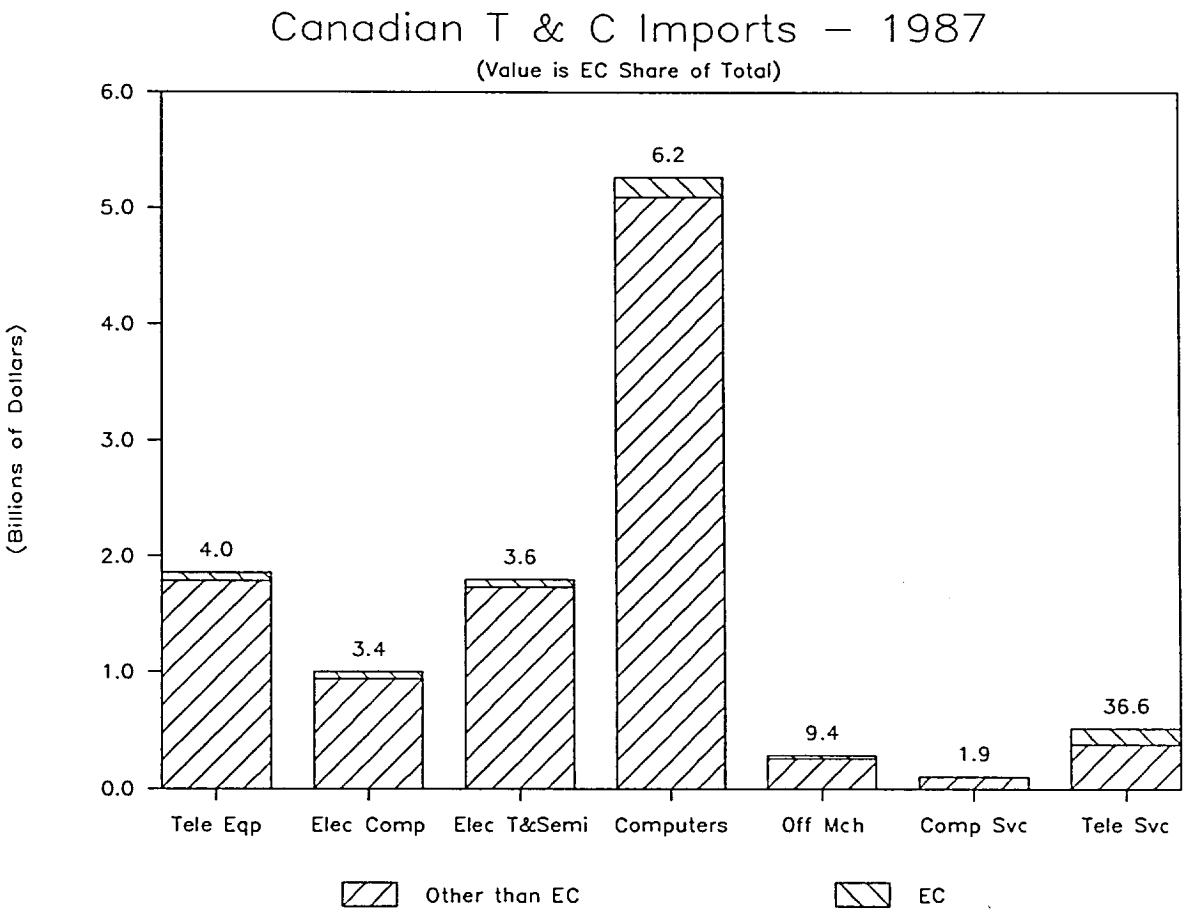
FIGURES AND TABLES

FIGURE 1



Source: Informetrica and Statistics Canada.

FIGURE 2

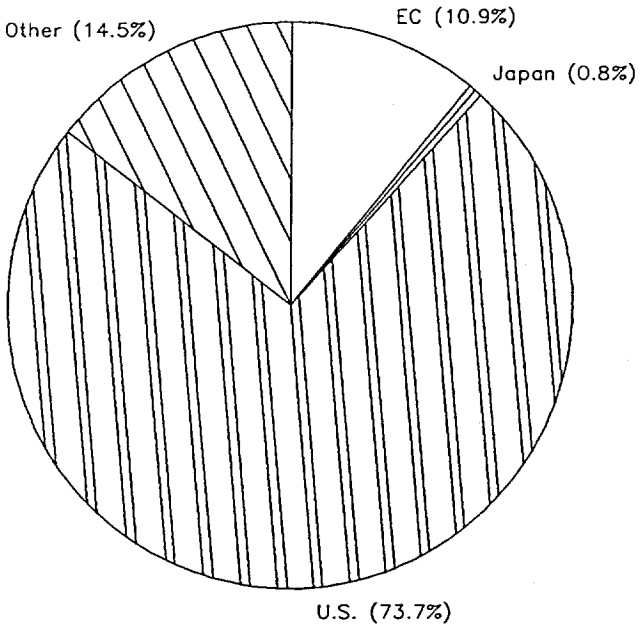


Source: Informetrica and Statistics Canada.

FIGURE 3

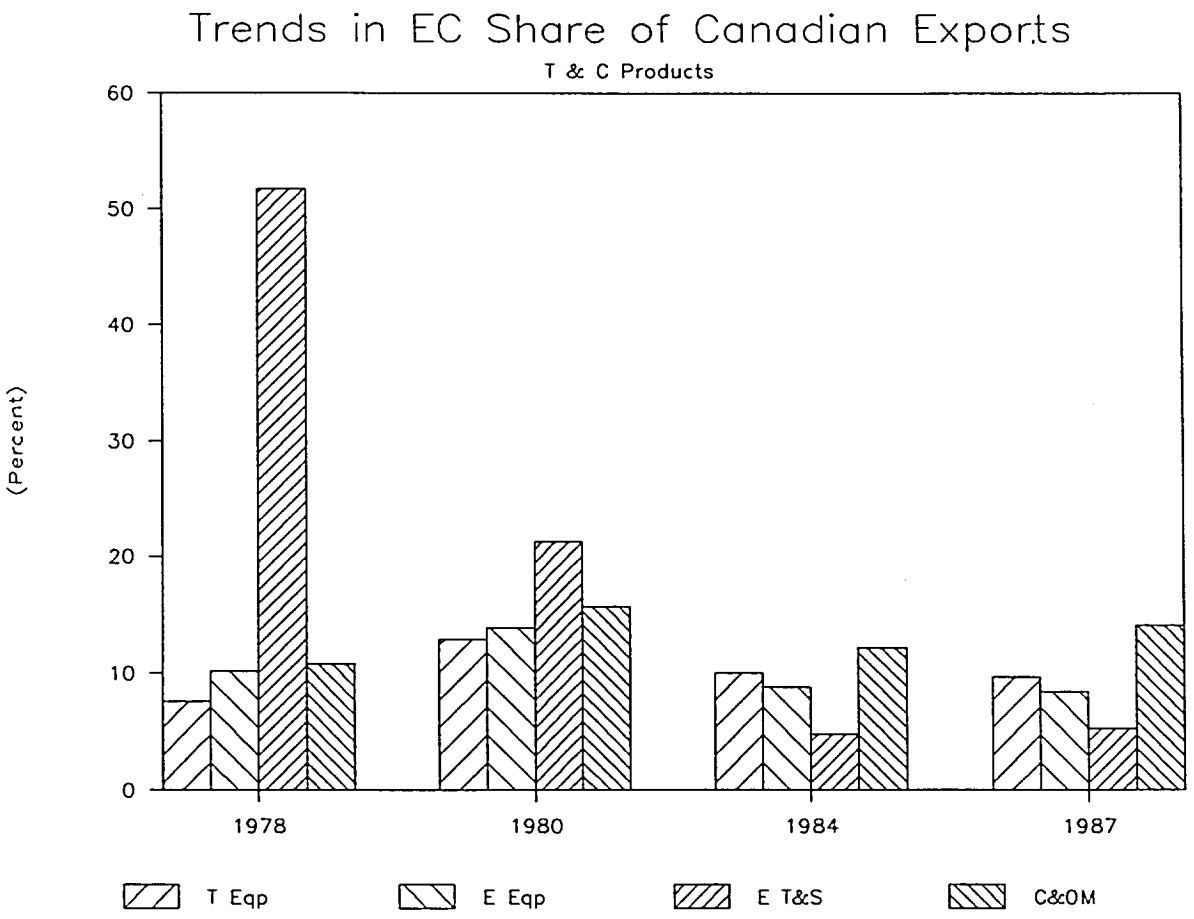
Canadian T & C Product Exports

1987



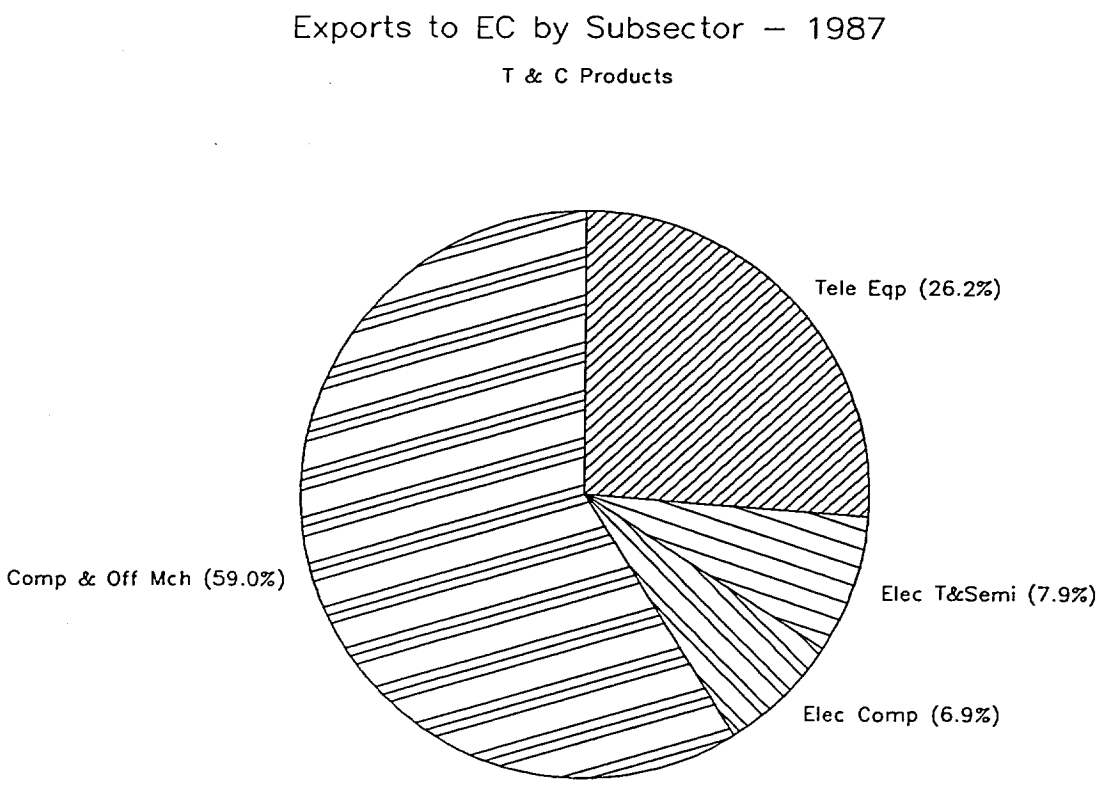
Source: Informetrica and Statistics Canada.

FIGURE 4



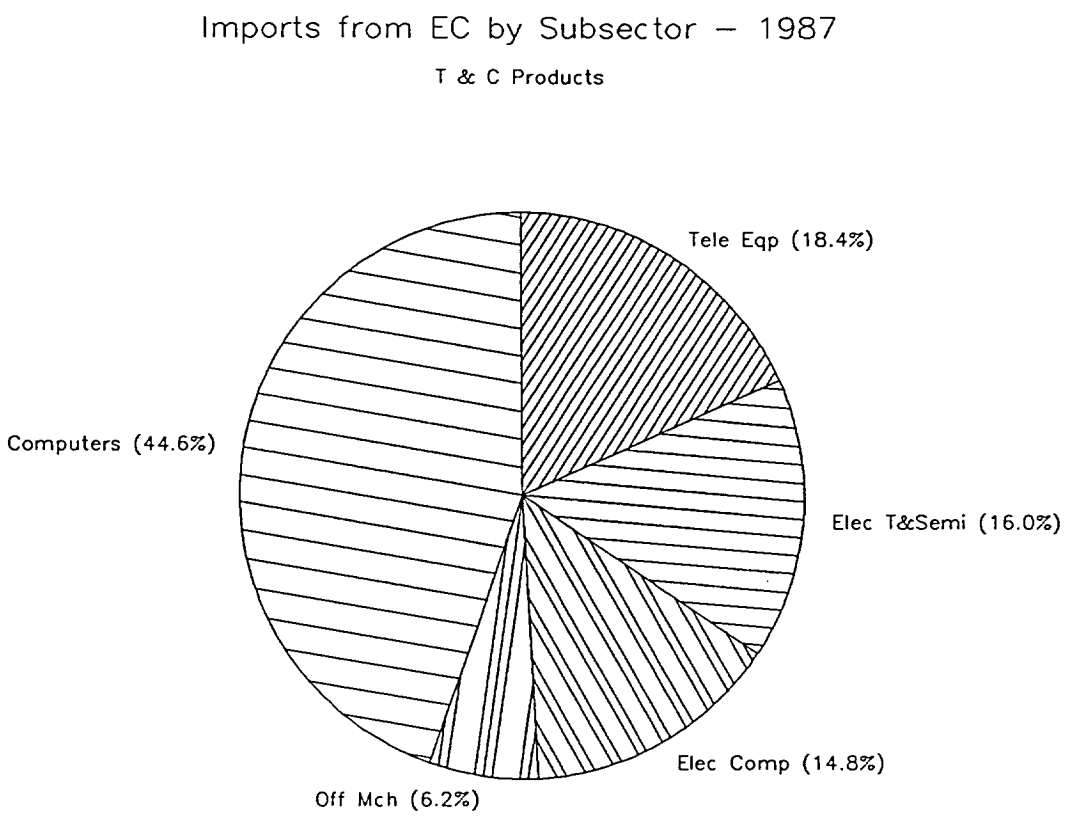
Source: Informetrica and Statistics Canada.

FIGURE 5



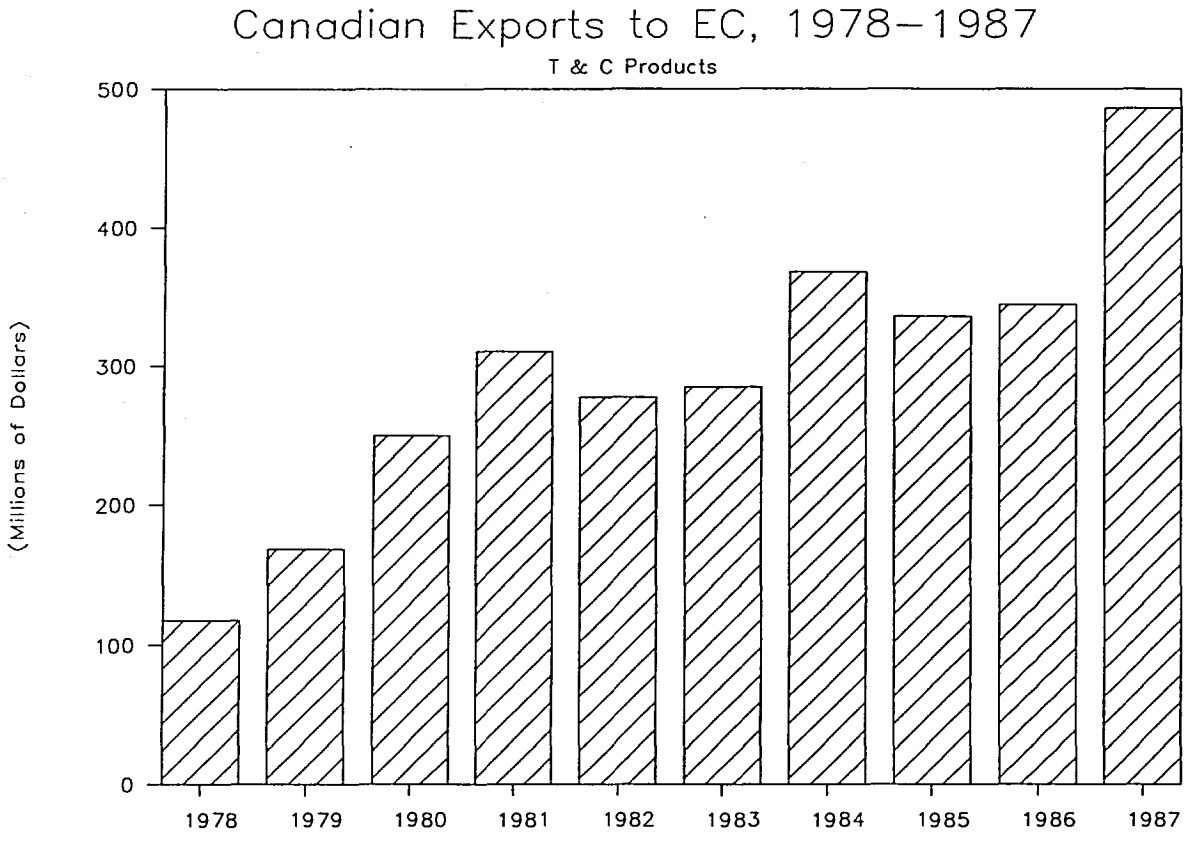
Source: Informetrica and Statistics Canada.

FIGURE 6



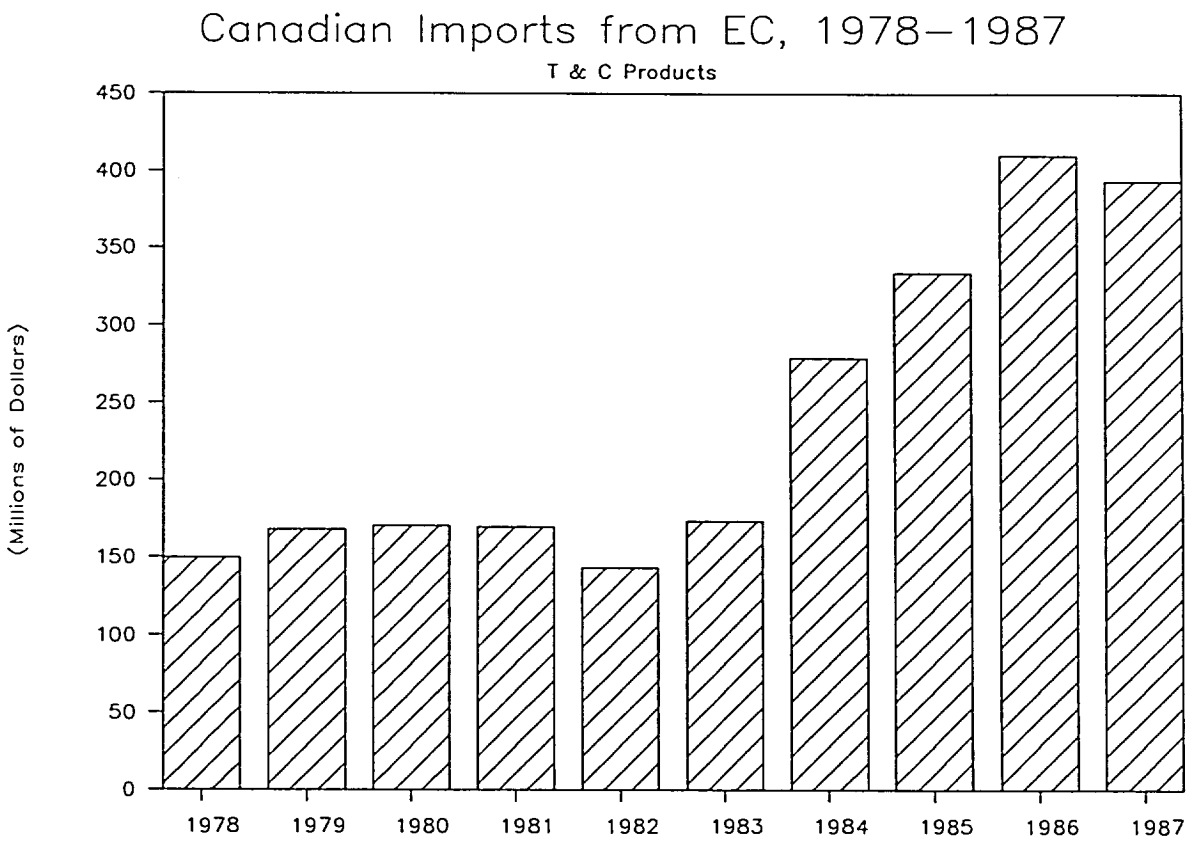
Source: Informetrica and Statistics Canada.

FIGURE 7



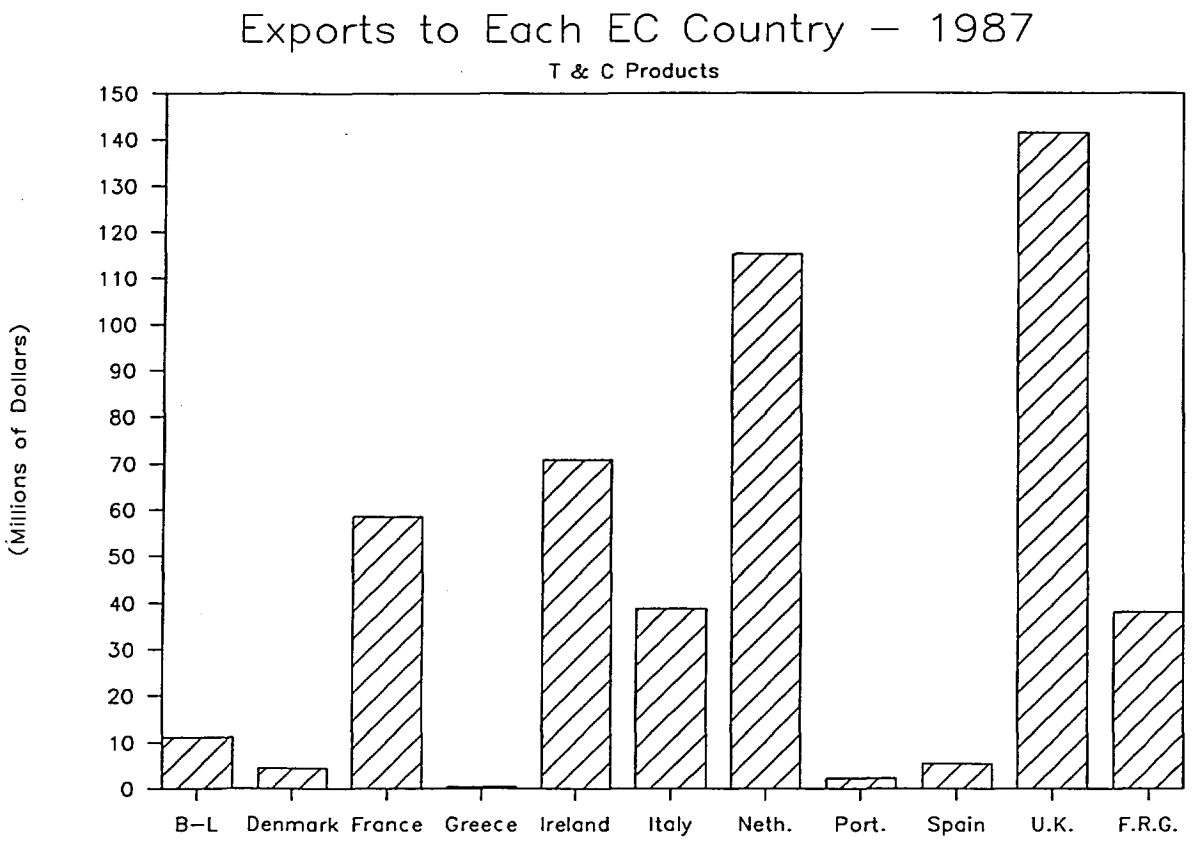
Source: Informetrica and Statistics Canada.

FIGURE 8



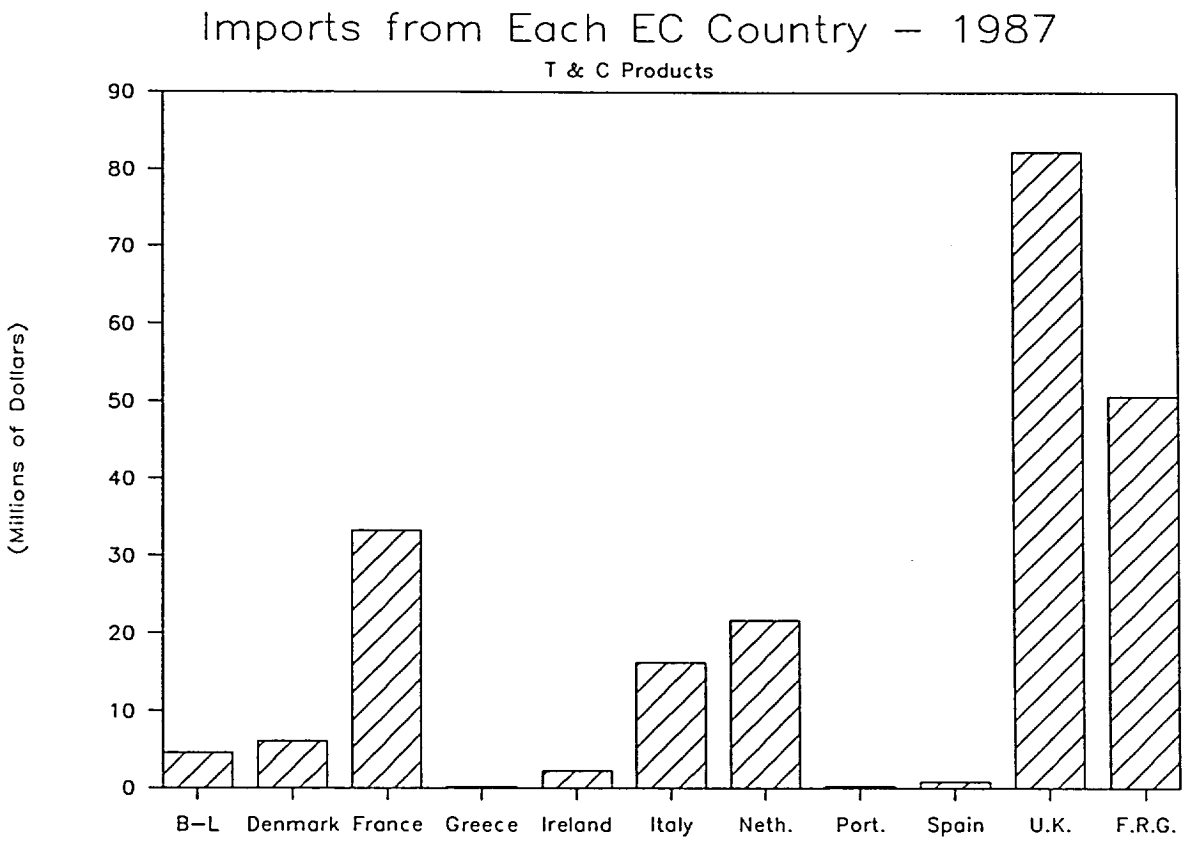
Source: Informetrica and Statistics Canada.

FIGURE 9



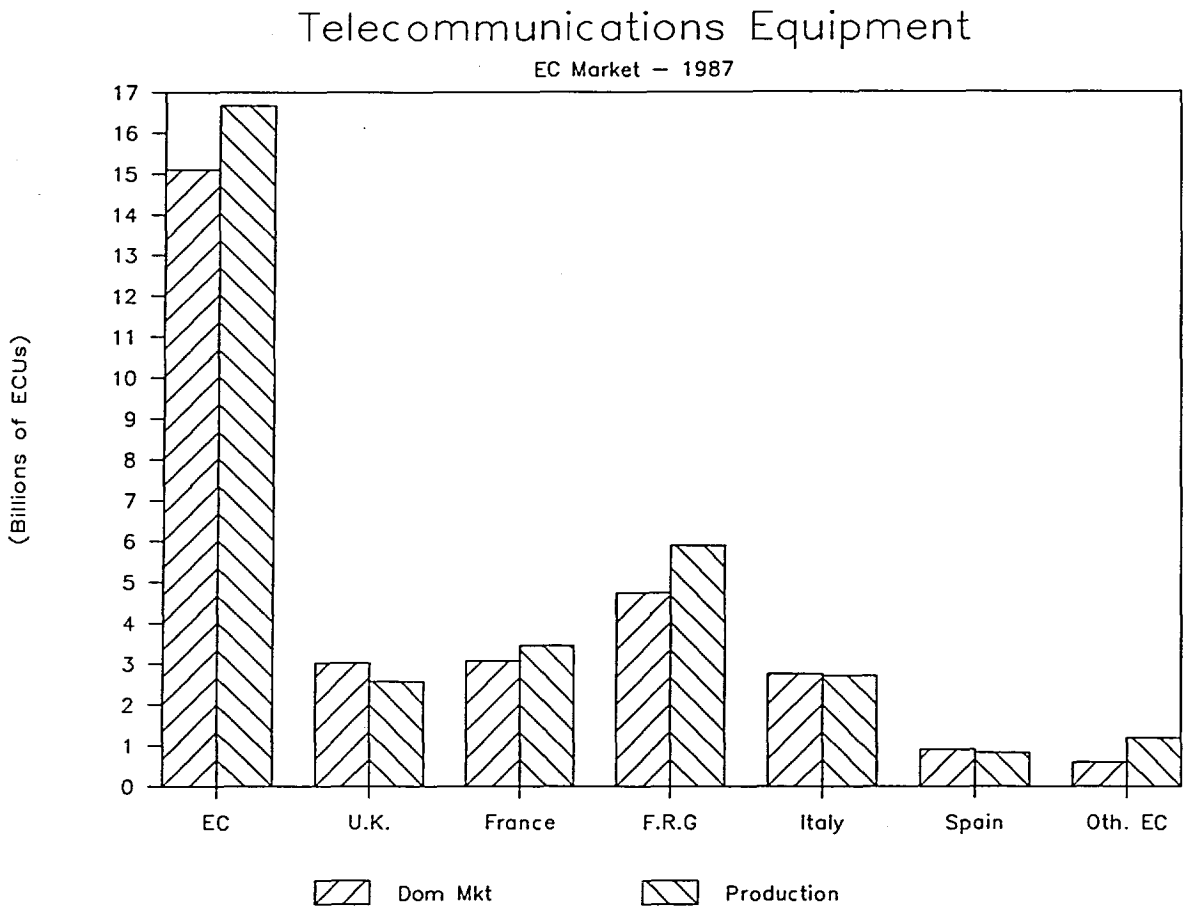
Source: Informetrica and Statistics Canada.

FIGURE 10



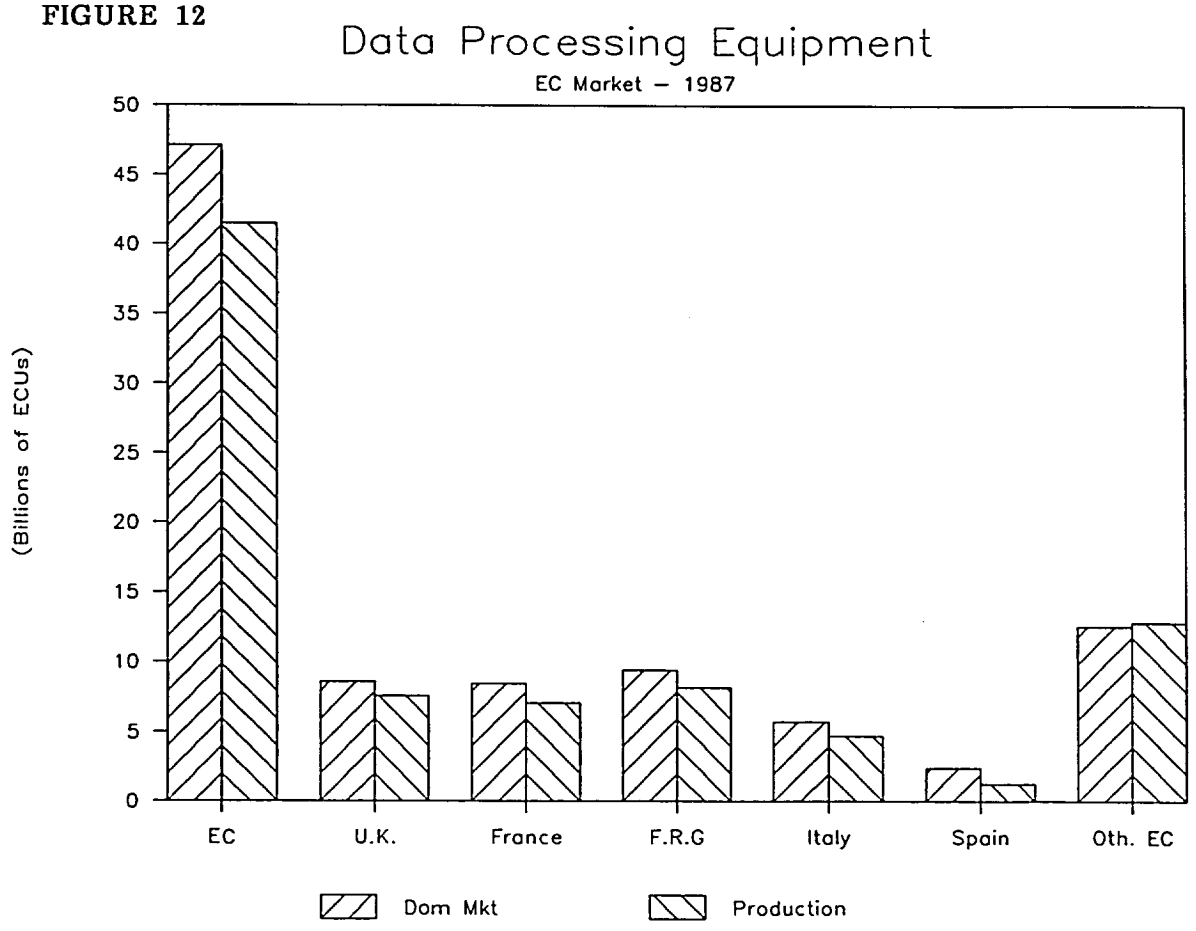
Source: Informetrica and Statistics Canada.

FIGURE 11



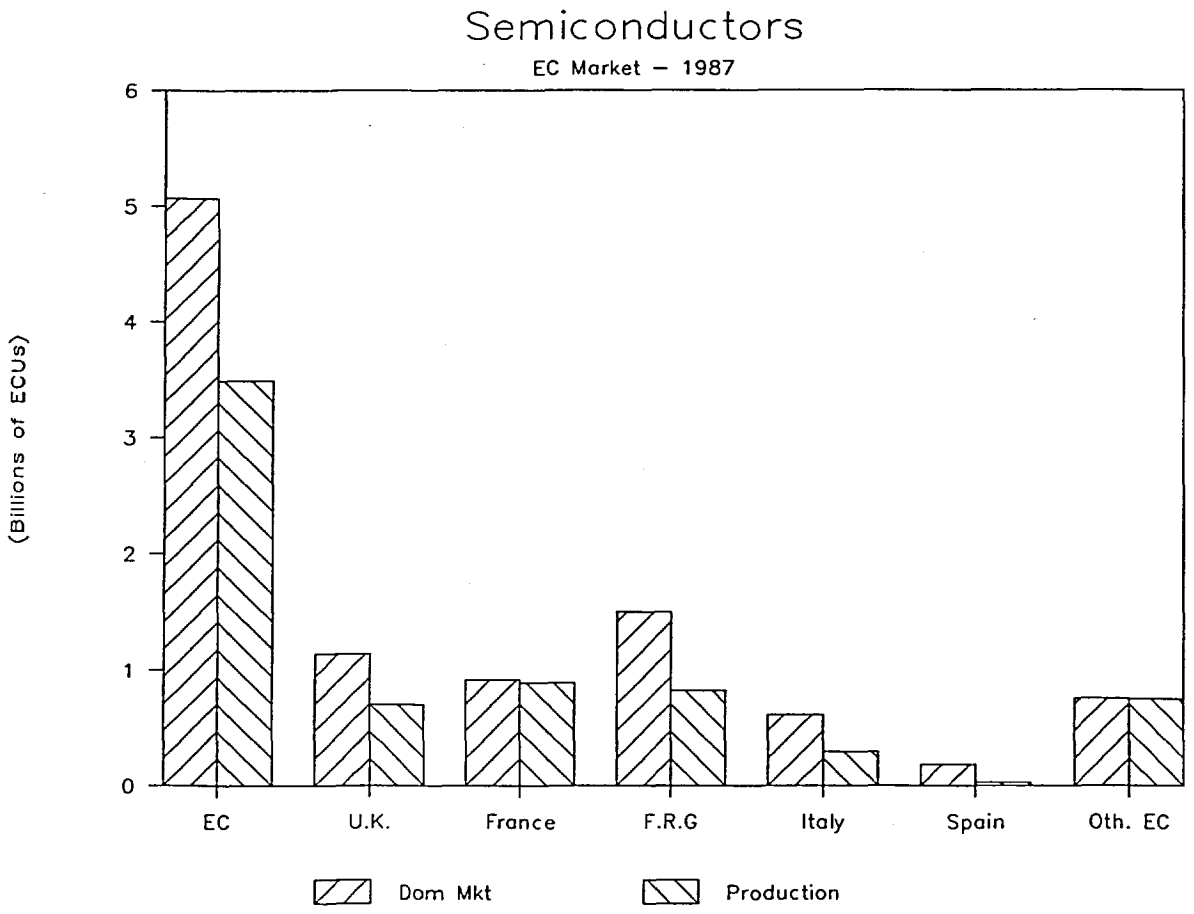
Source: See Table 6.

FIGURE 12



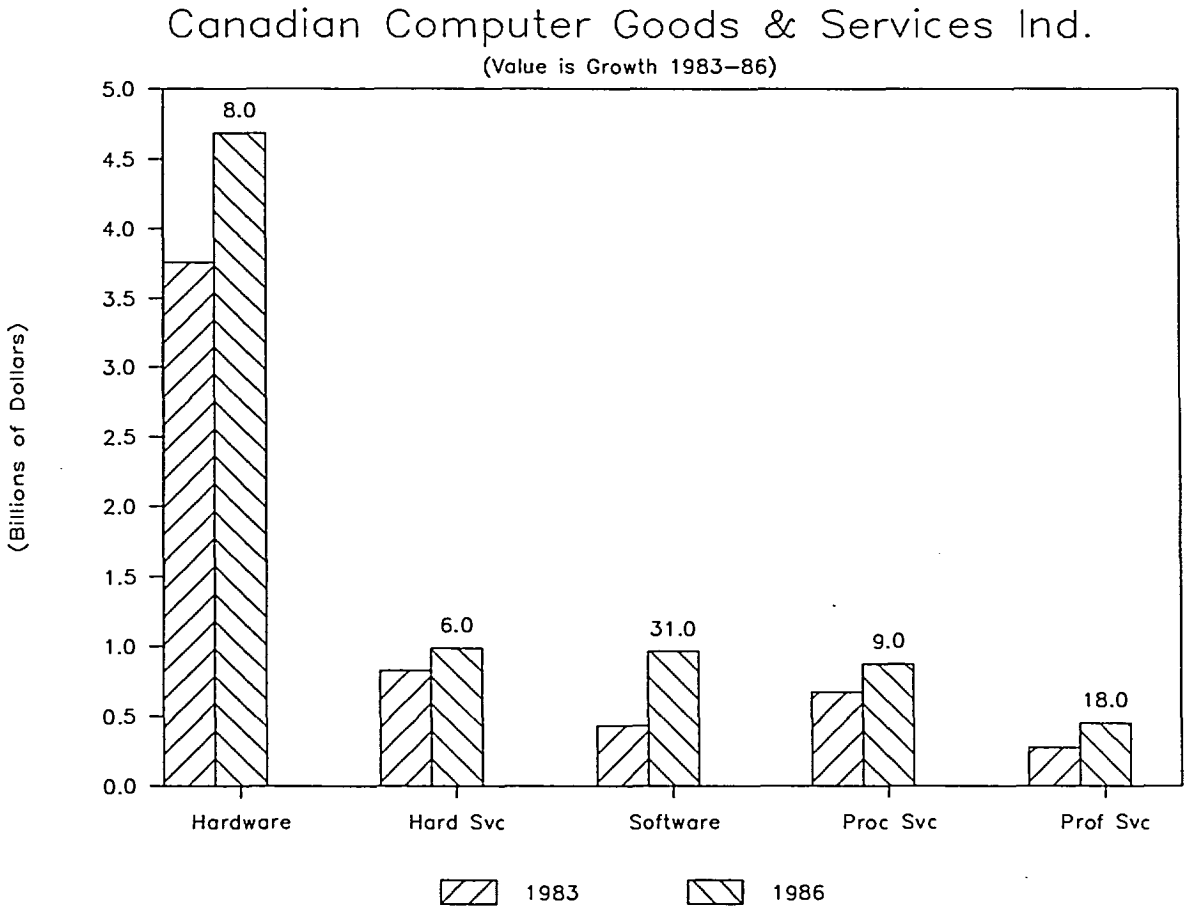
Source: See Table 6.

FIGURE 13



Source: See Table 6.

FIGURE 14



Source: See Table 15.

TABLE 1

Description of Canadian Telecommunications and Computer Sector, 1988[a]

	Communications Equipment and Electronic Components (SIC 335)	Computers, Peripherals and Business Machines (SIC 336)	Telecommunications Carriers (SIC 482)	Computer Services Industry (SIC 772)
Reporting units[a]	586	194	100	4 162
Employment	52 829	20 315	110 020	38 689
Shipments or revenue ($ millions)	5 484	2 706	12 246	3 160
R&D expenditures[a] ($ millions)	953	325	32	127
Total exports[b] ($ millions)	2 910	3 090	410	140[d]
Canadian market[c] ($ millions)	7 248	5 777	12 236	3 130
Imports ($ millions)	4 674	6 161	400	110[e]
Domestic exports,[g] as a % of shipments	47.6	98.4	3.3	4.4
Imports as a % of domestic market	64.5	106.6[b]	3.3	3.5
Number of major firms (Domestically owned)	6(4)	7(1)	7(7)	9(8)[f]

Source: ISTC *Information Technologies Industry Performance*, Statistical Summary, 1988, Aug. 1989 for SIC 335 and SIC 336; ITAC 1988 *Statistical Summary* for SIC 482 and SIC 772.

[a] Figures in last two columns are for 1987. The number of Reporting Units is supplied by Information Technology Association of Canada (ITAC) and figures are for 1987.
[b] Includes re-exports. Re-exports are also included in the import figures.
[c] Apparent Domestic Market. It is equal to shipments plus imports less total exports.
[d] Receipts from sales of computer services.
[e] Payments for purchases (from abroad) of computer services.
[f] Computer services firms. The incidence of foreign ownership is greater among computer software firms.
[g] Total exports less re-exports.

TABLE 2

Leading Telecommunications and Computer Firms in Canada, by Subsector

Telecommunications Equipment	Computer Hardware	Telecommunications Carriers	Computer Software and Services[c]
Northern Telecom	IBM[a]	Bell Canada	IBM[a]
Mitel[b]	Control Data[a]	B.C. Tel	Digital[a]
Motorola Canada[a]	Digital Equipment[a]	Alberta Government Telephones	Honeywell[a]
Microtel[d]	NCR[a]	Teleglobe	Cognos
Gandalf	Unisys[a]	Bell Cellular	Jonas and Erikson
NovAtel	Philips[a]	Cantel	STM Systems
	Hewlett Packard[a]		DMR Group
	Amdahl[a]		IST (Société de services informatiques)
	Xerox[a]		B.C. Systems
	Gandalf		SHL Systemhouse
	GEAC		
	Electrohome		
	Memotec		

Sources: ISTC Industry Profiles; Ontario, *Competing in the New Global Economy*, Report of the Premier's Council, Industry Studies, Vol. II, Ch. IX.

a Foreign owned.
b Jointly owned, Canada and U.K.
c The first five listed are software firms; the last five are services (professional) firms.
d Recently purchased by Northern Telecom from its U.S. owner, GTE.

TABLE 3

Canadian Trade in Telecommunications and Computer Goods and Services, 1987[a] (millions of Cdn dollars)

	Total		EC of 12		EC as Per Cent of Total	
	Exports	Imports	Exports	Imports	Exports	Imports
Telecommunications Equipment	1 303.0	1 788.9	127.6	72.4	9.8	4.0
Electronic and Related Equipment Components	400.8	942.4	33.7	58.3	8.4	3.4
Electronic Tubes and Semiconductors	716.6	1 731.4	38.3	63.1	5.3	3.6
Computers and Parts	2 031.3[c]	5 093.2	286.8[c]	175.6	14.1[c]	6.2
Office Machinery		262.4		24.6		9.4
Computer Services	139.0	106.0	1.0	2.0	0.7	1.9
Telecommunications Services[b]	394.0	380.0	114.0	139.0	29.0	36.6

Source: Informetrica and Statistics Canada.

a Although data for 1988 are now available, they are based on a new trade classification not easily comparable with previous years. Therefore the decision was taken to use 1987 trade figures.

b For 1986.

c Includes Office Machinery.

TABLE 4

Per Cent Distribution of Canadian Exports of Telecommunications and Computer Products

Year	Telecommunications Equipment			Computers and Office Equipment			Consumer Electronics		
	U.S.	EC	Other	U.S.	EC	Other	U.S.	EC	Other
1982	55	12	33	72	16	12	74	24	2
1984	62	10	28	73	17	9	97	1	2
1986	62	7	31	75	16	9	96	4	0

Source: ISTC, Industry Profiles 3029, 3065, 3090; Ottawa, 1988.

TABLE 5

Per Cent Distribution of Canadian Exports of Telecommunications and Computer Goods to EC, by Importing Country, 1987[a]

	U.K.	Irl.	Belg.-Lux.	Den.	France	F.R.G.	Greece	Italy	Neth.	Port.	Spain	TOTAL
Telecommunications Equipment	43.7	23.2	3.8	0.4	2.0	7.0	0.1	12.3	5.0	0.5	0.9	100.0
Electronic and Related Equipment Components	52.2	3.0	3.9	1.5	8.9	14.5	0	9.2	4.1	0.9	1.8	100.0
Electronic Tubes and Semiconductors	25.8	0	0	0	69.7	2.6	0	1.6	0	0	0	100.0
Office Machinery	20.3	14.0	1.7	1.1	9.2	7.7	0.1	6.7	37.4	0.5	1.3	100.0

Source: Informetrica.

[a] See note "a" to Table 3.

TABLE 6

Magnitude of EC Market for Telecommunications and Computer Products (millions of ECUs)

	1987					
	Telecommunications Equipment		Data Processing Equipment		Semiconductors	
	Domestic Market	Production	Domestic Market	Production	Domestic Market	Production
EC Total	15 110	16 680	47 100	41 500	5 070	3 490
U.K.	3 030	2 571	8 571	7 571	1 141	700
France	3 076	3 456	8 442	7 056	918	889
F.R.G.	4 734	5 894	9 421	8 164	1 499	821
Italy	2 760	2 721	5 699	4 677	615	297
Spain	921	844	2 384	1 231	187	27
Other EC	589	1 194	12 538	12 801	760	756

Source: BIPE (France-Paris), IFO-INSTITUTE (Brd-Munchen), PROMETIA (Italia-Bologna), *Europe in 1993: Economic Outlook by Sector*, January 1989.

TABLE 7

Production to Internal Market Ratio for Telecommunications and Computer Products, Selected EC Members, 1987

	U.K.	France	F.R.G.	Italy	Spain
Telecommunications Equipment	86	112	117	99	92
Data Processing Equipment	88	84	89	91	52
Semiconductors	61	97	60	73	14
Consumer Electronics	40	45	100	42	50

Source: BIPE (France-Paris), IFO-INSTITUTE (Brd Munchen), PROMETIA (Italia-Bologna) *Social and Economic Impact of 1992*, p. 75.

TABLE 8

EC Telecommunications Equipment Trade with Extra-EC in 1988 (millions of ECUs)

	U.S.	Japan	EFTA	Southeast Asia	Rest of World	Total
Exports	412	51	1 038	186	2 095	3 782
Imports	819	1 220	950	342	355	3 686
Balance	-408	-1 169	88	-156	1 740	95

Source: Commission of the European Communities, *Intra-EC and Extra-EC Trade Flows in Telecommunications Equipment in 1988*, XIII/208 (89)-EN, Table 1, p. 6.

TABLE 9

EC Telecommunications Equipment Balance of Trade with Extra-EC by Type of Equipment, 1988 (millions of ECUs)

	France	Belg.-Lux.	Neth.	F.R.G.	Italy	U.K.	Irl.	Den.	Greece[a]	Port.	Spain	EC
Switching	66	-4	49	13	-9	-64	7	-1	-2	-4	-9	44
Transmission	68	2	-27	478	2	-58	-9	5	-1	-4	-14	442
Radio-related	53	0	-2	16	-8	-10	-1	-1	0	-1	-9	38
Components	66	-2	-13	14	-13	-11	1	-8	-2	1	-14	18
Terminals	186	88	-267	83	-78	-404	34	-15	-22	-13	-40	-447
Total	439	83	-260	605	-107	-546	32	-19	-27	-20	-86	95

Source: Same as Table 8.

[a] Estimate based on the period January-April 1988.

TABLE 10

World Leaders in Telecommunications and Computers, by Subsector

Rank (1987)	Telecommunications Equipment	Data Processing Equipment	Semiconductors
1	AT&T (U.S.)	IBM (U.S.)	NEC (J)
2	Alcatel NV (EC)	DEC (U.S.)	Toshiba (J)
3	Siemens (EC)	Unisys (U.S.)	Hitachi (J)
4	NEC (J)	Fujitsu (J)	Motorola (U.S.)
5	Northern Telecom (C)	NEC (J)	Texas Instruments (U.S.)
6	Motorola (U.S.)	Hitachi (J)	Fujitsu (J)
7	Ericsson (Sw)	Siemens (EC)	Philips-Signetics (EC)
8	IBM (U.S.)	NCR (U.S.)	Intel (U.S.)
9	Fujitsu (J)	Hewlett Packard (U.S.)	Mitsubishi (J)
10	GPT (EC)	Olivetti (EC)	Matsushita (J)
11		Toshiba (J)	National/Fairchild (U.S.)
12		Wang (U.S.)	AMD/MMI (U.S.)
13		Apple Computer (U.S.)	SGS Thomson
14		Groupe Bull (EC)	Sanyo (J)
15		Control Data (U.S.)	Oki (J)
16		Nixdorf Computer (EC)	
17		Matsushita (J)	
18		Philips (EC)	
19		Xerox (U.S.)	
20		STC plc (EC)	

Source: Same as Table 6.

TABLE 11

Leading Firms in EC Telecommunications Markets

	Major Classes of Equipment		
	Central Office	Customer Premises	Transmission
Ericsson	x	x	x
GTE	x	x	
Alcatel	x	x	x
Philips	x[a]	x	x
Siemens	x	x	x
Northern Telecom	x	x	
IBM		x	
Marconi			x
TIE		x	
Average number of leading suppliers per EC member country	2.4	4.7	3.4
Average number of other suppliers	-	3.3	1.5
Importance of economies of scale	Very important	Not very important	Moderately important

Source: INSEAD *The Benefits of Completing the Internal Market for Telecommunications Equipment in the Community*, April 1988, pp. 4-7.

[a] With AT&T.

TABLE 12

Importance of Europe-1992 Liberalizations to Trade, by Nature of Existing Barrier

	Elim. of Explicit or Implicit TA Monopoly Positions	Harmonization of Standards[a]	Reduced Border Control	Greater Transparency and Openness in Procurement
Telecommunications Equipment	X	XX	X	XX
Computers and Parts		X		X
Electronic Tubes and Semiconductors			X	
Electronic and Related Equipment Components		XX	X	X
Office Machinery		X	X	
Computer Services				
Telecommunications Services				
Basic or "Reserved"	XX[b]	X		X
Competitive or "Value-Added"				

X 1992 changes will have an effect.

XX 1992 changes will have a pronounced effect.

[a] Guaranteeing Community-wide compatibility via legislative harmonization, transparency and mutual recognition of testing and certification practices.

[b] It is not clear whether this will apply to "third parties," i.e., non-EC countries, particularly those that fail to grant EC members "reciprocity."

TABLE 13

The Restructuring Response to Europe 1992

Leading Informatic Firms in Europe Who Have Restructured Operations	Recent Acquisitions, Investments and Joint Undertakings Contributing to Formation, Where Applicable
Alcatel NV	Formed by CGE (50 per cent) and ITT (37 per cent) in 1986
Siemens	Took over GCE's continental subsidiaries in 1986. In 1988, purchased Rohm, the telecom subsidiary of IBM
GPT	Formed by GEC (50 per cent) and Plessey (50 per cent) in 1988
Ital Tel	Joint venture with AT&T in which the latter acquired 25 per cent share in 1989
Philips	Co-operates with AT&T in APT (AT&T Philips Telecommunications. In 1989 the name was changed to AT&T Network Systems)
STC plc	Northern Telecom acquired, in 1987, a 27.5 per cent stake in STC plc

TABLE 14

All Cross-Border Acquisitions of EC Firms, 1984-87

Location of Buyer	1984	1985	1986	1987	Ratio of Number of Acquirers to Number of Acquired Firms in 1987
EC Member State Corporate Acquisitions					
Belgium/Luxembourg	0[a]	20	13	13	.34
Denmark	12	16	19	11	.92
France	29	36	75	121	1.19
Italy	9	14	23	41	.80
Netherlands	35	40	57	80	2.29
Spain	7	17	16	15	.30
U.K.	68	76	92	142	2.29
West Germany	49	31	68	72	.58
Acquisitions by Non-EC Corporations					
Norway, Sweden, Finland	46	96	41	81	
Austria, Switzerland	36	52	76	93	
U.S., Canada	151	172	143	160	
Other (including Japan)	38	66	74	88	
Total	480	636	697	917	

Source: *Acquisitions Monthly*, Tudor House Publications, E. Peckam, Kent, U.K.

[a] There were 11 firms acquired.

TABLE 15

Canadian Computer Goods and Services Industry Growth, by Segment, 1983-86
($ millions)

	1983 Revenue	1986 Revenue	1983-86 Compound Growth Rate
Hardware Sales, Lease, Rental	$3 756	$4 685	8%
Hardware Maintenance	825	988	6%
Packaged Software	431	963	31%
Processing Services	668	873	9%
Professional Services	272	449	18%
Total Revenues	$5 952	$7 958	10%

Source: International Data Corporation, 1987 Reports.

TABLE 16

World Market for Value-Added Network Services
(millions of U.S. dollars)

	1988	1995 (estimate)
U.K.	830	2 500
France	324	2 070
F.R.G.	309	1 545
Rest of Europe	613	3 701
U.S.	5 963	20 269
Japan	1 700	9 150
World	9 739	39 172

Source: *Financial Times* (London), July 19, 1989.

NOTES

1. An important question is whether non-EC based firms will be allowed to compete on an equal basis with EC based firms.

2. However, even the equipment distinctions are somewhat arbitrary, the boundaries between categories progressively blurred by rapid technological changes.

3. European Commission, *The Economics of 1992* (Cecchini Report), p. 17.

4. EC, Green Paper, p. 45.

5. Cecchini Report, p. 51.

6. Cecchini Report, pp. 53-54.

7. For example, one of AT&T's Western Electric plants in the U.S. has the capacity to produce seven million access lines per annum compared to a total demand of less than one million access lines per annum in some large European countries. European sales of PBXs per country are still small enough to result in a cost disadvantage of up to 20 or 30 per cent, when plant output is limited to the national market. INSEAD, *The Benefits of Completing the Internal Market for Telecommunications Equipment in the Community*, April 1988.

8. Cecchini Report, Table 6.1.1, p. 109.

9. These figures are complemented by national spending on R&D and private expenditures by firms. EC-sponsored funding of R&D is estimated to amount to only 6 or 7 per cent of total public funding of R&D in the European Community.

10. This raises an important policy question, that is beyond the scope of this report. Should Canada establish similar scientific and technological support programs? An alternative to R&D subsidies are more liberal rules regarding the magnitude and rapidity of R&D write-offs for tax purposes.

11. Nevertheless, indigenous Canadian computer firms have had some success in product niches such as terminals and word processors. A good example is Gandalf, which developed a niche in the supply of modems. See ISTC, Industry Profile: Computers and Office Equipment. However, most Canadian-owned computer hardware firms are now supplying, often via long-term contract, components to the major, multinationally oriented original equipment manufacturers. An example is B.C.-based Comptec International, which ships keyboard parts to factories in Korea, Taiwan, Singapore and other southeast Asian as well as to many European countries. Comptec also supplies U.S.-based Digital Equipment Corporation and has a plant in France. *Financial Post*, May 29, 1989, p. S12.

12. *Financial Post*, May 22, 1989, p. 44; July 27, p. 10.

13. The industry giant, Northern Telecom, devoted 13 per cent of its 1988 sales of US$5.47 billion (C$6.4 billion) to R&D.

14. The foundation for the development of ISDN in Canada has been laid by the widespread application of digital technology to Canada's telecommunications network. The implementation of ISDN in Canada is the subject of a recent report to the Department of Communications by a high level private sector advisory committee chaired by John Lawrence. See Communications Canada, *ISDN Canada: Report on ISDN Implementation in Canada*, March 1989. For a more technical discussion of ISDN and the contribution of Canadian firms to the development of the requisite technology see K. Chang and F. Leger, "The Development of ISDN Technology in Canada," *Americus Telecom Proceedings*, International Telecommunications Union (ITU), 1988, pp. 71-75.

15. Cecchini Report, p. 114.

16. The basic ideas employed here are drawn from David R. Ross, "Learning to Dominate," *Journal of Industrial Economics*, June 1986, pp. 337-354, and P. Dasgupta and J. Stiglitz, "Learning-by-Doing, Market Structure, and Industrial and Trade Policies," *Oxford Economic Papers*, vol. 40, 1988, pp. 246-268.

17. *Financial Times*, June 1, 2, 28, 1989.

18. Much will depend on the nature and applicability of the laws relating to intellectual property.

19. Even the individualistic-minded entrepreneur who does not want to work for someone else, still has the option of starting a new firm after sale of the preceding one. However, where the sale is to a foreign firm, there is the added problem that the sale may be distasteful to government policy makers wishing to maintain Canadian ownership, especially where foreign suppliers are already dominant. Nevertheless, an important determinant of whether a firm will enter an industry is its perceived ability to freely sell out at a favourable time and price.

20. However, ISDN does not eliminate all opportunities for national "creativity" designed to provide a degree of protection to national equipment suppliers. The choice of standard on which an ISDN network operates could be used to limit market access to a relatively few suppliers. However, the EC is building a common standard, which even if different from that in North America, nevertheless creates opportunities for non-EC firms that wish to enter into what will be a very large market.

21. *Financial Post*, September 13, 1989, p. 20.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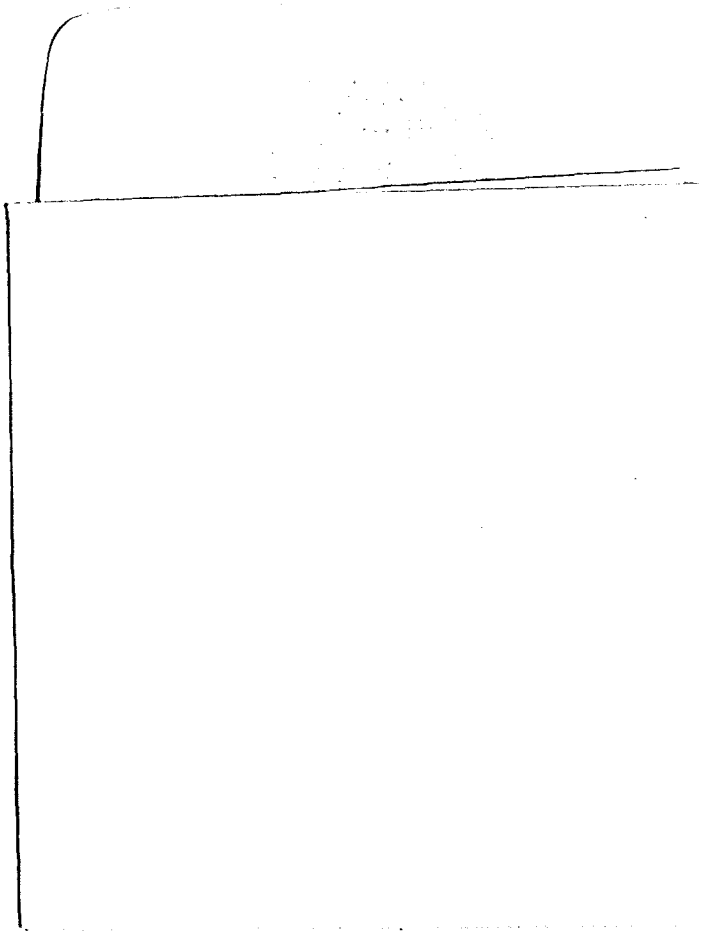

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