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Please cite this paper as:

OECD (1991-06-01), "Telecommunications Equipment: Changing Markets and Trade Structures, No. 24", *OECD Digital Economy Papers*, No. 3, OECD Publishing, Paris.
http://dx.doi.org/10.1787/237688077786

OECD Digital Economy Papers No. 3

Telecommunications Equipment

CHANGING MARKETS AND TRADE STRUCTURES, NO. 24

OECD

INFORMATION COMPUTER COMMUNICATIONS POLICY

24

TELECOMMUNICATIONS EQUIPMENT: CHANGING MARKETS AND TRADE STRUCTURES

OECD

PARIS 1991

INFORMATION COMPUTER COMMUNICATIONS POLICY

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TELECOMMUNICATIONS EQUIPMENT: CHANGING MARKETS AND TRADE STRUCTURES

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Publié en français sous le titre :

LES ÉQUIPEMENTS DE TÉLÉCOMMUNICATIONS :
TRANSFORMATION DES MARCHÉS
ET DES STRUCTURES DES ÉCHANGES

FOREWORD

This report was prepared in the context of the Organisation's work on the interaction of trade and telecommunications equipment. The report was first discussed by the Working Party on Telecommunications and Information Services Policy in June 1990. The Committee on Information Computer and Communications Policy recommended in October 1990 that the report be made available to the general public.

The report was written by Dimitri Ypsilanti of the Secretariat with Amy Plantin, a consulting analyst for the OECD's Science, Technology and Industry Directorate. It is published on the responsibility of the Secretary-General.

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AT&T	American Telegraph and Telephone – Public Telecommunication Operator (USA)
AXE	Ericsson Family of Public Exchange Switches
CAGR	Compound Annual Growth Rate
CPE	Customer Premise Equipment
ECL	Electronics Communications Laboratory (Japan)
EEC	European Economic Community
ETSI	European Telecommunications Standards Institute
NET	European Telecommunication Standard
NIE	Newly Industrialised Economies
NTT	Nippon Telegraph and Telephone – Public Telecommunication Operator (Japan)
OECD	Organisation for Economic Co-operation and Development (24 Member countries)
OPEC	Organisation of Petroleum Exporting Countries
PBX	Private Branch Exchange (also PABX, Private Automatic Branch Exchange)
PTO	Public Telecommunication Operator
RACE	Research on Advanced Communications in Europe
R&D	Research and Development
RBOC	Regional Bell Operating Companies (or baby bells). A term used to describe the regional telecommunications companies formed in the US after the divestiture of AT&T. More correctly, the seven main companies should be referred to as Regional Bell Holding Companies to which the 22 individual RBOCs belong.
SCT	Secretariat for Communications and Transport – Public Telecommunication Operator (Mexico)
SDR	Special Drawing Rights
TELMEX	Public Telecommunication Operator (Mexico)
TRAC	Technical Recommendations on Applications Committee

I. BACKGROUND

1. Introduction

The telecommunications industry is both a provider of services and a manufacturer of equipment used in the service infrastructure. Telecommunications is already a global industry interconnecting the world in a web of networks and contributing to a significant part of OECD economic activity. The industry is also an important link in support of international trade in goods and services. Over the last decade the industry has slowly embarked on a process of change – a process which has accelerated in the last few years. Changes taking place are altering the industry's role from that of a public utility providing simple telephony, to an industry responsible for creating a range of new service activities and products, an industry which is providing a product increasingly viewed as a key factor in international competitiveness and productivity, and an industry which has the potential to alter economic and social patterns of interaction.

Telecommunications plays a major role in the changes, already evident, which are shifting economic structures in the OECD toward an information economy. The foundations of these new economic structures will be based on communications networks, telecommunications equipment and information services. Recognising this, many corporations have taken strategic decisions increasing their involvement in telecommunications-led developments.

Governments have responded in varying degrees to the strategic importance of telecommunications. As a result, the philosophical homogeneity which in the past characterised the OECD telecommunications services market has all but crumbled. Increasing differences in national telecommunication services market structures are reflected in differences in market access for services and equipment and in the increasing number of international issues and debates revolving around telecommunications.

The monopoly-liberalisation question has been the cornerstone of these debates, but it must be recognised that arguments are usually more nuanced. Even in countries which have deregulated there is a recognition that some regulations need to remain, in order to ensure fair competition, and may be required in order to preserve economic and social concepts such as universal service.

One of the main international issues which has arisen from changes in telecommunications market structures has been in the area of trade in equipment. The ability to set up new services is often based on the ability to obtain and interconnect appropriate equipment and equipment imports are often dependent on domestic service market regulations. Unilateral changes in service market structures which have led to the opening of such markets to

competition have also stimulated trade in equipment and have led to bilateral pressures to open telecommunications markets for terminal equipment and services.

It is widely recognised that domestic telecommunications policies play a primary role in influencing the pattern and growth in demand for equipment and, as a result, equipment trade. Further, the emphasis given by some countries in promoting their domestic telecommunications equipment industry – directly and indirectly – has obvious implications for trade in equipment. The fact that international commercial relations in the telecommunications equipment industry reflect a wide range of domestic policy measures including regulatory and institutional frameworks governing telecommunications services, industrial policy initiatives and direct or indirect trade measures, complicates any analysis of trade in equipment. The changes in telecommunications equipment market structures and the factors behind these changes will be briefly examined in Part II of this report. Part III provides an examination of international trade in telecommunications equipment.

2. Growth in service markets

Most of the OECD Member countries have experienced significant growth in their telecommunications systems throughout the seventies and eighties. Tables 1 to 4 in the Annex provide details of some of the main indicators of this growth. Some of the features of this expansion can be highlighted.

- Growth in telephone lines per capita averaged 4 per cent per year for OECD countries as a whole during the ten year period 1976-87; however, for some countries this rate of growth was particularly high, e.g. Turkey, France, Ireland and Norway each showing a growth rate of 6.5 per cent or above (Table 1 in the Annex). Significant differences in the penetration of telephone lines per capita exist among OECD countries – even between some countries which are at a similar level of economic and structural development;
- The penetration rate data indicates that a growth potential still exists for system expansion in many OECD countries to meet universal service requirements. However, over the last several years, as higher penetration rates have been achieved in major OECD countries, growth has tended to diminish. For most of these countries there would have to have been a significant increase in the growth of mainlines per capita if they were to attain by the early 1990s the level of penetration which Sweden had achieved in 1982. In fact this is unlikely to occur given present investment trends and priorities toward digitalisation of networks which is a slow and expensive process. Much of this new investment is also aimed at enhancing the network rather than expanding it;
- Industry growth is also reflected in the ratio of waiting list for main lines to main lines currently installed. OECD countries have shown a steady decline in waiting lists for main lines. In most OECD countries this figure has become a better gauge of administrative efficiency than system capacity. Certain countries like Greece and Turkey continue to show extremely high ratios indicating the need for continued major investment in their basic telecommunications infrastructure. Table 2 in the Annex shows these ratios for the years 1978, 1982 and 1988;

- Such network expansion has obvious implications for growth in equipment trade, particularly because many of the countries which have a low penetration ratio and high unfulfilled main line demand, are not equipment producers;
- A further indication of system growth is the increase in revenue from telecommunications services which, for the OECD area as a whole, reached $267 billion in current prices in 1988, up from $116 billion in 1978 (Table 3 in the Annex). The United States, the EEC and Japan account for a large percentage of OECD telecommunications service revenue.

3. Changing service market structures and the equipment industry

Underlying the aggregate data on telecommunications system growth – historical and projected – are fundamental changes which have taken, or are taking place in telecommunications service structures. These interrelated changes are of two types:

- the enhancement and increase in number of services;
- changes in the service market structure.

3.1 *Regulatory Impact*

Telecommunications service growth and development in essence dictate the demand for equipment, and create new markets. Regulatory changes which introduce new services, whether these services are offered through market competition or through the regulatory framework, have an enormous impact on both the domestic equipment market and potential foreign trade markets.

The deregulation process itself has also stimulated equipment markets. After years of accepting the protection of a limited domestic market in most countries, producers are being shoved into the international scene. Companies in the United States, however, have been slow to take advantage of these structural changes. Many factors, such as lengthy type approval procedures and differing standards account for this languid pace. It is also necessary to point-out that unlike European firms, US manufacturers have enjoyed a domestic market large enough to provide sufficient revenue, thus reducing the incentive to move towards foreign markets.

Even with more liberal legislation, entry into foreign markets is subject to both visible and invisible barriers. Distribution channels, special interest groups and approval procedures are some of the major factors inhibiting penetration into foreign markets.

3.2 *Technological Change*

New technology which enhances services and broadens new equipment is a significant driving force for the equipment industry. For example, growth in the equipment industry can be attributed to the replacement of analogue technology of existing networks with digital systems. Much of this investment is replacement investment which, while not

necessarily expanding the geographic coverage of the network, is augmenting capacity and will allow for the creation of new services based on digital technology.

An important aspect of technological change, other than increasing equipment sales, has been to stimulate revenue as a result of new service features which become available (e.g. call forwarding, call waiting and call tracing) either as a result of network "intelligence" or intelligence in terminal equipment.

The competitive position of domestic equipment firms can, in some cases, influence the degree and rate of change in regulations in that rapid change in the service framework may have adverse impacts on the producing industry. Thus countries with a domestic telecommunications equipment industry may link regulatory changes to the domestic ability to compete in key equipment areas.

3.3 *Service Market Structure*

The introduction of new services is linked to the above factors, but two aspects need noting here. Firstly, in most cases, services offered in a competitive framework can also be offered in a regulated environment. In fact, technology in some cases may reduce pressures for deregulation in that possibilities exist for internalising services within Public Telecommunications Operators (PTO) networks and increasing revenues (e.g. Centrex digital systems have many features which are available on digital PBXs). Secondly, in certain cases, monopoly PTOs can help to push expansion of the market more rapidly than in a competitive environment. It could be argued that this has been the case with mobile telephony in the Scandinavian countries and with videotex in France.

There is, however, a fundamental difference between telecommunications services which are nurtured and grow at the national level and telecommunications services which have the potential to become available internationally. This is particularly the case where specifications for equipment and services are different. To avoid such situations is one of the reasons for EEC initiatives in Europe on telecommunications: for example the RACE[1] programme brings together user/service providers and equipment producers from all EEC countries to work closely together in order to identify common requirements and solutions.

Another important interrelationship between the telecommunications service and equipment sectors is that growth in the telecommunications service infrastructure is determined by PTO investment plans. Constraints on these plans (e.g. by diverting telecommunications services revenues or other government-imposed requirements) may be important for the growth and performance of the equipment industry.

The interaction of changing service market structures on telecommunications equipment trade must not be viewed as being based solely on a monopoly/liberalisation debate, but rather by recognising that equipment trade may be stimulated, under certain conditions, without the need to change the basic framework of the regulatory regime. For example, trends in Europe towards the harmonisation of norms may have important trade consequences within the European context. On the other hand, there is a need to recognise that regulatory changes in telecommunications services which are successful in one country may not be feasible in another depending on the size and business volume – the provision of some types of by-pass services may be an example.

In the next section we will review the ways in which the telecommunications equipment industry has changed, whether it be through technological advances or policy changes. We will spend some time looking at the backbone of the industry, research and development, as

well as some details of each of the three main equipment areas; central office switching, transmission and customer premise equipment (CPE).

The increasing internationalisation of the world information technology industry through inter-firm ties and co-operation is affecting the private communications service provision market, broadly defined, the telecommunications market and the telecommunications equipment industry and is playing an important role in reinforcing trade flows. In section III we will review the trade flows for the past nine years. This analysis will allow us to pinpoint trend variations due to changes in technology and policy.

II. STRUCTURAL CHARACTERISTICS AND CHANGE IN THE TELECOMMUNICATIONS EQUIPMENT INDUSTRY

1. The Industry Structure

The value of the world telecommunications equipment market in 1987[2] is variously estimated as ranging between $60 billion and $110 billion[3]. Roughly, the OECD area accounts for approximately 90 per cent of the production market with the United States 33 per cent, Japan around 20 per cent and Europe 40 per cent. Within Western Europe, no individual country has a production market larger than 8-10 per cent of the world total[4].

Estimates of the long-term growth of the equipment market vary. The central office switching market is expected to show a real annual growth rate of around 6-7 per cent in value depending upon the replacement timetable for analogue switches by network service suppliers and financing available in developing countries, (Table II-3) while the transmission market will marginally grow by 4 per cent during the next five years because of the price and performance of fibre optic (FO) based systems (Table II-8). The customer premise equipment market, spurred by the liberalisation process, is expected to grow at a rate of 8-10 per cent[5].

In view of the range of equipment in the telecommunications industry, each with its own market and growth characteristics, it is not possible to cover all aspects and issues related to the equipment industry. Rather, the broad structural characteristics and changes which influence the industry will be examined. Table II-1 breaks down the telecommunication equipment industry into three major areas: public switching equipment, transmission equipment and customer premise equipment. This table should not in any way be construed as an exhaustive list but rather as a portrayal of the equipment market.

1.1 *Technological changes*

Until 1970, one could easily define the telecommunications market as a grouping of PTOs whose equipment needs were satisfied by a close relationship with indigenous vendors. This scenario served to promote network compatibility, universal service and public policy goals.

Irrespective of whether a service monopoly is justified or not, the procurement of equipment from monopoly/duopoly suppliers or on the basis of self-supply is not economically justified by service requirements. The rationale put forward for such narrow procurement practices, commonly includes:

- The need to ensure that equipment specifications are available to meet service requirements and standards;

Table II-1. **Telecommunications equipment breakdown**

Equipment sector	First level specific subset	Equipment
Public switching equipment	Analogue Switches	Circuit (voice) Pack (data)
	Digitial Switches	Digital Cellular Radio Switch
Transmission equipment		Cable Mobile Base Station Fiber Optics Multiplexor Local Loops Satellite
Customer premise equipment (cpe)	Private Switching	Private Branch Exchange (PBX)
	Products	Local Area Network (LAN) Key Systems Multiplexors Modems
	Terminal (Voice)	Telephone Cordless Telephone Cellular Telephone Digital Telephone (Future)
	Terminal (Non-voice)	Multi-answer recorded message devices Teletex Telex Printers Facsimile Pagers Integrated voice/data workstation Modems (obsolete with ISDN) Voice messaging systems Videotex Monitors

- Stability of supply;
- National interest.

In reality, telecommunications administrations in most major equipment producing countries undertook an industrial policy role in developing, protecting and administering the equipment industry. The need for a minimum of price and product competition was recognised by splitting procurement between two or more firms ignoring, however, that procurement on such a basis seldom achieves the desired competitive effects which would arise from an open market. To reduce total life-time costs of equipment requires that long term software and hardware support and training be made available for switching equipment, limiting flexibility in changing suppliers in the shorter term. However, contracts awarded through competitive procurement procedures can also ensure that the long-run acquisition and maintenance costs of successful bidders are minimised.

The logic of universal service requirements and network efficiency should lead to policies aimed at long-term cost minimisation while at the same time allowing for maxi-

mum consumer equipment choice. Few telephone administrations can insist that their mandates require them to take an active role in support of the local equipment industry.

As a result of procurement policies, the competitive domain for the industry historically has been limited to non-producing OECD countries and Third World markets[6] where local vendors may be deficient in technology or manufacturing capabilities. To penetrate these markets the vendor is required in some cases to set up domestic manufacturing capabilities or to transfer the technology directly to the carrier.

In many OECD countries which are not producing equipment or all ranges of equipment, close ties are often maintained with one or several producing companies, often on the basis of some offset arrangements. In many markets open to competition outside the OECD, governments have often assisted their domestic companies in promoting sales of equipment, especially on the basis of favourable export financing arrangements[7]. Procurement practices have in some cases been detrimental to the competitive position of firms by orienting producers towards domestic markets and away from export markets, and by concentrating their equipment development and product specifications to meet PTO requirements which can differ from requirements in other markets.

Although procurement by telecommunication administrations remains a driving force in equipment markets, its relative role is declining. This decline results in some cases from liberalisation in network attachment regulations especially for customer premises equipment, as well as the emergence of new equipment, or equipment for new service areas over which – in some cases – PTOs have not extended their monopolies.

1.2 *Research and Development*

Significant amounts of money are now required to finance research and development (R&D) in telecommunications. It is estimated that the amount of total R&D budgets that are spent specifically on telecommunications averages around 10-13 per cent for all countries[8]. Most of this funding is provided by governments, PTO's and equipment manufacturers. It is estimated that $700 million to $1 billion is necessary to design a new generation of central office switches and off-setting sales must total at least $14 billion[9]. It is because of this extremely large price tag that joint ventures are becoming more common between equipment manufacturers as well as co-ordinated R&D efforts supported by governments or groups of governments. The amount of R&D financed by the PTOs varies between country. In the United States, PTOs finance 50 per cent of the effort, whereas in France, Japan and the United Kingdom it averages between 16-22 per cent and Germany is at the low end of the scale with only 5 per cent from PTO financing[10].

The amount of government financing is difficult to determine. In theory the bulk of the government financing in telecommunications R&D is for the military sector. There is a large grey area in which R&D in the military sector spills over into the civilian area. It is difficult to determine a value on this spill-over but it is commonly recognised to exist.

The United States government aids civil telecommunications R&D in an indirect sense. Under the Economic Recovery Act of 1981, tax cuts are available for R&D spending, it is estimated that this indirect subsidy reached $7.2 billion in 1985[11]. During the time AT&T was still a government sanctioned monopoly, resources were extracted directly from the customer telephone bills to finance R&D, the patents granted under this research were later given free of charge to the BOCs.

The Japanese government's system of subsidising R&D is much more complex in nature. The Electronics Communications Laboratory (ECL) of NTT has been instrumental in bringing up-to-date technology to the NTT family (NEC, Fujitsu, Oki and Hitachi)[12]. Two successive generations of digital exchanges have been designed under the leadership of ECL, which uses engineers provided by each manufacturer and the fixed price method of purchasing used by NTT allows manufacturers to recoup their R&D costs.

The European Community has created specific R&D programmes to work in the field of telecommunications. The four dominant European research programmes are RACE (Research on Advanced Communications in Europe), COST, EUREKA and ESPRIT. Each of these programmes falls under and receives their resources from the large FRAMEWORK Programme which has an overall budget of 5.4 billion ECUs.

In addition to government subsidies, manufacturers spend important amounts of revenue to keep on top of technology. Many manufacturers have teamed together in R&D because the cost is becoming prohibitive for one company or simply to have a foothold in a new market. The Ericsson-IBM alliance to develop intelligent network products and the joint venture with Thorn/EMI and Ericsson to produce the AXE for British Telecom are both good examples. A study carried out by the Wissenschaftliches Institüt für Kommunikationsdienste der Deutschen Bundespost estimated the R&D costs for the top ten telecommunications manufacturers. Table II-2 shows the findingsof this study.

Special note was made in the study regarding the R&D budgets of NEC and Fuijtsu which seem to be too low. The study says "Compared to tables from Japanese R&D statistics for telecommunications R&D of the five largest companies NEC's and Fujitsu's R&D expenditure for telecommunications should be two or three times higher."

Table II-2. **R&D expenditures of major manufacturing companies civil telecommunications in 1987**[1]

Rank	Company group	Telecoms-equipment turnover		R&D for telecom in million US$[2]	R&D group intensit of the company group in %
		in million US$	in % of total turnover		
1.	AT&T	36 100[3]	29	2 652	7.3
2.	Alcatel[4]	8 200	79	800	9.8
3.	Siemens[4]	5 100	24	650	12.7
4.	NEC[4]	4 100	32	106	2.6
5.	Northern Telecom	4 800	100	588	12.2
6.	Ericsson[4]	3 300	90	300	9.1
7.	Motorola	3 100	52	270	8.7
8.	GPT[4]	2 300	19	210	9.1
9.	Fujitsu[4]	1 600	16	130	8.1
10.	GTE	2 200	13	251	12.5

1. Estimates.
2. In some cases rough estimations based on various information from the companies.
3. Including service revenues.
4. National currencies converted in US$ by current purchasing power of parities used by the OECD for the field of science.

Source: Adapted from Wissenschaftliches Institüt für Kommunikationsdienste der Deutschen Bundespost, October 1989.

2. National Market Overview: Central Office Switching Equipment

The market worldwide for telecommunications central office switching equipment was according, to one estimate, $15.6 billion in 1987 and forecasted to increase at a rate of 7 per cent per year which will make the value of the market in 1992 worth $21.6 billion[13]. Table II-3 looks at the regional growth in the central office switch market which accounts for approximately 16 per cent of the worldwide expenditure on telecommunications equipment while Table II-4 shows for each region, the total net addition of digital access lines.

It is estimated that by 1992, the market for all telecommunication equipment in twenty countries[14] will each individually exceed $1 billion. Of those twenty, ten will have central office switching markets totalling $1 billion or more and an additional thirty countries will each buy a minimum of $100 million worth of central office switching equipment[15]. The low percentage change for North America and the negative percentage change for the Far East and Pacific probably shows that the aggressive investment plans of the past few years are levelling off. The increase in spending in the Middle East and South East Asia is mainly accountable to increased investment spending in India while the big players in Latin America were Mexico, who doubled its spending in 1989, and Brazil.

In looking at the world's geographic telecommunications markets, 90 per cent of spending is concentrated in North America, Western Europe and Asia. Each area has major differences in their telecommunication policy. North America has gone the farthest to provide a liberalised system open to competition, Western Europe is slowly moving down the same path with Asia the furthest from moving away from its monopoly system. Two major technological innovations, the change from analogue to digital switching and the move towards fibre optic cable as the transmission medium of choice will drive the increase in spending in these areas[16]. For other areas, such as Eastern Europe, Latin America and Africa, it will be a combination of these technological advances and expansion of their infrastructures which will drive growth.

Table II-3. **The world central office switch markets by region 1978-92**

	US$ million[1]		Growth percent year
	1987	1992	
Asia	4 829	6 000	4.4
North America	4 593	6 000	5.5
Western Europe	3 136	4 400	7.0
Eastern Europe	1 900	3 600	13.6
Latin America	609	900	8.1
Africa	251	350	6.9
Oceania[2]	317	330	0.8
TOTAL	15 635	21 580	6.7

1. Projections are in 1987 dollars.
2. Australia and New Zealand.
Source: A.D. Little, August 1988.

Table II-4. **Volume of central office digital switch by region**

Thousands of subscriber access lines

	1987	1992	Growth percent per year
North America	9 500	10 300	1.6
Western Europe	7 500	10 200	6.3
Asia	3 600	7 800	16.7
Latin America	1 000	2 500	20.1
Africa	400	1 200	24.6
Oceania[1]	300	500	10.8
Eastern Europe	250	2 500	58.5
TOTAL	22 500	35 000	9.2

1. Australia and New Zealand.
Source: A.D. Little, Inc, estimates, August 1988.

In terms of global spending, Table II-5 looks at the movement in equipment expenditure between 1988 and 1989. The 1990s will also see the emergence of a new important market, Eastern Europe. The lack of hard currency and a non-convertible national currency may slow the potential impact of this market. Even with these restrictions we are seeing a number of joint-ventures between the East and the West. For example, the GEC Plessey and Moscow Telephone Network (MGTS) joint venture which placed pay phones which accept prepay and major international credit cards at the international airport, all major hotels and other central locations in the city; the Nokia Telecommunications and Moscow Telephone Network established joint venture to provide mobile-telephone services in the Moscow area; the US West and Magyar Posta, the Hungarian PTT joint venture to build, own and operate a national cellular telephone system; an international consortium led by US West International to develop with the Soviet Ministry of Posts and Telecommunications, a trans-Soviet fibre optic cable system to name only a few of the joint ventures now being considered.

Table II-5. **World expenditure on telecommunications equipment by region**

US$ millions

	1988	1989	Percent Change
Europe	40 778.0	43 971.8	7.8
North America	29 016.4	29 105.6	0.3
Far East & Pacific[1]	25 950.7	25 493.1	-1.8
Middle East & SE Asia	4 866.3	5 793.4	19.1
Latin America	3 185.3	4 141.8	29.7
Africa	1 905.3	2 042.0	7.2

1. Including Oceania.
Source: Telephony, 27th February, 1989.

Asia is an immense market whose major players are Japan, Korea, Taiwan and Singapore. Since the early 1980s, China has been seen as an emerging Asian market but a number of problems have made this market weak, including a lack of co-ordinated development, poor foreign exchange position, inadequate basic infrastructure and a fragmented supplier situation. Of the strong Far East countries only Korea and Singapore were expected to increase their spending in 1989[17].

Africa is composed mostly of underdeveloped countries which makes it the least attractive of all the regional markets. There is only one principal player which is South Africa which accounts for 33 per cent of the total market. Nevertheless, the transition from analogue to digital technology, the full or partial forgiveness of official debts by several OECD Member countries, and new approaches made by host countries, suppliers and funding sources account for approximately $2 billion spent in 1989.

Mexico and Brazil each account for over 20 per cent of the South and Central American market. Mexico doubled its 1988 spending in 1989. Currently Mexico's public telecommunications services are provided by two government-related entities: the Secretariat of Communications and Transportation (SCT) and the government's majority-owned Telmex. Telmex is responsible for providing service to large towns and cities with more than 2 500 inhabitants while SCT handles the telephone service to smaller and more rural towns and other services such as telex, television distribution, time-sharing and data transmission. In the near-term, Telmex planned to add 1.5 million lines between 1988 and 1990 and expected all long-distance nodes to be digital by 1990. SCT has visions of developing an infrastructure of satellite communications. What is needed at this point is to attract foreign capital to augment the capital generated through the revenue of international long distance service which supplies 53 per cent of the annual total telephone operations for Telmex[18].

In 1980 the average cost per line for a digital switch was $490 of which 64 per cent was specifically the cost of hardware. In 1990 the price will be in the $250 range of which only 43 per cent will represent hardware[19]. While trends in central office switch prices are similar around the world, major differences in the price of a line appear between countries. In most cases, these differences occur due to procurement policies, subsidies, taxes, import duties and a lack of real competition in the domestic market. The differences are seldom due to technology, which is remarkably comparable, or to manufacturing techniques, which are well-developed in all major countries. It is necessary to note that each case needs to be reviewed independently. A high switch price per line could also indicate a period of growth in new switching offices, which are more expensive per line than a mere addition since first units must also include fixed costs such as the power plant, control and maintenance systems. in addition these fixed costs will vary given the final capacity of the switching office, known to range between a few hundred to tens of thousands of lines. Given these conditions it is not surprising to see countries with large, sparsely populated rural areas to show a larger switch price per line.

The structural changes affecting PTO's around the world have prompted vendors to scramble for a global market position, this has resulted in mergers, takeovers and joint ventures as well as heavy investments in R&D. It is estimated that on average, a telecommunications company will spend around 12 per cent, of total costs in R&D alone[20]. In order to compete in the global market place companies will be required to add ten times the R&D costs to cover the production and marketing costs in a global setting[21].

The central office switching equipment market is controlled by nine major vendors (Table II-6). The percentage of central office switching equipment market sold outside the

Table II-6. **Leading central office switch suppliers 1987**

Parent Company	Co Switch Subsidiary/Division	Domestic Base	Co Switch Family Name	Total Revenues (US$ million)	Co Switch Revenues	Switch Revenue as percent of Total Revenue
AT&T	AT&T Network Systems Group	USA	5ESS	33 600	3 600	10.7
Siemens	Telecommunications Networks and Security Systems Group	Germany	EWSD	29 798	2 000	6.7
CGE	Alcatel N.V.	France	E10, System 12	21 937	2 872	13.1
NEC	Communications Systems and Equipment	Japan	NEAX61, D60/D70	19 592	1 200	6.1
Fujitsu	Communications Systems	Japan	FETEX-150, D60/D70	14 360	800	5.6
GEC/Siemens	GPT	UK	System X, DCO	13 571	875	6.4
Bell Canada Enterprises	Northern Telecom	Canada	DMS	11 852	2 577	21.7
STET	Italtel	Italy	Linea UT	11 260[1]	664	5.9
Ericsson	Public Telecommunications	Sweden	AXE	5 521	1 507	27.3

1. 1986 Data.
Sources: Business Week July 18, 1988; A.D. Little.

domestic base can give us a view of who is focusing on a global market versus a domestic market. There are major differences, for instance, Ericsson secures 91 per cent of its market outside of Sweden while Italtel derives only 5 per cent of its sales outside of Italy (Table II-7).

Table II-7. **International revenues in the central office switch market 1987**

	Domestic Base	Percent of Revenues Outside Domestic Base
Ericsson	Sweden	91
Northern Telecom	Canada	67
Siemens	Germany	56
NEC	Japan	50
Alcatel N.V.	France	30
Fujitsu	Japan	30
GPT	UK	20
AT&T	USA	10
Italtel	Italy	5

Source: A.D. Little, Inc., January 1989.

In the future, manufacturers will increasingly have to devote energies and budgets to helping the telecommunication service companies and PTO customers succeed in developing usable ISDN-based applications in order to continue justifying the heavy investments currently being made in the infrastructure.

3. Transmission Equipment Market

The transmission equipment market is expected to increase by an average of 4 per cent per year between the years 1986 and 1995 (Table II-8). The digitalisation of networks has created a booming business for manufacturers during the early 1980s but as digitalisation is completed, the market will show a levelling off.

The "last mile" or subscriber local loop is a series-connected loop of copper wire or optical fibre connecting the subscriber's telephone receiver with the central office. During the early stages, this part of the system represented one-third of the total network capital investment. Traditionally the local loop was considered high in cost and low in flexibility. Currently manufacturers have been asked to develop cost-effective optical fibre equipment for use in the local loop. This will allow broadband Integrated Services Digital Network (ISDN) services to be offered directly to residential subscribers, including video teleconferencing and high definition television (HDTV).

Table II-8. **Transmission equipment markets, 1986-95**

US$ million

	1986 Size	Rank	1990 Size	Rank	1995 Size	Rank	Growth per year 1995-1986
USA	5 762	1	5 710	1	5 980	1	0.4
Soviet Union	2 184	2	2 680	2	4 060	2	7.1
Japan	1 345	3	1 522	5	1 472	6	1.0
Germany	1 295	4	1 767	4	1 978	3	4.8
France	1 255	5	1 787	3	1 836	4	4.3
Italy	705	6	1 414	6	1 480	5	8.6
UK	661	7	1 038	7	1 173	7	6.6
Spain	393	8	840	8	858	8	9.1
Australia	349	9	780	9	792	9	9.5
India	340	10	593	10	675	10	7.9
TOTAL	14 289		18 131		20 304		3.9

Source: Telecommunications Research Centre.

3.1 *Fibre Optics*

The most influential new technology of the 1980s was within the transmission equipment market. Fibre optic technology has revolutionised the cost of long distance transmission and is providing large amounts of band width with promises of even larger capacities, all of which will support the economic delivery of new services. Table II-9 shows the major transoceanic cables that have recently been constructed, under construction or are proposed for near future construction.

Fibre optic systems have two principal measures of capacity:

Bit rate – the rate at which digital pulses of information can be transmitted from one point to another, and;

Maximum repeater spacing – the distance between electronic devices that are used to regenerate and amplify signals.

Progress in technology has been producing higher bit rates and greater distances in maximum repeater spacing making them ideal for the long-haul and regional telecommunications networks.

Further improvements to the already high-capacity fibre optic systems are in sight. The following are new technologies which will offer substantial improvements over the current systems:

Frequency-division multiplexing involves the separate, simultaneous transmissions of pure light at different frequencies (i.e. colours). It is expected that this technology will rapidly be implemented and could triple the existing capacity of fibre cables.

Optical time-division multiplexing involves electronic transmissions being fed into an optical transmitter that produces photonic transmissions. Since electrons simply cannot

Table II-9. **Selected transoceanic cables recently constructed, under construction and proposed**

Area	Name	Capacity	Service Data
Atlantic	TAT-8	280 Mbits/s (37 800 voice circuits)	
	TAT-9	565 Mbits/s on each working fibre	1991
	PTAT	420 Mbits/s on 3 lines (8 500 voice circuits)	1989
	NPC	60 000 voice circuits	1990
Pacific	PACRIM EAST	280 Mbit/s	1993
	PACRIM WEST	280 Mbit/s	1994
	TPC-3/HAW-4	75 600 voice circuits	1988
	TPC-4[1]	75 600 voice circuits	1992
	TASMAN 2	57 000 voice circuits	1991
	H-K-J	37 800 voice circuits	1990
	G-P-T	37 800 voice circuits	1989
Europe/Asia	SEA-ME-WE-2	565 Mbit/s on each working fibre	1994
	TRANS-SIBERIAN		

1. 37 carriers from 22 countries.
Source: Compiled from various sources.

move fast enough, this allows the transmission to move at the speed of photons which by definition travel at the speed of light. Thus, the photon streams are combined in an optical multiplexer to achieve higher bit-rate streams for photonic transmission through the optical fibre. While this technology can only be considered emerging, it is expected to double or triple current performance.

New materials for making optical fibres involve heavy-metal (halides) fluoride cable. The primary advantage of these new fibres will not be speed of transmission but rather the extremely low loss of signal during transmission. The theoretical loss for heavy-metal fluoride cable is as low as 0.01 decibel per kilometre, which means that 6 000 kilometre repeater-spacing is possible. This technology is currently still in the laboratory but could very well represent the next step in the evolution of fibre optics.

Given that many inter-continental distances are less than 6 000 kilometres, for example the Atlantic Ocean, heavy-metal fluoride cable will be in direct competition with satellites.

3.2 *Satellites*

Satellite services have three components:

- Fixed Satellite Services (FSS);
- Mobile Satellite Services (MSS);
- Direct Broadcast Satellite (DBS).

Worldwide at the end of 1985, there were 1 400 civilian transponders and by 1990 there should be about 2 500 transponders in orbit, 40 per cent of which will be part of

American Systems, 30 per cent will be part of International Systems (Intelsat and Inmarsat), 6 per cent will be part of European or Japanese systems, 4.5 per cent will be part of Canadian systems, with the other 13.5 per cent being divided among the remaining countries[22].

To place a telecommunications satellite into orbit takes a large number of specialised firms and a number of disciplines. The satellite itself consists of a platform, (metal skeletons, panels, solar panels, etc.) constructed by aerospace firms and a payload, (electronic equipment for receiving, transmitting, amplifying and multiplexing, etc.) developed by telecommunications firms. For launching the satellite into orbit firms in aeronautics manufacturing provide launching rockets and space vehicles. Earth-station equipment is developed by electronics and telecommunications firms and consists of receivers and transmitter antennae and aerial mobility devices.

The reliability of space equipment improved steadily until the early 1980s at which time a number of losses at the launching point and to a lesser extent during orbit, increased insurance costs which now amount to over 30 per cent of satellite value at launching. This is compared to 7 per cent ten years ago[23]. Another major economic problem is the inability to adhere to launching schedules, which in essence increases the economic risk of the investment.

It is evident that satellites are truly an agile technology adapting to new demands in the network quickly and efficiently. "Satellite pipelines can be moved around the country, instantaneously, to meet changing demand. They also provide point-to-multipoint broadcast capability with rapid, flexible networking even for mobile stations and remote locations[24]." In addition the need for standby systems to cover cable breakdown qualifies as a reason in itself for comparable transmission capacities to be available.

Even though satellites no longer have the edge on point-to-point long-distance high speed-rate transmissions, this does not mean the demise of the industry. By its very nature, the mobile telecommunications market which is the fastest growing new telecommunications market in the world takes greatest advantage of satellite technology.

The OECD cellular radiotelephone systems market reached over 6 million subscribers in 1989[25]. With the fast growth in this market it has encouraged a number of new companies to manufacture the needed equipment, lowering the cost of high-capacity (800-900 MHz) networks and subscriber equipment. Europe has been slow in implementing this technology but is making progress towards a Pan-European digital cellular network scheduled to provide limited service starting mid-1991.

4. Customer Premise Equipment Market

Customer Premise Equipment (CPE) is equipment located on the user's site and is used for the transmission and switching of voice and data communications. Table II-1 gives a general outline of what is included in the CPE market. Liberalisation of the telecommunications sector has impacted on a greater scale the trade trends of customer premise equipment imports than for other more inelastic markets, such as central office switching.

4.1 *Private Branch Exchange Systems*

The most expensive and technologically advanced product in the CPE market is the private branch exchange system (PBX). PBX systems today vary from the small versions with as few as 24 extension lines to large versions covering 4 000 or more extensions. The newest 4th generation PBX systems offer digital high-speed data switching capabilities while at the same time providing traditional PBX voice service. Table II-10 shows the market share of PBXs in the United States.

Table II-10. **U.S. PBX supplier market share, 1988**

Company	PBXs 4.9 million Lines (Percent)
Siemens[1]	21
AT&T[2]	20
Northern Telecom	20
Mitel	10
NEC	9
Fujitsu/GTE	8

1. Includes Rolm acquisition from IBM Corporation.
2. Includes AG Communications Systems, AT&T-GTE joint venture.
Source: Robert A. Sayles Associates, Inc./NBI/Datapro.

4.2 *Local Area Networks*

Local area networks (LAN) are privately owned data networks connecting information processing equipment over a shared, high speed communication channel within a given area. LANs use data compression technology to enable multiple stations to share a common transmission path. An example would be multiple workstations that can share programmes, data bases, printers and add additional features such as electronic mail. In the United States the LAN equipment market is experiencing sales growth of nearly 20 per cent per year[26].

4.3 *Facsimile Machines*

Facsimile machines in the past have proven to be a high growth CPE market. The technological history of modern fax terminals started with the Group I facsimile, which were analogue, capable of sending documents in 4 to 6 minutes per page. Group II were the first digital machines reducing total transmit time in half. Group III are digital, requiring less than one minute of transmit time per page. Many include autodialers, document feeders, polling voice request and activity report capabilities. Group IV facsimile machines will work within an ISDN framework for fast transmission. This greater transmission speed will allow colour coding in addition to monochrome.

4.4 *Telephones*

Telephones range from a complex cordless memory system to one that could almost be described as a "disposable telephone". Telephones, like facsimile machines and message recording devices, have two things in common: they have a relatively low technology content and are easy to mass produce. This scenario works well in the East Asian NICs, whereas the United States, Canada and major European industrialised countries hold a comparative advantage in the production and marketing of equipment having a high technology content and also requiring a high degree of after-delivery service and follow-up. Japan belongs more to the later than the former but also appears to have some comparative advantage to sell mass produced products abroad.

5. Conclusions

Substantial change has occurred in telecommunications equipment from both a policy aspect as well as from a technological view. These changes have required a more aggressive research and development budget as well as a more global marketing plan. With these additional costs we are seeing companies engage in merger or acquisition deals in order to blend their strengths and weaknesses and thereby survive and prosper in this new climate in a way that they could not achieve on their own. Currently there are only nine major vendors left in the world's central office switching market, one of the hardest markets to enter coupled with the highest R&D costs.

In the 1980s the transmission market produced the most influential new technology, fibre optics. Fibre optics will parallel satellites in providing communication transfer, while at the same time will create their own proper market. Fibre optics will be a major point-to-point transmission method while satellites will be the choice for the cellular markets. Both methods will have back-up potential in case of network failure.

Part III, which examines trade, shows that changes in policy to liberalise markets predominately affected CPE and not the high technology, high service markets like central office switching. It is of course in CPE that one finds items that have simple technology or if they have a high technology content can still be easily mass produced. In terms of trade trends it was primarily the Far East countries that were able to take advantage of the opportunities following the liberalisation and opening of markets due to their proven methods of mass production.

III. TRADE IN TELECOMMUNICATIONS EQUIPMENT

1. Product Definition

It is important to realise that a wide range of products is included under the heading "telecommunications equipment", which only proves to complicate the analysis of trade in equipment. There is no internationally agreed definition as to what constitutes "telecommunications equipment products" for trade analysis. The United Nations, starting with 1988 data, will provide a more detailed breakdown of products which, however, will remain insufficient in view of the rapid pace of technological changes. (See Table 6 in the Annex which compares revision 2 and 3.)

For the purpose of this paper all data is sourced from the Next database and "Telecommunications Equipment" is defined in terms of the Standard Industrial Classification Revision 2[27] as:

- Electric line telephone and telegraph equipment: (SITC 764.1) which includes exchanges, switchboards, telephone apparatus, facsimile apparatus, teleprinter and teletype units, etc.;
- Telephonic/Telegraphic Transmitters (SITC 764.3) which includes multiplex transmitters, relay apparatus, microwave transmitters, satellite microwave transmitters, etc., but also includes items which belong to the communications industry largely defined such as television and radio equipment;
- Telephonic/Telegraphic Receivers (SITC 764.81) which includes diversity, multiplex, satellite microwave and terrestrial microwave receivers, etc.;
- Line Equipment Parts (SITC 764.91) which include parts for products in SITC 764.1.

Details of products included under these commodity classifications are given in Table 5 of the Annex. The above four product items[28] have different trading and growth patterns which will be examined separately in the sections below.

2. Overall Trade Performance

Total OECD exports of telecommunications equipment increased at an annual average rate of 11.1 per cent between 1978 and 1987[29], from $5.1 billion to $13.2 billion (Table III-1) – in comparison, the growth in total manufacturing exports grew yearly on the average of 8.4 per cent. The series of proportional pie charts seen in Figure III-1 shows the

Table III-1. **Telecommunications equipment: total OECD exports to world**

US$ millions

	Telecommunications products[1]					Percent distribution			
	[764.1]	[764.3]	[764.81]	[764.91]	Total	[764.1]	[764.3]	[764.81]	[764.91]
1978	2 518.2	1 376.9	145.5	1 097.3	5 137.9	49.0	26.8	2.8	21.4
1979	2 972.5	1 424.3	169.4	1 328.9	5 895.1	50.4	24.2	2.9	22.5
1980	3 391.8	1 610.1	198.1	1 625.4	6 825.4	49.7	23.6	2.9	23.8
1981	3 491.8	1 615.0	218.7	1 706.5	7 032.0	49.6	23.0	3.1	24.3
1982	3 969.2	1 734.4	231.5	1 451.1	7 386.2	53.8	23.5	3.1	19.6
1983	4 101.8	1 840.6	194.3	1 611.3	7 748.0	52.9	23.8	2.5	20.8
1984	4 370.4	1 857.4	233.5	1 904.0	8 365.3	52.2	22.2	2.8	22.8
1985	4 695.6	2 059.7	239.7	2 050.4	9 045.4	51.9	22.8	2.6	22.7
1986	5 325.9	2 336.9	268.1	2 492.0	10 422.9	51.1	22.4	2.6	23.9
1987	7 253.8	2 917.2	327.6	2 665.3	13 163.9	55.1	22.2	2.5	20.2

1. Defined by the Standard International Trade Classification (SITC) Revision 2:
   [764.1] Electric line telephone and telegraph equipment.
   [764.3] Telephonic/Telegraphic transmitters.
   [764.81] Telephonic/Telegraphic receivers.
   [764.91] Line equipment parts for classification 764.1 .

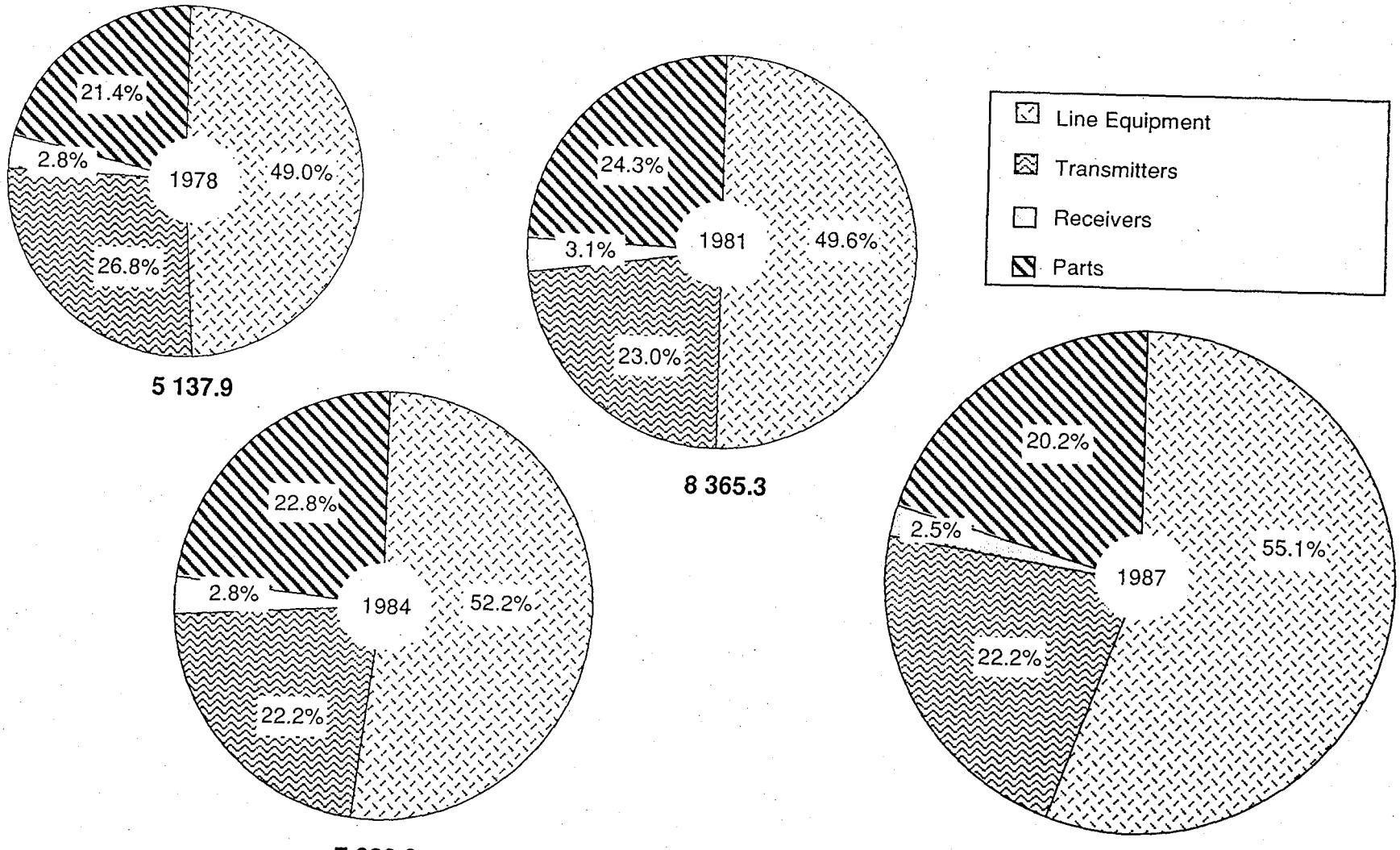
Source: OECD.

market share of each of the equipment categories over the past nine years. In terms of the four main product categories which constitute "telecommunications equipment" the high rate of growth in line equipment exports (12.5 per cent annual average over 1978-87) has been the main contributing factor to total export growth of telecommunications equipment. This item accounts for just over 55 per cent of total telecommunications equipment exports.

OECD imports of telecommunications equipment from the world grew at an annual average rate of 17.1 per cent over 1978-87 from ($2.5 billion to $10.4 billion) reflecting, in particular, the growth in imports of line equipment (22.0 per cent annual average over 1978-87) and the high rate of growth in imports from the non-OECD area, notably from the Far East. In 1978 the Far East exported $165 million worth of telecommunications equipment to the OECD. By 1987 this table had steadily risen to $1.7 billion; an annual growth of 29.6 per cent over the nine year period.

The level of OECD telecommunication equipment exports varied considerably between countries (see Table 7 in the Annex). The only absolute decline appeared for Portugal, accounting for the 27.9 per cent annual increase in its trade deficit, and the Netherlands, where the balance of trade tables also show a change from $150 million surplus in 1978 to a $160 million deficit in 1987. The leading exporters continued to show strong growth (Japan, Germany and the United States). In the case of Japan, the period 1985-87 showed an extremely high growth rate at 30.1 per cent per year compared to their overall annual growth for the nine year period of 19.5 per cent. Certain countries, starting from low positions have marked large increases (i.e. Austria, Finland and Ireland). Nevertheless, exports of telecommunications equipment is highly concentrated with the top ten exporting countries supplying, on average during 1978-87, 92 per cent of the OECD exports, and the leading four countries – Japan, Germany, United States and Sweden – 67 per cent of OECD telecommunications equipment exports.

FIGURE III-1. **PERCENTAGE OF TOTAL OECD TELECOMMUNICATION EQUIPMENT EXPORTS TO THE WORLD BY SITC[1] CLASSIFICATION**
(US$ Million)



1. Standard International Trade Classification
Source: *OECD Trade Database (NEXT)*

The period 1978-87 was characterised by a decline in the competitive position of OECD telecommunications equipment exports by seven of the top ten countries. An indication of a country's competitive position can be studied by looking at export elasticity coefficients. These coefficients can be derived by comparing the rate of compound growth of country X's telecommunication exports between a given time period and the compound growth of telecommunications exports for the total of all OECD countries. Table III-2 shows both export and import elasticity coefficients for 11 OECD countries and the EEC. The three countries showing marked increases – Japan, Canada and Finland – showed export elasticity coefficients of over 1.5. This is in contrast to the poor performance of Belgium[30] and Sweden. It should be noted that all the top ten countries with the exception of Japan, Canada and Finland show export elasticity coefficients of less than 1.0. In 1987 Japan had increased its market share to almost 35 per cent while the EEC held 38.6 per cent of the market. Given the average rate of growth, Japan should exceed all EEC countries combined in total telecommunications exports in 1989.

Table III-2. **Telecommunications equipment trade: export and import elasticity coefficients**[1]

	Exports	Imports
Belgium/Luxembourg	0.5	0.5
Canada	1.8	0.8
Finland	3.5	1.0
France	0.7	0.6
Germany	0.9	0.7
Italy	0.9	1.1
Japan	1.8	0.7
Sweden	0.4	1.1
United Kingdom	0.6	1.4
United States	0.7	1.3
EEC (12)	0.7	0.8

1. Defined as the rate of compound growth of a country's telecommunications exports or telecommunications imports over 1979-87 compared to the rate of compound growth for total OECD exports or imports of telecommunications equipment.
Source: OECD.

In terms of imports, the import elasticity coefficients reflect, among other things, the growth in the domestic market, competitive factors and the relative degree of openness in a market. Half of the major telecommunications equipment producing countries (Finland, Italy, Sweden, United Kingdom and the United States) have import elasticity coefficients of 1.0 or above showing a rate of growth in telecommunications equipment imports above the OECD average. Belgium, France, Germany and Japan showed the lowest coefficients.

Another performance indicator in trade is to measure changes in the structure of specialisation within the manufacturing trade. Such an index (Table III-3) shows to what extent a country specialised in manufacturing trade of a particular commodity vis-à-vis the average for the OECD as a whole. For the major ten telecommunications producing and trading countries this index has shown considerable change. Japan and Finland are still

Table III-3. **Index of export specialisation in telecommunications equipment trade**

	1978	1982	1984	1985	1986	1987
Belgium/Luxembourg	99.2	71.8	57.5	53.8	74.7	76.2
Canada	52.9	117.9	134.8	121.2	104.6	107.5
Finland	31.4	97.4	101.0	117.4	171.8	200.3
France	91.1	97.5	88.8	88.1	77.6	79.8
Germany	89.7	75.8	65.0	63.6	65.6	82.8
Italy	46.1	46.2	39.7	40.9	44.2	42.6
Japan	123.3	128.9	159.8	164.2	181.9	223.5
Sweden	484.0	442.1	409.3	428.8	355.0	297.6
United Kingdom	90.2	94.3	100.6	95.5	86.5	78.4
United States	91.6	101.6	83.5	92.3	90.6	83.3
EEC (12)	90.5	79.9	71.2	67.8	68.0	73.6
OECD	100.0	100.0	100.0	100.0	100.0	100.0

Formula:

$$\frac{\dfrac{\text{Total telecommunications equipment exports for country X}}{\text{Total manufacturing exports for country X}}}{\dfrac{\text{Total telecommunications equipment exports for OECD}}{\text{Total manufacturing exports for OECD}}} \times 100$$

Source: OECD.

showing significant increases in their relative specialisation in telecommunication exports, while in the case of Belgium, France, Germany, Italy, Sweden, the United Kingdom, the United States and the EEC there has been a decline in the relative importance of telecommunications exports in total manufacturing trade. Canada and the United Kingdom experienced a relative improvement in the index of specialisation over 1978-84, followed by a decline.

It should be noted that for the OECD as a whole, telecommunications equipment exports account for just under 1 per cent of the total manufacturing trade – it represents a significantly higher proportion of manufacturing trade only for Sweden and Japan (2.69 and 2.02 per cent in 1987 respectively[31]. Telecommunications equipment imports as a percentage of total manufacturing imports have averaged 0.8 per cent for the OECD. Iceland (1.7 per cent), Norway (1.5 per cent), Turkey (2.6 per cent), Australia (1.9 per cent) and Austria (2.4 per cent) showed the highest ratio of telecommunications imports to total manufacturing imports.

Trends in the index of import dependence in trade are shown in Table III-4. Relatively important increases in import dependence in trade in telecommunications equipment have occurred in Australia, New Zealand, Sweden, Iceland, Switzerland, Turkey, the United Kingdom and the United States. Most other OECD countries have experienced a reduction in import dependence for telecommunications equipment. The EEC equipment producing countries, in particular France[32] and Germany have very low indices of import dependence. Japan, which in the late 1970s showed a high index of import dependence, managed to cut it in half by 1987.

Table III-4. **Index of import dependence in trade**

	1978	1982	1984	1985	1986	1987
Australia	118.7	229.3	206.1	237.7	264.3	235.7
Austria	170.8	103.0	88.1	75.0	77.0	81.4
Belgium/Luxembourg	71.5	71.8	44.6	47.3	45.5	47.4
Canada	136.0	126.4	107.8	103.2	114.4	120.3
Denmark	222.5	135.3	120.6	108.4	121.7	148.7
Finland	181.3	216.4	147.0	163.1	156.5	158.5
France	51.6	45.6	31.3	29.0	26.9	31.1
Germany	62.6	39.5	29.5	32.0	32.6	43.2
Greece	239.7	144.9	102.3	66.3	97.2	87.8
Iceland	184.3	174.3	185.0	188.4	252.3	208.7
Ireland	163.6	315.4	184.8	162.0	140.5	133.7
Italy	83.4	87.6	80.6	78.1	67.3	79.4
Japan	122.7	85.8	55.5	53.3	63.5	64.0
Netherlands	131.6	91.6	70.5	82.0	88.6	90.3
New Zealand	152.1	135.7	184.5	353.0	375.7	297.3
Norway	243.5	174.4	161.4	181.9	210.8	187.3
Portugal	94.8	137.0	82.9	74.8	76.2	85.2
Spain	74.2	157.4	79.3	89.0	75.3	83.5
Sweden	98.0	118.1	145.0	147.3	154.8	126.9
Switzerland	12.8	16.5	14.7	19.3	27.7	35.9
Turkey	170.2	186.3	280.8	248.9	280.0	319.3
United Kingdom	69.3	108.2	97.6	103.5	104.7	123.3
United States	117.6	120.9	151.1	143.4	145.8	141.5
EEC (12)	83.2	78.4	62.4	63.1	62.3	71.4
OECD	100.0	100.0	100.0	100.0	100.0	100.0

Formula:

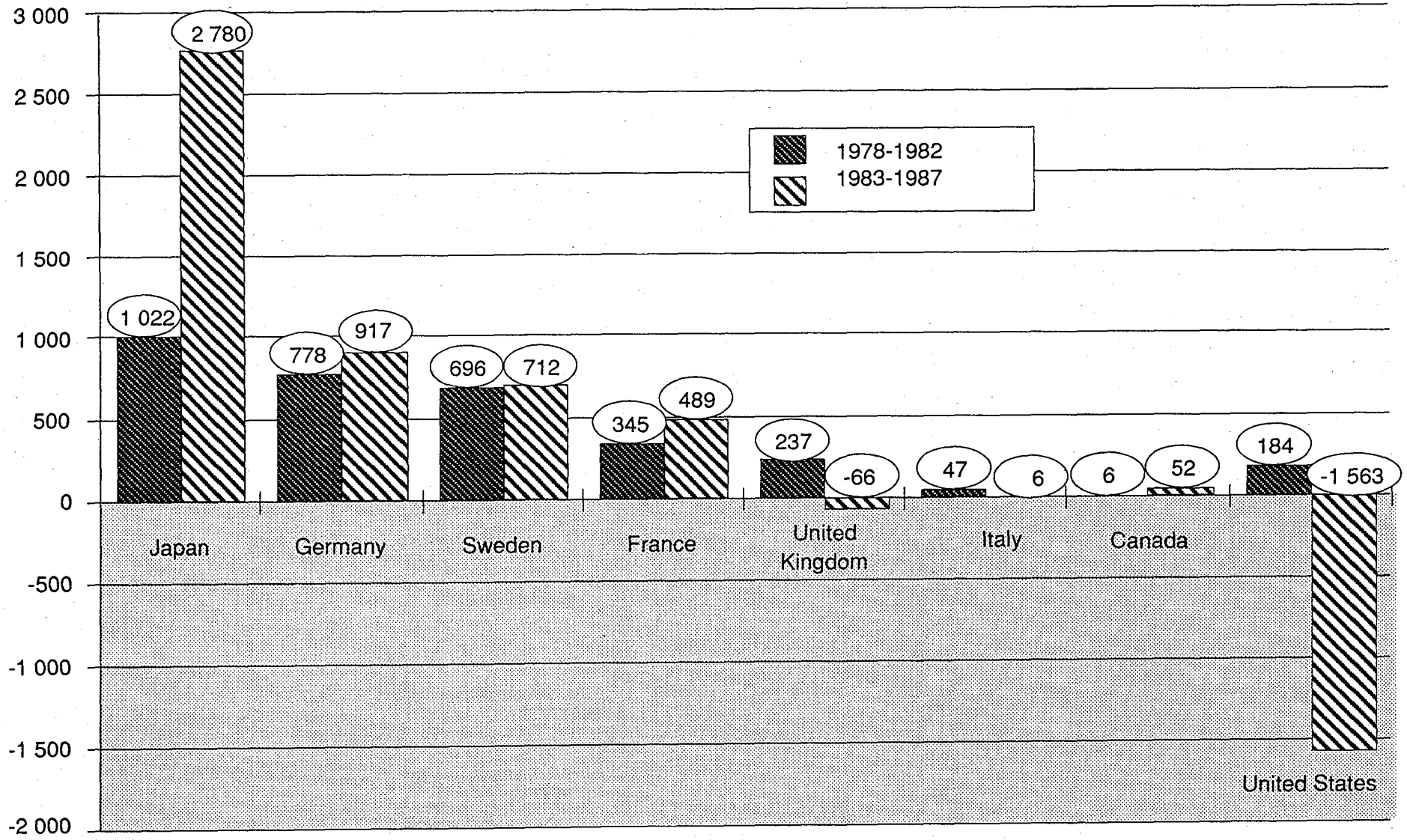
$$\frac{\dfrac{\text{Total telecommunications equipment imports for country X}}{\text{Total manufacturing imports for country X}}}{\dfrac{\text{Total telecommunications equipment imports for OECD}}{\text{Total manufacturing imports for OECD}}} \times 100$$

Source: OECD.

3. Trade Balances

Telecommunications equipment trade balances for OECD countries are shown in (Table 9 in the Annex). In 1987 seven of the twenty four OECD countries held a trade surplus in telecommunications equipment as compared to ten in 1978. Eight countries held a constant trade deficit in the nine year period between 1978-87, while five countries held a constant trade surplus during the same period. Of the main equipment producing countries, Canada, Italy, United Kingdom and the United States had trade deficits in 1987. The pattern of trade deficit in each of these countries was starkly different. In 1978 Canada accounted for the largest trade deficit of any OECD country, quickly rectifying this situation in 1980 by producing a surplus that continued until 1985.

FIGURE III-2. **AVERAGE TRADE BALANCES FOR SELECTED OECD COUNTRIES**
(US$ Million)



Source: OECD Trade Database (NEXT)

The fluctuation in telecommunications equipment investment, which is reflected in trade flows, implies that year-to-year trade balances are less important than the longer-term average balance of trade. The average trade balance between 1978-82 and 1983-87 is shown graphically for the main OECD equipment trading countries in Figure III-2. These tables show that all countries with the exception of the United States, the United Kingdom and Japan, have maintained relatively even balances of trade figures over time. In the case of the United States and the United Kingdom the small positive balance of trade figures for the first period quickly evolved into a negative position in the second period and this was particularly apparent in the United States balance. This is in contrast to Japan which showed a strong positive balance between 1978-82 and continued to outpace all other countries between 1983-87. The United States split up AT&T in 1982 (though not finished until 1984) and the United Kingdom liberalised its telecommunications market in 1984. This change in policy has been looked upon as the catalyst that moved these countries into a deficit position. The liberalisation of type approval and opening of value-added network service markets certainly stimulated customer premise equipment markets, but regulatory changes in type approval have been taking place in most countries before fundamental structural change took place in telecommunication services structures. Liberalisation in these sectors has served to open procurement markets but, in most cases, has not contributed to any significant extent to trade deficits. For example, in switching and line equipment the United States still holds a solid position. The table below indicates for selected products some details of the United States trade balance.

For a number of countries, such as the United States, increased competition in customer premise equipment, including eliminating the requirement that the customer must rent or purchase at least one telephone from the service supplier, has led producing firms to cut costs mainly by locating producing units in low-cost countries. This in itself has also been a factor in increasing the trade deficit to large industrialised countries.

In contrast to the United States, Japan has maintained a surplus in equipment trade with all major OECD producing countries, although, with the exception of the United States, this surplus has been relatively small. The EEC as a whole has shown a poor performance in trade with the OECD area maintaining a constant deficit in trade. The EEC is a major supplier to OPEC, which accounted for its high balance of trade figures for the

Table III-5. **United States: telecommunications equipment trade balance for selected products**

US$ million

	1982	1984	1986	1987	1988
Telephone Switching Equipment and Parts	211.3	–154.8	–7.1	–4.5	160.7
Telephone Instruments	–111.8	–448.8	–895.0	–884.0	–698.8
Other Telephone Equipment and Parts	122.9	–262.3	–174.0	–164.4	–39.7
Telegraph Apparatus and Parts	–74.3	–117.9	–93.7	–351.0	–746.1
Cordless Handset Telephones	–107.4	–259.6	–221.8	–351.3	–394.4
Intercom Systems	–6.0	–7.3	–8.7	–13.1	–8.8
Telephone Answering Devices	–88.6	–108.4	–272.7	–277.5	–372.2

Source: Electronic Market Data Book, EIA, US Department of Commerce.

Table III–6. **Export (X) and import (M) ratios: telecommunications equipment**

	Japan		U.S.		Canada[1]		EEC (8)[2]		Germany		France		U.K.		Sweden	
	X	M	X	M	X	M	X	M	X	M	X	M	X	M	X	M
1979	14.9	0.9	n.a	n.a	45.3	77.8	n.a	n.a	28.3	11.2	11.3	4.8	n.a	n.a	80.3	5.0
1980	14.9	0.8	4.5	3.5	49.1	72.9	20.3	32.5	28.1	11.8	13.1	4.6	n.a	n.a	76.8	6.5
1981	17.7	0.7	4.9	3.8	57.1	79.3	20.9	36.9	32.2	14.6	13.9	4.1	n.a	n.a	65.2	5.5
1982	24.6	0.8	6.2	4.7	50.0	20.1	19.6	34.0	36.9	16.3	17.0	4.6	n.a	n.a	75.9	6.1
1983	23.8	0.8	5.9	9.0	54.4	28.6	21.5	37.4	35.3	16.9	23.1	4.8	14.8	18.9	77.5	6.0
1984	22.9	0.8	4.9	11.5	71.8	30.9	26.8	47.9	35.1	15.7	21.4	4.3	17.2	21.9	85.2	12.5
1985	24.8	1.0	4.6	11.1	66.9	31.0	31.0	48.0	32.1	15.2	22.5	4.7	15.3	20.1	95.0	14.8
1986	22.1	1.1	4.1	10.5	59.4	37.4	25.5	43.1	34.1	15.6	16.8	4.0	13.4	22.5	83.0	17.1
1987	25.7	1.3	3.8	10.2	57.2	38.6	n.a	n.a	38.3	18.7	17.1	5.6	14.0	29.0	77.9	16.7

1. 1979-1981 includes electronic components and other communication equipment.
2. Belgium, Germany, France, Italy, Ireland, the Netherlands, Luxembourg, and the United Kingdom.

Sources: Calculated from data on production, exports and imports.
Japan: Electronics Industries Association of Japan.
United States: Department of Commerce.
Canada: Department of Industry, Science and Technology, Canada.
EEC(8): Eurobit.
Germany: Amtliche Statistik.
France: SI3T, Syndicat des industries du téléphone, du télégraphe et de leurs applications télématiques.
UK: Department of Trade and Industry.
Sweden: SCB, Statistics Sweden.

non-OECD region until the OPEC slow-down in the early 1980s. Though this has had little effect on the figures for the EEC which continues to be the largest supplier to OPEC from within the OECD.

Despite the proven competitiveness of Japanese firms as evidenced by their high penetration of the United States market, they had not been able to penetrate, up until 1985, to any significant extent the more closed European markets. One explanation for this was that they did not regard Europe as sufficiently profitable. Since 1985 the Japanese firms have obtained a large share of the terminal market in the EEC and in 1988 held 44 per cent of the terminal equipment imports to the EC[33]. Firms in the EEC have not made any significant inroads in open markets such as the United States where competitiveness is a much more important factor than in non-OECD markets. Along with the EEC, the United States also has been content with a domestic market large enough in size to diminish the necessity to look abroad to increase their international markets. Recently there have been signs of a shift in this attitude. Ericsson (Sweden), after many years of trying to infiltrate the US market, has recently signed a contract to supply a US BOC (Bell Operating Company)[34] with a large number of switches within the next few years.

Although an examination of trade balances is instructive, it is also worth examining briefly export and import ratios for some countries in order to bring a perspective on the extent to which export trade plays an important role vis-à-vis production and the role of imports in the domestic consumption of telecommunications equipment. The data for some countries are provided in Table III-6.

4. Pattern of Trade

An important aspect of trade performance is how a country's trade position has changed in various markets and in particular whether a country's performance has improved in any of the following markets: non-OECD markets, in OECD markets which are not major telecommunications equipment producing areas and in those which are important producers.

The following paragraphs only give a brief overview of the geographic pattern of trade. These will be examined in more detail when the individual commodity items are analysed. Although in the 1970s a larger share of OECD telecommunications equipment exports went to non-OECD countries (58 per cent in 1978) by 1987 this figure was reduced to 37 per cent largely because of the decreasing importance of the OPEC market coupled with faster growth in some OECD export markets. The United States accounted for almost half of the exports to the world from Japan. This can be linked to the decision by the United States to liberalise its market. The EEC countries have only touched the surface of the US market growing at an average of 17 per cent per year compared to Japan's ability to increase its market share by 33.4 per cent per year over the same period. The share of main export markets by economic zone is shown in Table III-7.

The growth in exports from the Asian newly industrialising economies (NIEs) market looked extremely promising up until 1982, at which point a small but continued down trend appeared. Over the nine year period, the annual growth rate was 2.5 per cent per year but looking at this growth for the past five years (1982-87) shows a decline in growth of –7.6

Table III-7. **OECD telecommunications equipment exports, share by main destination: economic zones**

Percentage

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
OECD Total	42.0	43.0	43.8	44.5	43.9	47.7	55.6	56.9	59.5	63.0
Non-OECD Total	58.0	57.0	56.2	55.5	56.1	52.3	44.4	43.1	40.5	37.0
EEC (12)[1]	20.2	22.5	23.0	22.1	19.0	18.2	17.4	18.2	21.3	25.4
OPEC	26.3	23.7	20.0	19.7	19.9	16.5	12.5	11.8	7.9	6.3
COMECON	1.7	1.3	0.9	1.1	1.0	1.3	1.0	0.9	1.4	1.8
Asian NICs[2]	4.8	5.8	8.4	7.5	8.9	7.5	6.9	6.7	6.1	6.0

1. Includes intra EEC exports.
2. South Korea, Hong Kong, Singapore and Taiwan.
Source: OECD.

Table III-8. **Country share of OECD telecommunications equipment exports**

Percentage

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	TCMA[1]
Belgium/Luxembourg	5.4	4.5	6.1	4.2	3.2	3.1	2.4	2.2	3.4	3.4	–4.5
Canada	2.2	3.4	3.8	4.3	5.3	6.1	7.8	6.9	5.1	4.4	7.2
Finland	0.3	0.5	0.9	1.1	1.2	1.3	1.2	1.3	2.0	2.4	55.0
France	8.2	8.3	8.2	6.8	8.0	9.1	6.9	6.8	6.2	6.1	–2.9
Germany	17.0	16.4	16.2	14.4	13.6	11.7	10.7	10.8	12.4	15.0	–1.2
Italy	3.3	2.9	2.8	2.8	3.3	2.9	2.8	2.9	3.3	3.0	–0.9
Japan	17.6	14.2	14.3	18.9	20.4	24.4	29.2	29.5	32.1	34.2	6.9
Sweden	13.1	13.6	12.4	11.4	11.2	10.4	10.5	11.2	9.7	7.7	–5.2
United Kingdom	7.9	8.2	7.6	8.6	7.2	7.4	7.0	6.8	6.0	5.4	–3.7
United States	13.1	13.5	13.0	14.7	16.7	14.9	13.3	14.1	11.7	9.9	–2.8
Total of above	94.6	93.0	92.4	92.4	92.5	92.9	93.7	93.0	91.7	91.3	–0.4
EEC (12)	51.5	51.9	52.9	46.8	42.7	40.1	35.8	34.7	36.9	38.6	–2.8

1. CAGR: Compound Annual Growth Rate.
Source: OECD.

Table III-9. **Telecommunications equipment imports: main sources**

Percentage

	1978	1980	1982	1984	1985	1986	1987
OECD Total	89.1	88.8	86.0	80.3	82.1	80.9	81.0
Non-OECD Total	10.9	11.2	13.9	19.5	17.9	19.1	19.0

Source: OECD.

per cent per year (Table III-7). Another NIE market, Mexico, has shown important growth at a rate of 11.4 per cent per year.

The relative importance of each individual OECD country as an export market for total OECD exports of equipment is shown in Table 11 in the Annex. A number of factors need noting here – first the significant growth of the EEC as a market for OECD telecommunications exports. One quarter of all OECD exports are shipped to EEC countries, a large part to the United Kingdom. It should be noted that a large amount of the United Kingdom's imports are "entrepot" trade. The United States which was rapidly increasing its share of OECD exports up until 1984 started to pull back and now looks to be levelling off at 18.5 per cent of all OECD exports. OPEC, a large recipient of OECD exports in the 1970's has significantly decreased its imports from the OECD while at the same time the Far East market continues to be important. As regards to the main sources of OECD telecommunications equipment imports, the significant increase since 1978 in the role of non-OECD countries is important.

The early data indicated a deteriorating trend vis-à-vis OECD's share. The sudden change between 1982 and 1984 can mainly be attributed to a surge in US imports of telephones from Taiwan, Hong Kong and South Korea.

The changing import market share of country telecommunications equipment imports is shown in Table 12 in the Annex. For individual countries these trends can be highlighted:

- Canada increased its imports during 1978-87 from Japan from one-tenth to one-third. Consequently, the share of imports from the United States declined. An important increase of imports non-OECD countries occurred also during this period;
- France imports one-fifth of its telecommunications equipment from its neighbouring country Germany. Sweden, which at one time supplied 13 per cent of the imports to France, now only provides 2.3 per cent. A considerable increase of non-OECD imports to France was also noted;
- Germany receives one-third of its imports from Japan, followed closely by the United States. Contrary to Canada and France, the level of non-OECD has stayed somewhat stable, showing little movement in either direction;
- The United States is the major import market for the Japanese, but the share has been declining. Major increases to OECD countries within the EC were also noted. Between 1984 and 1987, Japan increased its exports to Germany and the United Kingdom annually by 97.2 and 56.7 per cent respectively It should be noted that Japan also increased its exports, over the same period, to non-OECD countries annually by 31.8 per cent;

- The largest share of the United States import market is held by Japan whose share was 47.5 per cent in 1987. The non-OECD area accounts for over one-third of the import market share;
- For the EEC, Japan has emerged as a major player since 1985, it now holds a little over one-fifth of the total import market share. By contrast, the United States has reduced its market share since 1985, and now contributes 11.9 per cent of the imports in comparison to Sweden which holds 11.4 per cent of the market. The non-OECD area has remained relatively constant over the period.

Although the main trends and changes in total telecommunications trade are worth noting, it is of more interest to examine in detail the main product categories which show different characteristics in the pattern of trade and better reflect country specialisation.

5. Line Equipment

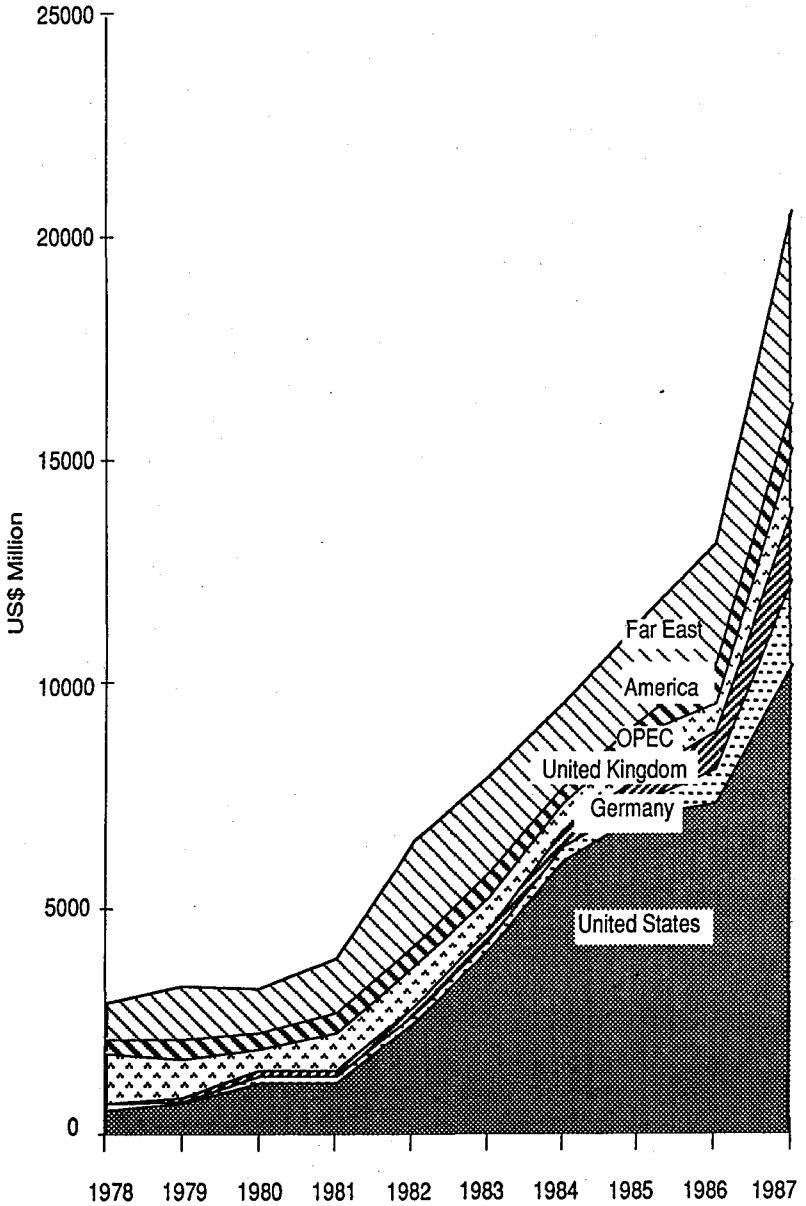
As noted earlier, exports of line equipment constitute the major and most rapidly growing product category in total OECD telecommunications exports. There have been important changes in export market shares for such equipment among the major OECD countries shown in the table below (and Table 13 in the Annex and Figure III-3 and Table III-10):

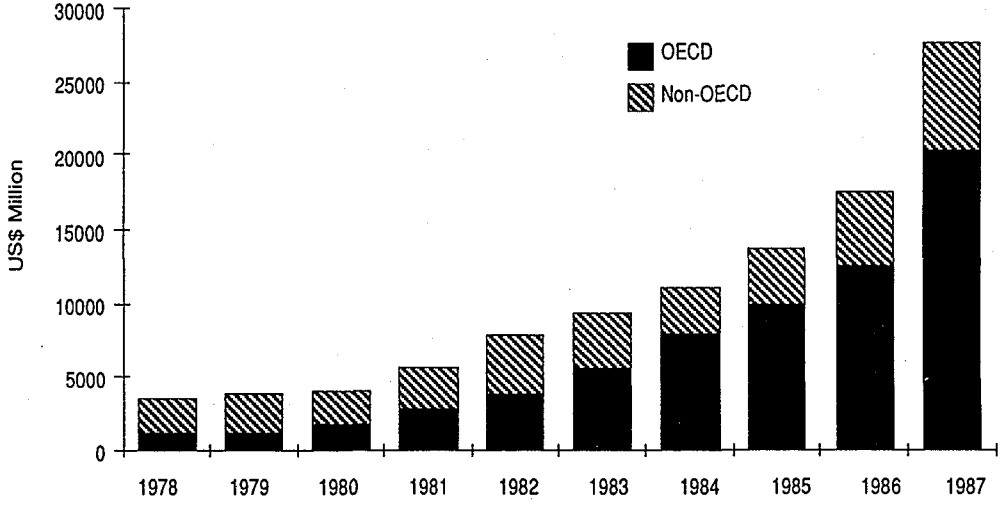
The changes in line equipment market shares have, in particular, entailed a redistribution in the relative position of eight major exporting countries which together maintained a 90 per cent share of total OECD line equipment exports. A strong performance in line equipment exports has been shown by Japan which also had an increasingly favourable balance of trade in line equipment, especially since 1980. The United States' market share increased up to 1982, however, since 1978 it has had a continuous and widening deficit in its balance of trade with the OECD. This deficit in line equipment trade had been compensated, up to 1982, by a sufficiently large surplus with the non-OECD area to provide a positive trade balance. After 1982 there was a significant deterioration in the United States' balance of trade in line equipment resulting mainly from an acceleration of imports of telephones and cordless handsets (see Table III-5 which shows a trade surplus in switching equipment for 1987 but sizeable deficits in telephones, cordless headsets and telegraph equipment).

A considerable loss in market share for line equipment is evident for Germany, and especially the Netherlands over 1978-87. This decline in share is also the main reason for the drastic reduction in market share of the EEC area vis-à-vis Japan and the United States. The United Kingdom has had a negative trade balance in line equipment with the OECD since 1978 (with the exception of 1979) but compensated this deficit up to 1982 with a surplus from the non-OECD area. Both Italy and Switzerland have managed to show slight increases in their share of line equipment exports while France has shown a minor decrease, but retaining a balance of trade surplus resulting in particular from an expansion of non-OECD trade.

There is a marked contrast between the export market share of line equipment by major countries and their share as receiving countries in total OECD line equipment to the OECD area (Table 14 in the Annex). The rapid increase in market share the United States

Figure III-3. **MAJOR JAPANESE EXPORT MARKETS : LINE EQUIPMENT**



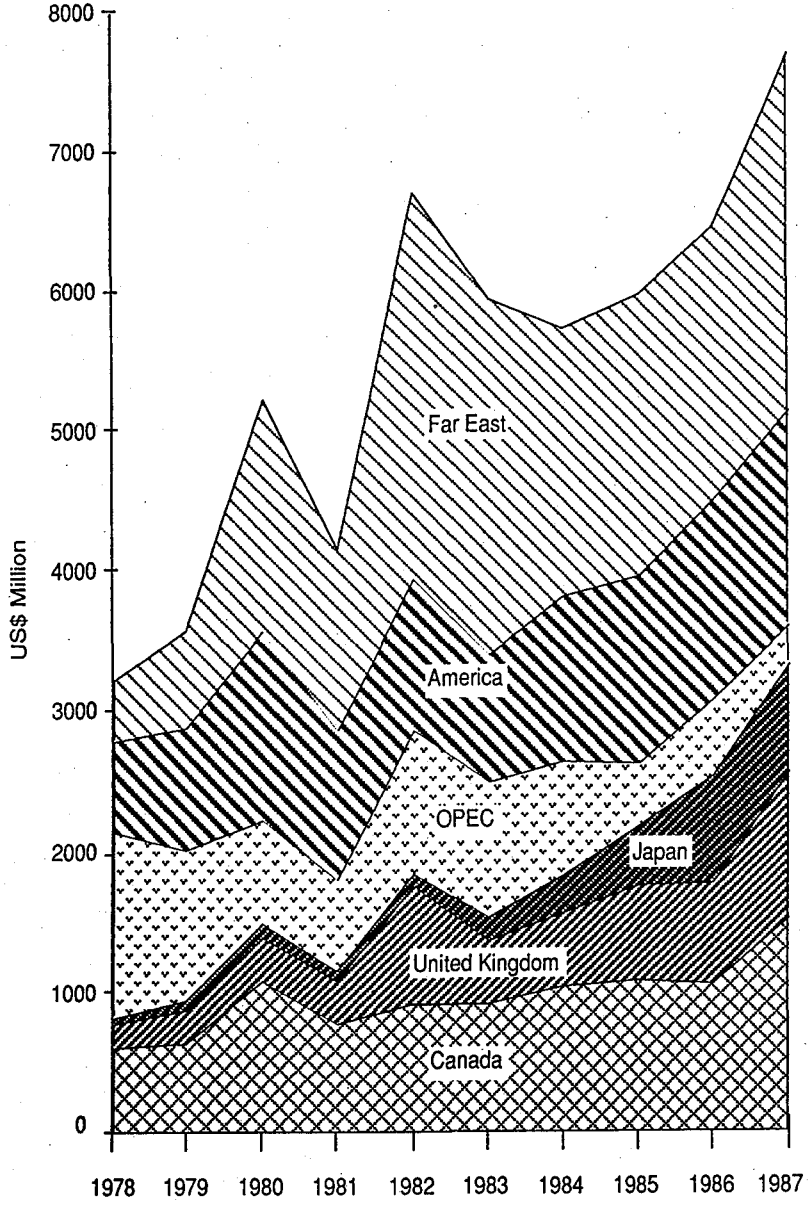


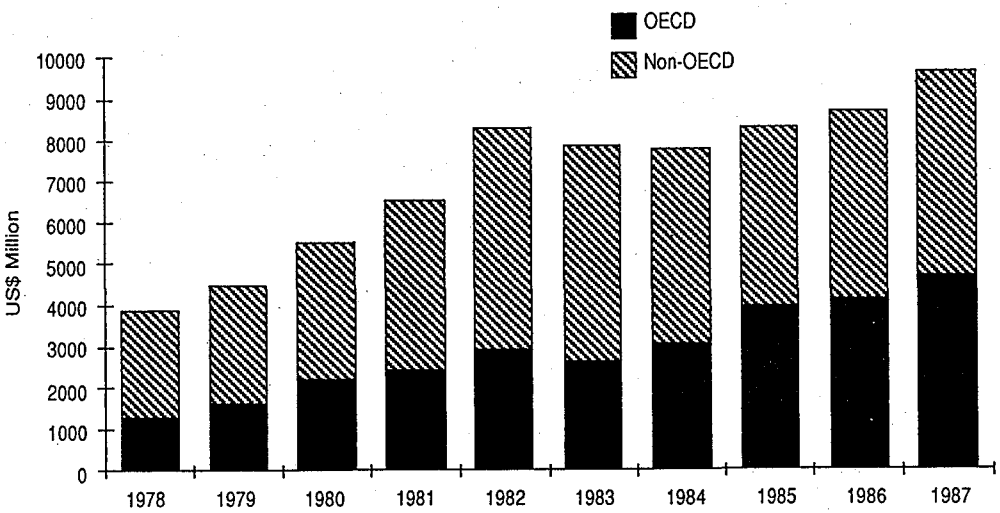
Japan - Trade Data
US$ Million

	1978	1981	1984	1987
World Total	358.6	566.5	1 119.0	2 765.4
OECD Total	109.1	280.7	797.0	2 029.3
United States	58.2	177.0	613.2	1 042.5
Germany	10.4	16.4	25.2	193.3
United Kingdom	1.5	14.2	42.2	162.3
Non-OECD Total	249.5	285.8	321.9	736.1
OPEC	115.2	82.5	57.1	131.0
Saudi Arabia	10.2	9.3	17.9	17.9
Venezuela	30.3	26.4	2.6	28.1
America	27.8	40.6	40.7	101.5
Columbia	4.2	5.0	5.4	22.6
Far East	80.3	124.9	187.3	430.4
Hong Kong	5.2	10.9	27.7	131.0
Taiwan	13.6	7.5	14.3	47.2
India	2.0	31.7	14.4	28.9
China	0.2	6.8	17.4	108.3

Source: OECD Trade Database (NEXT)

Figure III-4. **MAJOR UNITED STATES EXPORT MARKETS : LINE EQUIPMENT**



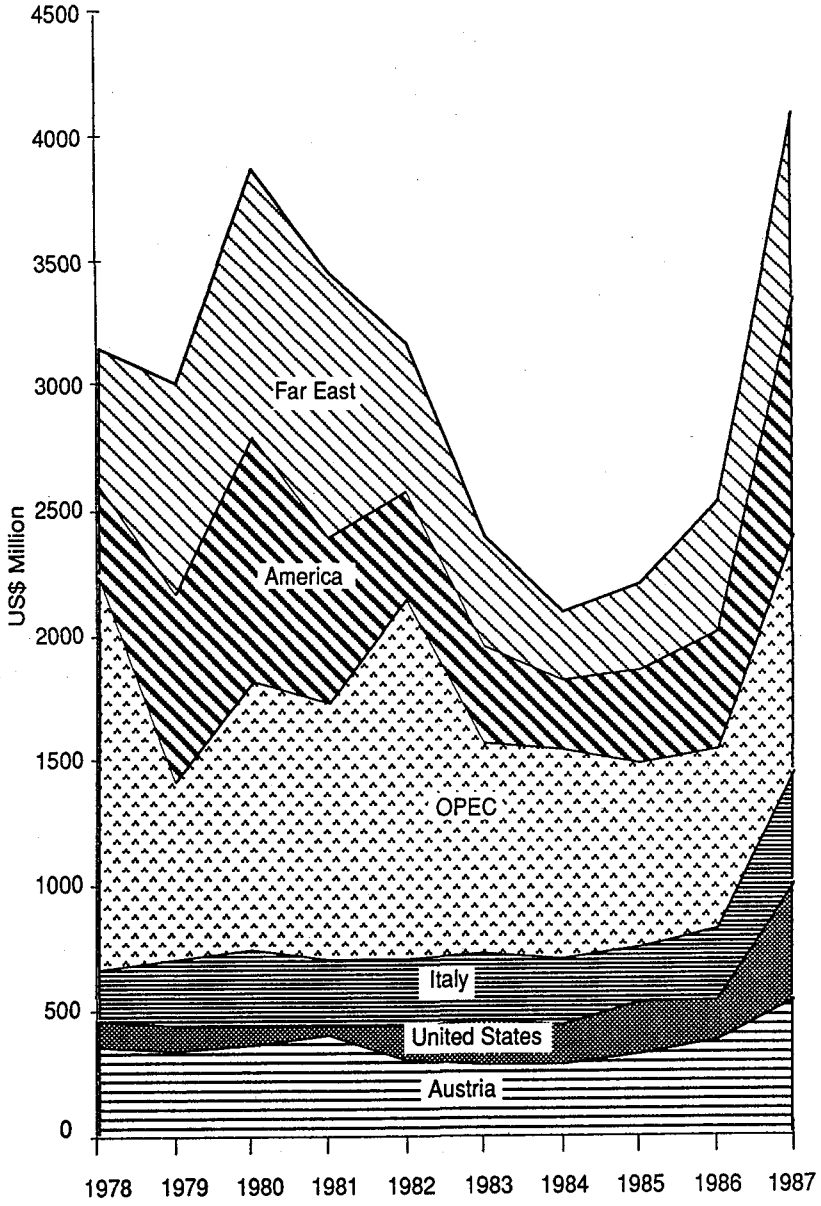


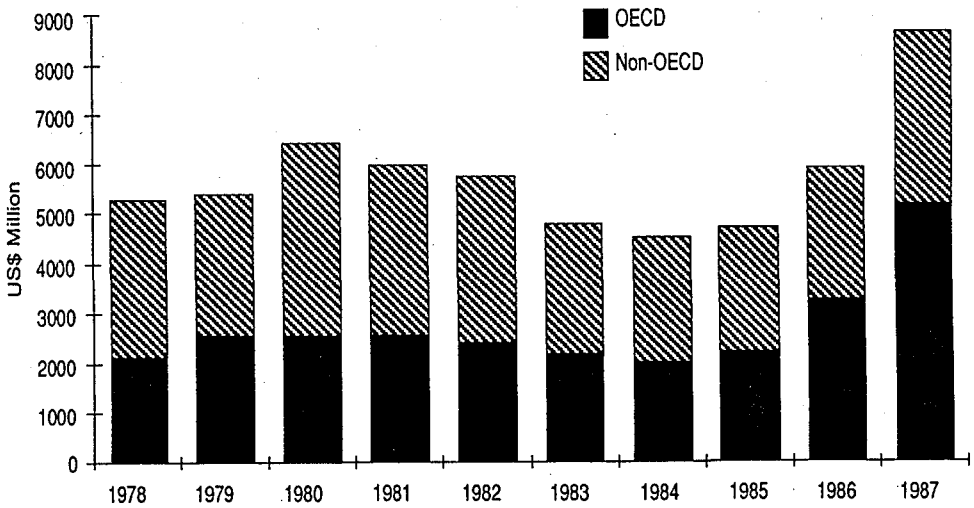
United States - Trade Data
US$ Million

	1978	1981	1984	1987
World Total	388.2	653.2	777.3	964.5
OECD Total	128.2	240.2	306.8	466.8
Canada	60.5	109.5	105.2	151.4
United Kingdom	16.8	31.8	51.3	105.1
Japan	6.3	8.2	26.8	76.6
Non-OECD Total	260.0	413.0	470.5	497.7
OPEC	130.9	73.8	80.5	26.4
Saudi Arabia	60.3	40.0	60.5	9.2
America	63.8	135.6	118.4	154.9
Mexico	7.1	54.5	54.2	88.1
Far East	43.1	164.2	192.1	256.3
South Korea	6.1	66.9	102.3	36.7
Taiwan	18.0	38.1	23.5	103.1

Source: OECD Trade Database (NEXT)

Figure III-5. **MAJOR GERMAN EXPORT MARKETS : LINE EQUIPMENT**



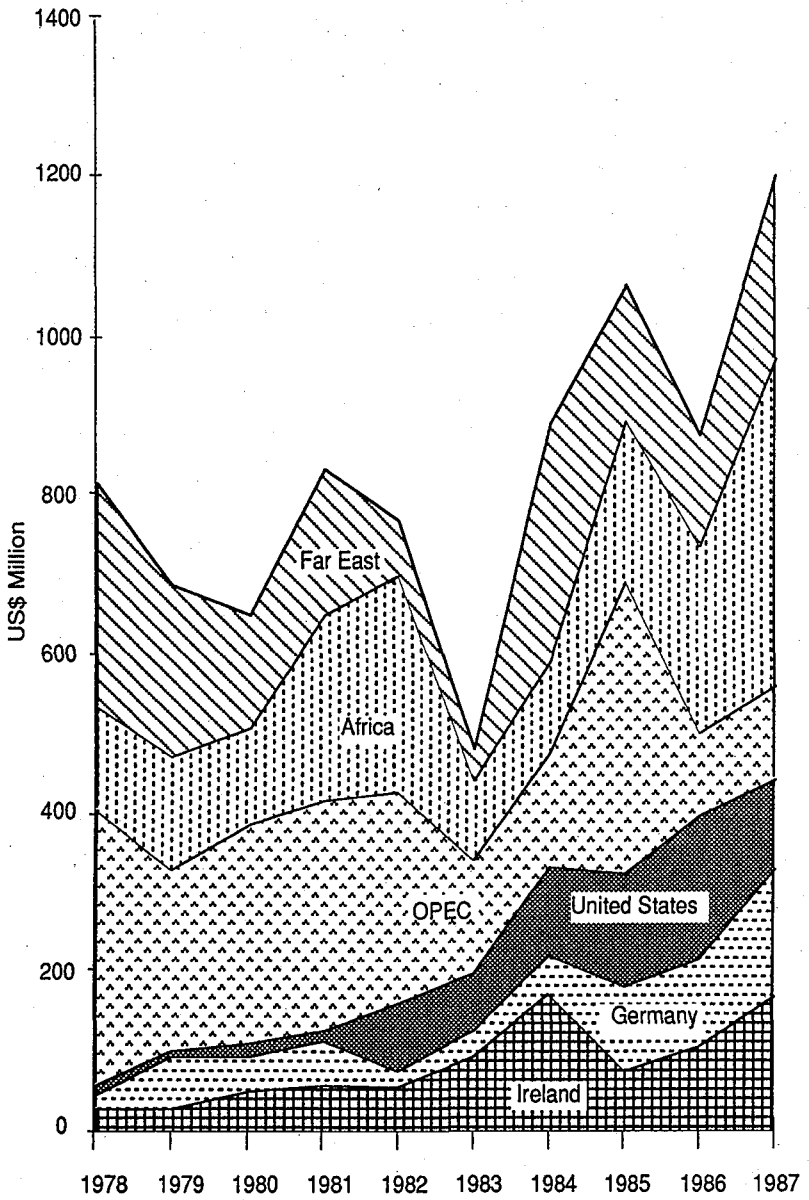


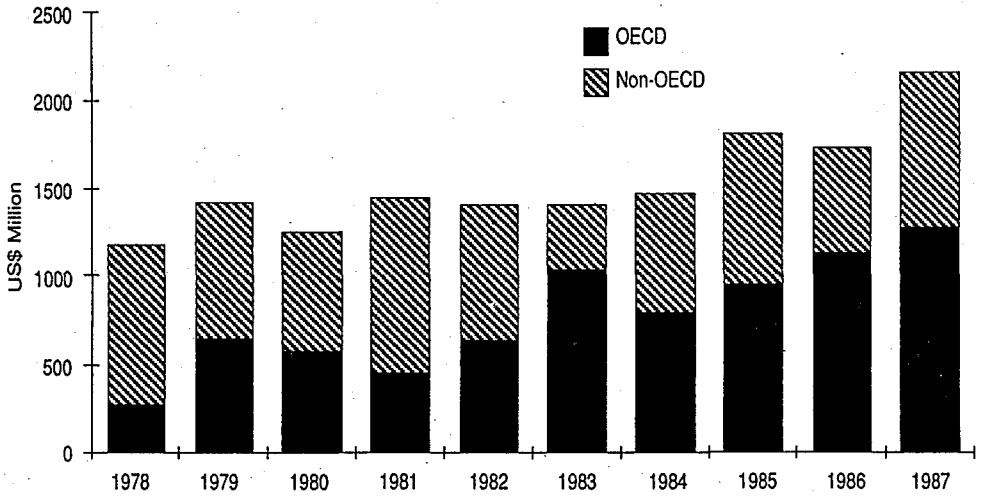
German - Trade Data
US$ Million

	1978	1981	1984	1987
World Total	528.2	595.8	452.6	864.9
OECD Total	215.0	255.0	203.5	516.7
Austria	35.1	40.6	28.8	54.3
United States	11.1	4.3	16.7	45.7
Italy	20.2	25.8	25.0	45.1
Non-OECD Total	313.2	340.8	249.1	348.2
OPEC	157.7	101.9	84.0	94.1
Libya	45.2	26.7	5.5	7.4
Saudi Arabia	10.8	10.9	5.5	5.3
Iran	17.1	16.8	31.1	20.1
America	36.9	66.1	28.5	95.7
Argentina	8.0	32.9	12.9	49.9
Far East	54.7	107.5	26.6	74.1
Hong Kong	17.7	28.4	4.9	0.6
Philippines	1.4	64.4	6.3	1.7

Source: OECD Trade Database (NEXT)

Figure III-6. **MAJOR UNITED KINGDOM EXPORT MARKETS : LINE EQUIPMENT**



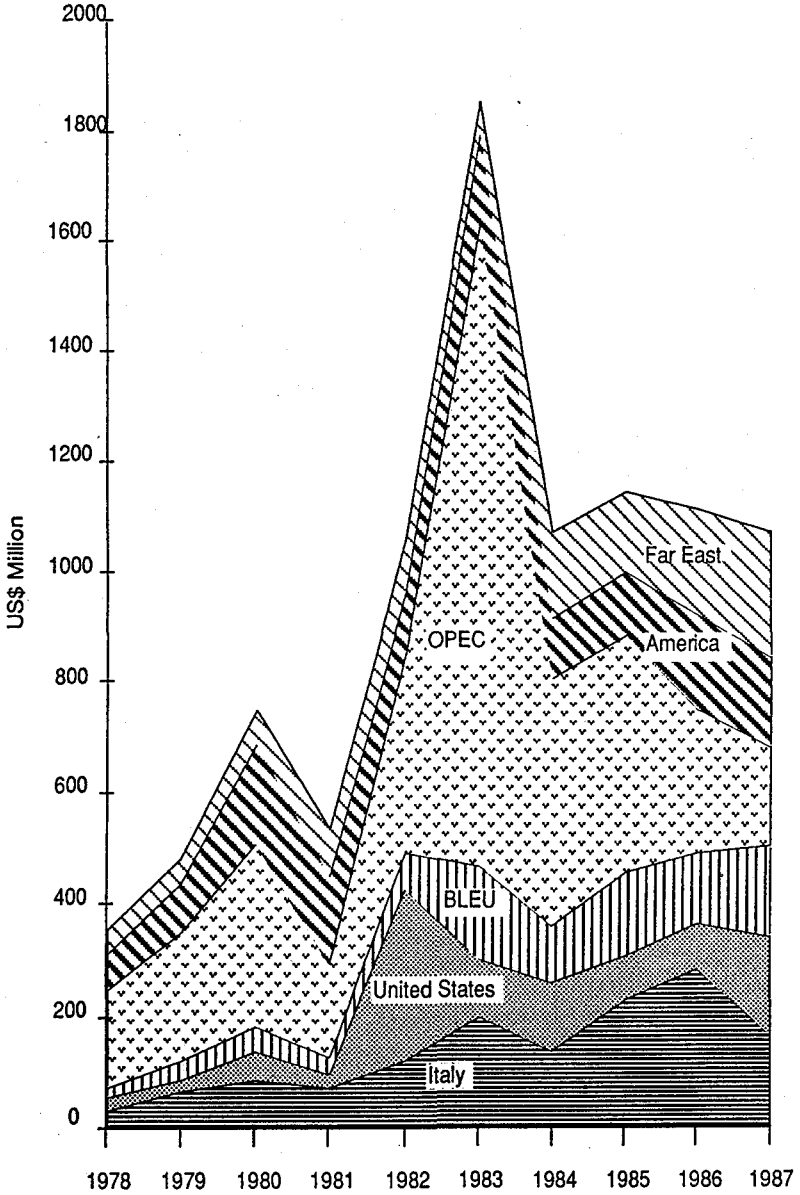


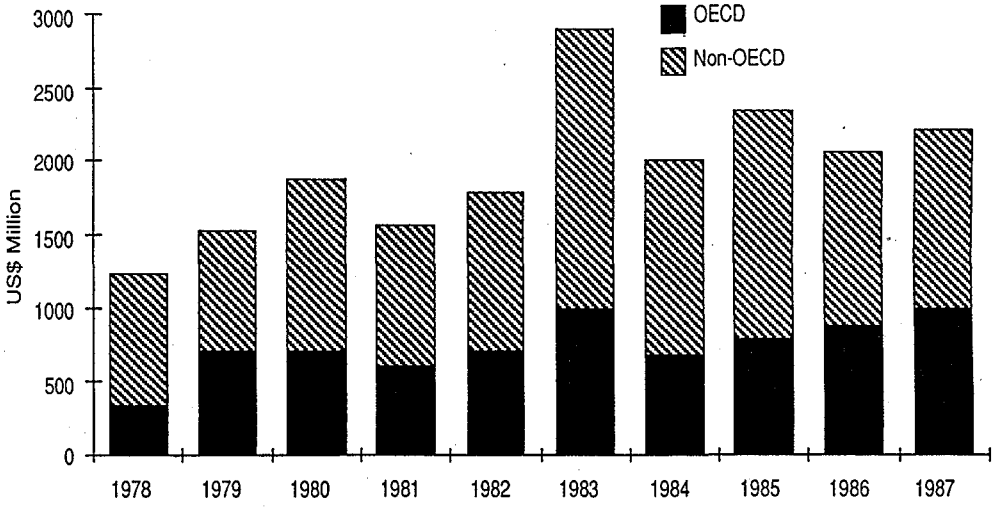
United Kingdom - Trade Data
US$ Million

	1978	1981	1984	1987
World Total	118.0	145.2	147.2	215.1
OECD Total	28.4	45.3	79.8	127.8
Ireland	3.3	6.2	17.4	17.1
Germany	1.9	5.3	4.7	15.8
United States	0.9	1.4	11.3	11.2
Non-OECD Total	89.6	99.9	67.4	87.3
OPEC	34.4	28.9	14.1	11.7
Saudi Arabia	3.3	11.2	4.1	3.7
Africa	13.3	23.3	11.9	41.3
Kenya	0.6	1.4	1.8	30.4
Far East	28.0	18.3	29.8	23.1
Singapore	10.9	1.5	13.7	5.2
Hong Kong	4.4	13.7	14.3	5.9

Source: OECD Trade Database (NEXT)

Figure III-7. **MAJOR FRENCH EXPORT MARKETS : LINE EQUIPMENT**



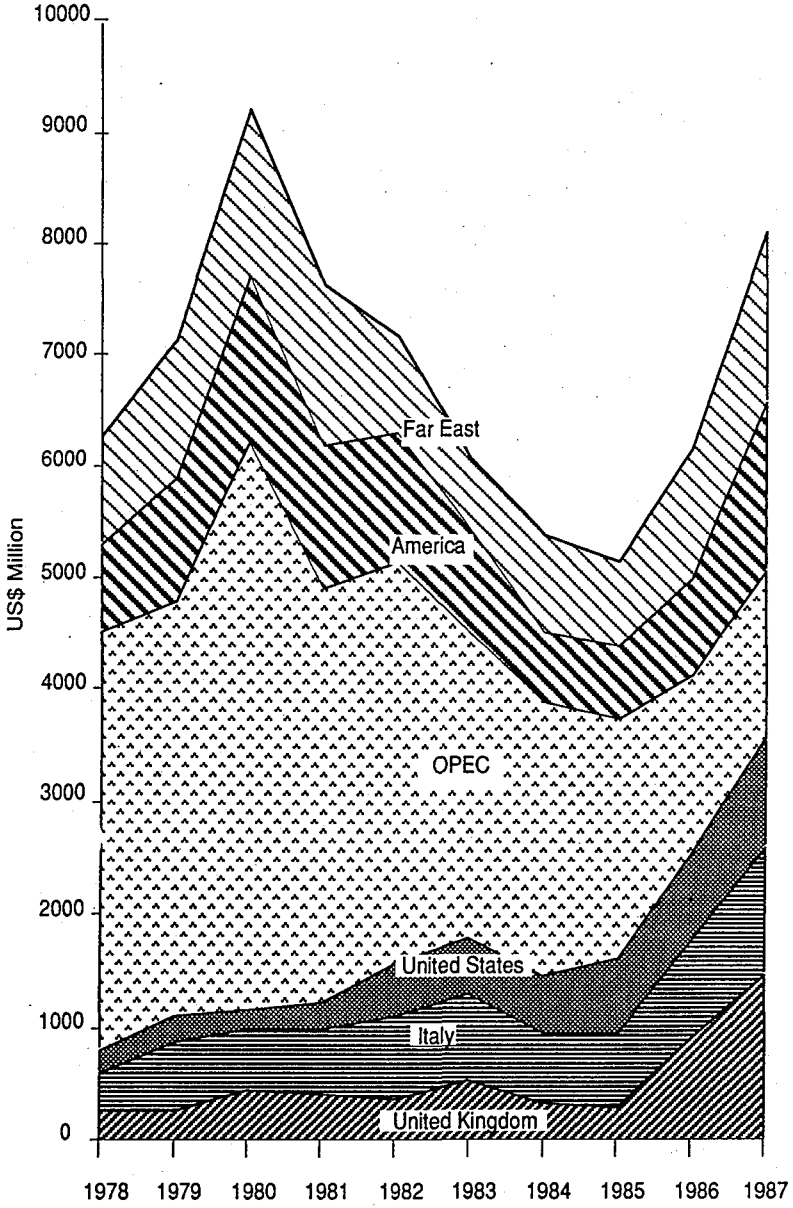


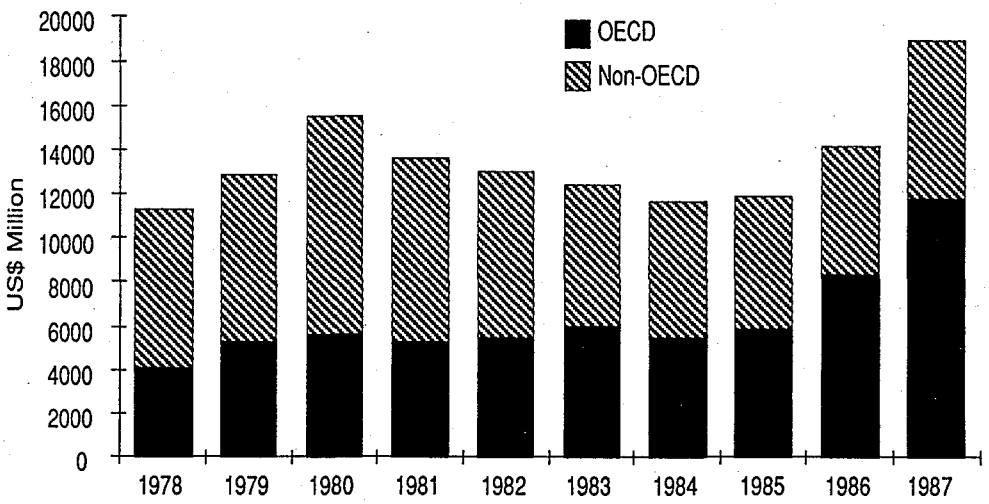
France - Trade Data
US$ Million

	1978	1981	1984	1987
World Total	124.5	156.5	200.7	221.4
OECD Total	34.0	60.3	68.8	99.9
United States	2.2	2.6	12.3	17.7
Italy	3.3	7.4	14.0	16.7
BLEU	2.1	2.8	9.8	16.1
Non-OECD Total	90.5	96.2	131.9	121.5
OPEC	17.7	16.6	45.2	17.8
Iraq	0.5	0.8	21.0	1.9
America	6.2	15.9	10.5	16.6
Far East	4.2	8.4	15.9	22.8
India	0.0	0.0	0.1	10.6
Taiwan	0.0	6.0	1.3	1.0

BLEU : Belgium / Luxembourg Economic Union
Source: OECD Trade Database (NEXT)

Figure III-8. **MAJOR EEC (12) EXPORT MARKETS : LINE EQUIPMENT**





EEC(12) - Trade Data
US$ Million

	1978	1981	1984	1987
World Total	1 136.7	1 369.4	1 164.5	1 897.8
OECD Total	417.1	537.6	548.7	1 184.6
United Kingdom	29.0	44.8	34.9	148.3
Italy	32.8	55.1	63.7	113.3
United States	19.8	24.8	50.5	94.9
Non-OECD Total	716.9	831.6	615.7	713.0
OPEC	370.7	366.7	242.4	151.2
Saudi Arabia	131.3	188.4	92.3	19.6
Africa	110.6	132.6	148.2	191.4
South Africa	31.7	44.9	60.8	47.8
Egypt	17.6	12.6	23.7	18.6
America	78.9	129.7	63.5	153.2
Argentina	11.6	44.7	22.1	52.2
Far East	96.5	145.7	86.5	152.0
Hong Kong	22.4	44.5	21.3	12.1
Singapore	18.0	7.1	25.3	24.9

Source: OECD Trade Database (NEXT)

Table III-10. **Line equipment export market shares: major countries**

Percentage

	1978	1980	1982	1984	1985	1986	1987
Canada	4.5	7.6	9.8	14.9	13.2	10.0	8.0
France	5.0	5.5	4.5	4.6	5.0	3.9	3.1
Germany	21.4	18.9	14.5	10.4	10.0	11.1	11.9
Japan	14.5	11.7	19.9	25.6	29.4	32.9	38.1
Netherlands	9.2	10.9	4.2	2.7	2.4	3.0	3.4
Sweden	15.5	14.1	12.3	11.5	11.0	9.9	8.9
United Kingdom	4.8	3.7	3.5	3.4	3.9	3.2	3.0
United States	15.7	16.4	20.9	17.8	17.7	16.3	13.3
Total of above	90.6	88.8	89.6	90.9	92.6	90.3	89.7
EEC (12)	46.1	45.9	33.1	26.7	25.5	26.7	26.2

Source: OECD.

showed between 1978-84 should be noted. After 1984, the United States' position started to show a constant retreat, which is in contrast to the EEC which has shown a steady rise in OECD export line equipment market share since 1984. All EEC countries with the exception of Greece and Ireland showed a partial recovery in market share between 1984-87, most notably the United Kingdom, Germany and the Netherlands. In terms of the non-OECD market the regional distribution of line equipment exports has undergone important changes (Table 15 in Annex). Most notably the constant decline in the OPEC area as a viable market and the increase in the market for the NIEs (Newly Industrialised Economies), of which most of this increase is mainly a result of the NIE's in the Far East[35].

The market share by region for line equipment exports by the EEC(12), Japan, the United States, France, Germany and the United Kingdom is shown in Figure III-3. Several observations deserve noting:

- Except for the case of Japan, the non-OECD area has been a major market up to the early 1980s, mostly due to the OPEC influence. After 1981, a levelling off is observed and in some cases an actual decline in exports to the non-OECD area, [i.e. EEC(12), France and the United Kingdom];
- Japan's major line equipment export market is the OECD area of which 51 per cent of this market is accounted for as exports to the United States. Japan has also built up a considerable market presence in the Far East area (mainly with the Asian NIEs);
- The poor performance of the EEC in line equipment exports until 1987 is evident. The penetration of EEC-based firms outside the in other than internal EEC market has been especially low with, for example, minimal growth in the United States market contrasting sharply with the performance of Japanese firms in that market. Similarly, the EEC has been unable to obtain an important market share in the fast growing Far East market. Its export growth first stagnated, then declined in both OECD and non-OECD markets until 1985. The increase in the EEC after 1985 is due mainly to the increasing presence of Germany in the world market. Germany

increased its exports of line equipment in both the OECD and non-OECD markets, most notably to the United States, Argentina and the Far East areas. The peak in 1983 of French line equipment exports to OPEC, reflected a large delivery to Iraq equivalent to 30 per cent of its line equipment exports for that year.

Canada's line equipment exports increased from $111.4 in 1978 to $581.9 in 1987 with 59 per cent of all exports destined for the United States in 1987. During 1978-87 Canadian line equipment markets also expanded steadily in other OECD countries (e.g. Turkey and the United Kingdom). Between 1978 and 1984 some far East Asian countries (Malaysia, Singapore and South Korea) showed steady rises in exports of line equipment from Canada but have lost ground during 1985-87. Canada was a minor supplier to OPEC during the late 70s and early 80s, therefore was cushioned from the 1980-81 decline in that market.

6. Telephone/Telegraph Transmitters

Nearly one quarter of OECD telecommunications exports are accounted for by trade in telephonic/telegraphic transmitters. Over the period of 1978-87, exports of this product category have grown at 8.7 per cent per year, less than the average for total telecommunications equipment. Imports have grown at an annual average of 10.5 per cent per year over the period 1978-87. Export market shares are highly concentrated between the following countries:

- Germany shows a major change in terms of market share starting in 1986. By the end of 1987 Germany held one-fifth of the OECD exports of telephone and telegraphic transmitters to the world. Weakened positions during the period of 1978-87 appeared for France, the United Kingdom and the United States while Japan showed continued rise until 1987.

Table III-11. **OECD Exports of telephone/telegraph transmitters: market shares by major countries**

Percentage

	1978	1980	1982	1984	1985	1986	1987
France	13.8	13.8	13.6	8.0	7.3	6.8	8.5
Germany	11.0	12.9	10.3	11.1	9.8	13.0	21.3
Japan	27.2	23.7	24.9	31.9	33.6	37.5	34.5
United Kingdom	14.3	15.8	13.8	17.2	13.8	12.0	9.9
United States	18.9	18.5	21.6	15.9	19.9	13.3	9.9
Total of above	85.2	84.7	84.2	84.1	84.4	82.6	84.1
EEC (12)	50.1	53.2	47.1	47.3	39.9	42.9	48.7

Source: OECD.

- All major exporting countries showed positive balance of trade tables with the exception of the United States who carried a negative balance between 1984 and 1987. France showed a constant negative balance for OECD trade, which was offset by a large positive balance in non-OECD countries. Since 1980 this same scenario appeared for the United Kingdom, except 1984, while the United States carried a negative balance within the OECD for the period 1984-87.
- Canada has had a growing deficit in its trade balance in this item reaching $404 million in 1987.

7. Telephone/Telegraph Receivers

Telephone and telegraphic receivers account for approximately 2.5 per cent of OECD telecommunications exports. Export market shares have altered significantly with Japan in particular taking a lead role.

The major trade changes and trends can be briefly highlighted:

- The United States holds the largest OECD import market share for telephone and telegraphic receivers (66.3 per cent) followed by the United Kingdom (5.5 per cent), Japan (5.0 per cent) and Germany (4.6 per cent).
- The United States carries a substantial deficit in trade of this product. In 1987 the trade deficit was $392 million (Table 18 in Annex). This deficit appeared in both OECD and non-OECD markets. The EEC carried a deficit with the OECD area but shows a surplus in trade with non-OECD countries, yet still shows a total deficit of $31.8 million.
- Japan continues to make headway capturing almost 50 per cent of the export market for all telephone and telegraphic receivers in 1987.

Table III-12. **OECD exports of telephone/telegraph receivers market share by major country**

Percentage

	1978	1980	1982	1984	1985	1986	1987
Germany	18.9	10.8	16.7	11.5	8.8	16.4	12.4
Japan	25.2	28.5	33.6	51.5	55.1	45.9	49.4
United Kingdom	13.6	20.2	20.0	8.1	9.1	10.3	9.5
United States	17.7	16.6	13.6	16.2	13.9	14.5	15.4
Total of above	75.4	76.1	83.9	87.3	86.9	87.1	86.7
EEC (12)	53.4	50.6	51.6	28.7	25.9	33.3	29.7

Source: OECD.

8. Line Equipment Parts

This product item encompasses parts, not elsewhere specified, for electrical line telephonic and telegraphic apparatus. One-fifth of telecommunications equipment exports is accounted for by this product category. Due to differences in country trade classification procedures, data for this product category is not always available separately (e.g. Canada, Switzerland and the United States). Major declaring country exporters include:

- All major exporting countries run large positive trade balances in this commodity (Table 19 in the Annex), an important part of which can be attributed to trade with the non-OECD area;
- The leading OECD line equipment parts importing countries in 1987 were the United Kingdom (17 per cent) followed by the Netherlands (10.6 per cent), Italy (9.4 per cent) and Germany (8.0 per cent).

Table III-13. **OECD line equipment parts exports: market shares selected countries**

Percentage

	1978	1980	1982	1984	1985	1986	1987
Belgium	18.3	20.7	10.4	7.2	7.7	10.7	12.6
France	9.0	8.7	12.2	12.0	11.3	11.1	12.5
Germany	15.3	14.7	14.7	11.0	13.9	14.1	17.1
Japan	12.1	8.7	14.0	32.0	22.5	23.9	21.5
Sweden	22.6	20.4	20.0	17.6	22.0	17.8	11.4
Total of above	77.3	73.2	71.3	79.8	77.4	77.6	75.1
EEC (12)	63.2	67.2	62.1	46.6	51.6	53.3	62.4

Source: OECD.

IV. CONCLUSION

The most important change which has occurred in trade during the period of 1978-87 is the significant growth in imports since deregulation of telecommunication service markets in the United States in 1982 and in the United Kingdom in 1984.

The United States shows its largest percentage growth the two years just following deregulation (see Table IV-1) after which the growth drastically fell in 1984-85 and continued on a downward trend. Much of the 1982 growth can be linked with the importation of telephone sets, PBXs and other customer premise equipment as a result of the complete liberalisation of this market following Computer Inquiry II in 1980. The United Kingdom did not show a significant rise in imports until three years after deregulation. This slow rise in imports can be somewhat linked to the flooding of the PBX market just prior to deregulation.

Regulatory policies vary widely between countries which have wide sweeping effects on the operation of the telecommunications network, standard setting, type-approval procedures and in the provision of services. Delays in type-approval, duplication of testing in certain instances, vague type-approval criteria and in some cases the need to seek approval on an installation by installation basis all have obvious and direct trade implications.

Changes are taking place which are easing the impact of type-approval procedures and standardisation on trade. For example a 1985 OECD study noted the time delays experienced in obtaining type approval ranged from an average delay of 6-8 months in the United States, two months for Japan, six months for Germany and one year for France[36]. In the latest update the tables showed major improvements in time delays for Germany and France now showing four months and five months respectively. Another example, as a result of bilateral negotiations between the United States and Japan, the Japanese Ministry of Posts and Telecommunications agreed to accept foreign manufacture-generated test data for customer-premise interconnection equipment and have eliminated certain requirements

Table IV-1. **Import growth per year**

Percentage

	1978/79	1979/80	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86	1986/87
United Kingdom	27.9	33.1	28.7	5.2	22.8	5.7 *	25.2	23.5	53.8
United States	–3.2	19.3	27.4	12.3 *	61.7	56.6	17.8	15.1	10.9

* Deregulation occurred.
Source: OECD.

for tests on equipment. In regards to standards we are seeing a definite link in possible research and development funds and standardisation in Europe. The Research on Advanced Communications in Europe (RACE) imposes upon its member countries an unprecedented standardisation effort mostly linked to the future European network to be installed[37].

The economic role of standards and their impact in telecommunications is getting increasing attention by governments and firms. Although standards are evidently necessary to facilitate compatibility between equipment and to ensure interoperability, they can also be used to ensure exclusivity of a network to a defined group. There is, however, recognition now by governments especially in Europe that common standards are needed and are beneficial to domestic firms by widening their market opportunities. Europe opened the TRAC (Technical Recommendations on Applications Committee), a centre for certifying equipment in 1987 followed by the creation in April 1988 of ETSI (European Technical Standard Institute). Of ten European Telecommunications Standards (NET), two have been in effect since July 1989 and will become compulsory throughout the EEC after a transition period[38].

An important principle of international trade is that of reciprocity. The liberalisation of telecommunications equipment markets in the United States and the United Kingdom has attracted many OECD equipment producing countries with their ease of entry. However, the position of many firms in the United States and in the United Kingdom may become increasingly untenable in that they cannot expect to continue taking advantage of these markets when a reciprocal opportunity does not exist in their national markets.

The market structure of telecommunications equipment in a country and the trade pattern for its equipment directly reflects the requirement to meet service demands and is consequently dependent on the structure of the telecommunications service framework. This does not imply that direct trade instruments are not important, however, it needs stressing that many of the issues which become apparent in trade are often not trade policy based but derived from regulatory policy and need to be understood in the context of the telecommunications service framework.

In terms of direct trade instruments, tariff rates on equipment vary widely by country and according to the type of equipment. Export credits have also played an important role in promoting sales of telecommunications equipment particularly to non-OECD countries. Broadly defined, an export credit arises whenever a foreign buyer of exported goods or services is allowed to defer payment[39]. For the OECD as a whole, telecommunications export credits as a percentage of total telecommunications exports to non-OECD markets is as follows:

	1979	1980	1981	1982	1983	1984	1985	1986	1987
Total OECD	10.4	32.8	29.3	17.3	25.5	19.7	17.4	12.7	18.3

Source: OECD Trade Directorate.

Table IV-2 will give a clearer picture of exactly how much aid is given in the form of export credits by individual OECD countries to non-OECD countries.

It is worth noting that in 1984 35.5 per cent of the total OECD export credits to non-OECD countries went to the NIEs. Between 1985 and 1988 almost no export credits were

Table IV-2. **Export credits in the communications sector five year credit or over to non-OECD countries**[1]

In Special Drawing Rights millions

	1984	1985	1986	1987	1988
Canada	154	–	14	12	99
Denmark	–	–	–	8	–
France	178	102	123	107	133
Germany	1	70	23	102	104
Italy	20	14	3	2	38
Japan	34	116	16	129	41
Netherlands	12	7	2	–	–
Norway	–	–	–	4	–
Spain	–	–	9	5	2
Sweden	122	136	181	36	96
Switzerland	–	–	18	–	3
United Kingdom	140	–	–	–	15
United States	21	16	99	162	58
Total	682	497	499	567	589

1. Countries not listed reported no five year export credits in the communications sector during this time period.
Source: Creditor Reporting System Forms 1c.

given to the NIEs. During the same time period no export credits were given to Eastern European countries until 1988 when France credited 22 SDR million to the East Bloc.

The past decade has shown substantial changes in the pattern of telecommunications trade. It is evident that the more industrialised countries have increased their imports faster than that of the developing world, while it was those industrialised countries who first liberalised their telecommunications markets who showed the most significant import growth. This import growth, in general, appeared at the low end of the product spectrum. It was the NIEs who showed their competitive strength in this area, supplying most of this increase in the CPE market.

In reviewing the major points of this trade exercise, we have seen a major redistribution of export market share of telecommunications line equipment for the eight major exporting countries. Germany held the highest market share in 1978 followed by the United States and Sweden. By 1984 Japan had repositioned itself from number four to number one showing an eight point advance on the United States, then number two. After 1984 the positioning remained relatively stable but the point spread between the top two countries, Japan and the United States, increased to 24.8 per cent. The majority of this difference resulted from the acceleration of imports of telephones and cordless handsets, after the elimination of the regulation that the first telephone must be rented from the local PTO.

Germany's loss in line equipment market share, was counterbalanced by a growth in telephone/telegraph transmitters. In 1978 Germany ranked fifth in market share but by 1987 was second to Japan. Japan has held the largest market share on exports of telephone/telegraph receivers, cornering almost half the total export market.

Changes in regulatory policy have influenced trade but in general, the changes in trade patterns over the past ten years were due to a complex set of conditions and cannot be looked at as solely produced by the change in regulatory policy.

Future trade data issued under revision 3 will give us a better idea of changing trends in telecommunications equipment. The ability to break out switching equipment from telephone handsets will provide more detailed data for better study. At the time of publication, 1988 data was available, therefore the appendix tables have all been updated to reflect this new data. Time did not allow the updating of tables located in the text.

Notes and References

1. RACE is the second-largest program within FRAMEWORK, an European Community R&D programme. It is focused on building a broadband telecommunications network in the Community.
2. Good data on market size do not exist and it is difficult to reconcile various data made available by market consultancy companies. Often a different coverage is used to define the equipment industry, different sources and different exchange rates. Official statistics do not provide timely market data. It is also increasingly difficult to refer to a homogeneous group of "telecommunications equipment" and to differentiate between network equipment, data communications equipment and office automation equipment.
3. For example, Robert A. Sayles Associates estimates the market at $115 billion. The EEC estimates it to be $60 billion.
4. *Economist,* February 25, 1989.
5. F. Ringling, (28th August 1989) "Going Global", *Telephony.*
6. Exclusion from the world market was total for Western Electric (AT&T) by legal constraints until 1st January 1984. The seven US BOCs are presently constrained from equipment production.
7. For the OECD as a whole telecommunications export credits as a percentage of total telecommunications exports to non-OECD markets were 25.5 per cent in 1983, 17.7 per cent in 1985 and 18.3 in 1987.
8. T. Schnöring, *Research and Development in Telecommunications, an International Comparison,* Wissenschaftliches Institüt für Kommunikationsdienste der Deutschen Bundespost (WIK).
9. G. Dang Nguyen, *European R&D Policy for Telecommunications,* WIK.
10. T. Schnöring, *Research and Development in Telecommunications, an International Comparison,* WIK.
11. G. Dang Nguyen, *European R&D Policy for Telecommunications,* WIK.
12. F. Hills, (1986), *Deregulating Telecoms,* Frances Pinter, London.
13. Arthur D. Little (August 1988), *Central Office Switching Equipment: Regional Market Opportunities and Issues,* Spectrum.
14. The 20 countries include, US, USSR, Japan, West Germany, France, Italy, UK, Canada, China, South Korea, Spain, Switzerland, India, Australia, South Africa, Brazil, Mexico, Sweden, Austria and Taiwan
15. Arthur D. Little (August 1988), *Central Office Switching Equipment: Regional Market Opportunities and Issues,* Spectrum.
16. "$24 Billion spells mostly sunny skies for US Telecom Industry", (January 19, 1990), *Telephony.*
17. "Review and Forecast", (February 27, 1989), *Telephony.*
18. "Mexico's Development Dilemma", (April 24, 1989), *Telephony.*

19. Arthur D. Little, quoted in 1985 dollars.
20. Arthur D. Little (January 6, 1989), *CO Switching Equipment: The Competitive Environment,* Spectrum.
21. Centre for Information and Communications Technology (January 1989), *The GEC-Siemens Bid for Plessey: The Wider European Issues,* University of Sussex.
22. According to the systems planned at end 1986. Forecasts estimate, excluding military systems, satellites nearing end of their lifespan, including reserve capacities, and excluding USSR and China. Cf. *World Space Industry Survey, Ten Year Outlook,* Euroconsult, November 1986, p. 155.
23. OECD (1988), *Satellites and Fibre Optics Competition and Complementarity,* Paris.
24. W. McGowan, Chairman of MCI at the PPI Conference (November 1984), *The $12 Billion Carriers Gamble.*
25. OECD, *Communications Outlook,* Paris, 1990.
26. US Department of Commerce, *US Industrial Outlook 1989* - Telephone and Telegraph Equipment.
27. United Nations, *Commodity Indexes for the Standard International Trade Classification Revision 2, Statistical Papers, Series M, No. 38/Rev.2, Vol. 1.*
28. The definition of "telecommunications equipment" excludes various product categories under the heading SITC 764 "Telecommunications Equipment and Parts" which are not strictly speaking part of this industry. One item, 764.93, which includes parts for a whole range of equipment – including telecommunications equipment – has also been omitted because it is too broad in its coverage.
29. Some countries did not adopt the SITC Revision 2 classification in 1978. For these countries, SITC Revision 1 (group 724.91) data have been used, (Australia, New Zealand and Portugal for 1978, Spain for 1978 and 1979 and Turkey 1978 to 1984 inclusive). This adjustment in some cases may vary the data for "total OECD". Data for 1988 will not be available until late 1990 due to the conversion to Revision 3.
30. For all text and tables of this study, reference to Belgium implies Belgium/Luxembourg.
31. In 1987 telecommunications equipment exports represented 1 per cent or more of manufacturing export for only six OECD countries. These countries were Sweden (2.69 per cent), Japan (2.02 per cent), Finland (1.93 per cent), Ireland (1.64 per cent), Norway (1.40 per cent), and Denmark (1.37 per cent).
32. It should be noted that France had the lowest import dependence in 1987 of all OECD countries (31.3 per cent).
33. R.A. Cawley and P. Verburgt (June 1989), *Intra-EC and Extra-EC Trade flows in telecommunications equipment in 1988.*
34. Southwestern Bell Telephone (SWBT) announced in October 1989 its selection of Ericsson as the primary supplier of central office switches for the company's modernisation plan.
35. The major non-OECD markets for line equipment in 1987 in order of importance were, the Far East, non-OECD America, OPEC and Africa.
36. OECD (1985), *Type Approval Procedures for Telecommunications Terminal Equipment in OECD Member countries.*
37. G. Dang Nguyen, *European R&D Policy for Telecommunications,* number 49, Deutsche Bundespost, Wissenschaftliches Institüt for Kommunikationsdienste (WIK).
38. *Panorama of EC Industry,* 1989.
39. OECD (1990), *The Export Credit Financing Systems, in OECD Member Countries.*

Annex

LIST OF TABLES

Table 1. **Telephone lines per 100 inhabitants**

	1978	1982	1987	1988	Growth[1] 1978-88
Australia	29.24	35.87	42.83	42.82	3.89
Austria	25.11	32.25	38.39	39.52	4.64
Belgium	22.13	27.82	34.49	36.03	4.99
Canada	39.30	41.70	51.19	51.20	2.68
Denmark	40.20	45.95	52.86	54.43	3.08
Finland	32.81	39.83	53.33	49.94	4.29
France	22.01	35.04	43.62	46.23	7.70
Germany	28.22	36.87	43.95	45.69	4.94
Greece	21.61	25.80	34.73	36.12	5.27
Iceland	34.82	38.72	45.75	46.92	3.03
Ireland	12.28	16.57	22.47	23.82	6.85
Italy	20.15	25.89	33.27	34.97	5.67
Japan	32.19	36.02	39.27	40.73	2.38
Luxembourg	34.27	37.57	43.78	44.80	2.72
Netherlands	30.60	36.88	42.37	43.79	3.65
New Zealand	34.71	37.09	41.12	43.65	2.32
Norway	25.92	34.59	46.42	47.88	6.33
Portugal	9.20	11.53	16.12	17.95	6.91
Spain	16.82	21.02	26.18	28.31	5.34
Sweden	55.47	59.64	65.14	66.03	1.76
Switzerland	42.24	46.54	51.44	54.45	2.57
Turkey	2.28	3.24	7.66	9.12	14.87
United Kingdom	29.48	34.75	39.00	38.88	2.81
United States	39.50	40.91	48.30	49.33	2.25
OECD Average[2]	28.36	33.42	39.80	41.37	3.85

1. CAGR: Compound Annual Growth Rate.
2. Weighted Average.

Source: Derived from International Telecommunications Union (ITU), Yearbook of Common Carrier Telecommunications Statistics.

Table 2. **Waiting list for telephone main lines as a ratio of total main lines**

	1978	1982	1987	1988
Australia	0.19	0.13	0.10	0.11
Austria	8.33	3.61	1.27	1.01
Belgium	1.06	0.95	0.35	0.41
Canada	n.a.	n.a.	n.a.	n.a.
Denmark	0.04	0.00	n.a.	n.a.
Finland	0.11[1]	0.06	0.06	n.a.
France	8.78	1.17	n.a.	n.a.
Germany	0.78	0.12	0.09	0.09
Greece	33.53	35.58	30.33	29.14
Iceland	n.a.	n.a.	n.a.	n.a.
Ireland	15.29	13.45	1.90	1.60
Italy	4.04	4.30	1.05	0.59
Japan	0.35[1]	0.20	n.a.	n.a.
Luxembourg	4.10	1.44	2.04	2.55
Netherlands	11.80	0.81	0.87	0.59
New Zealand	1.14[1]	0.30	0.21	0.11
Norway	8.27	2.87	n.a.	n.a.
Portugal	14.96	11.95	8.47	9.64
Spain	10.66	3.86	3.57	5.24
Sweden	n.a.	n.a.	n.a.	n.a.
Switzerland	0.15	0.17	0.14	0.22
Turkey	150.96	116.58	51.68	27.18
United Kingdom	1.20[1]	0.11	n.a.	n.a.
United States	0.04	0.00	n.a.	n.a.

n.a. = not available
1. 1979.
Source: Derived from the ITU Yearbook.

Table 3. **Total income from all telecommunications services**

US$ million

	1978	1982	1987	1988	Growth in National Currency[1] 1988/1978
Australia	2 104.25	3 182.39	4 369.44	n.a.	8.5[2]
Austria	849.72	1 093.07	2 281.75	2 355.83	10.7
Belgium	1 123.19	972.28	1 958.80	2 100.21	6.5
Canada	4 051.26	7 225.93	9 067.54	n.a.	9.4[2]
Denmark	739.88	668.82	1 898.57	1 861.51	9.7
Finland	620.56	738.30	1 628.28	1 657.89	10.3
France	7 809.57	8 309.97	19 601.12	16 312.59	7.6
Germany	14 108.85	12 099.83	23 140.19	20 974.44	4.0
Greece	495.05	625.07	964.09	1 000.36	7.3
Iceland	26.42	29.05	101.75	108.18	n.a.[3]
Ireland	191.60	395.28	799.71	861.70	16.2
Italy	3 631.55	5 157.30	13 122.25	12 879.41	13.5
Japan	7 922.57	20 434.53	36 485.71	45 206.99	9.7
Luxembourg	57.43	54.98	109.95	131.61	8.6
Netherlands	2 032.74	1989.66	n.a.	n.a.	n.a.
New Zealand	409.09	469.00	n.a.	1 318.35	12.4
Norway	661.23	932.67	2 270.69	2 132.72	12.4
Portugal	318.28	419.86	910.90	1 009.46	12.2
Spain	1 891.36	2 147.34	4 880.21	n.a.	11.1[2]
Sweden	1 317.67	1 384.16	3 200.47	3 736.76	11.0
Switzerland	1 885.39	1 906.83	4 220.60	3 805.89	7.3
Turkey	293.84	373.06	1 084.29	1 249.46	15.6
United Kingdom	6 758.13	10 084.98	15 654.49	n.a.	9.8[2]
United States	46 244.00	72 090.80	114 356.10	111 611.54	9.2
Total OECD	115 543.63	150 178.28	n.a.	n.a.	

n.a. = not available.
1. CAGR : Compound Annual Growth Rate.
2. 1978-87.
3. Currency devaluation.
Source: ITU Yearbook.

Table 4. **Telecommunication investment[1] as share of gross fixed capital formation**

	1978	1982	1987	1988	CAGR in Gross Investments[2]	
					1988/1980	1987/1982
Australia	3.27	n.a.	3.11	2.32	–3.37	–25.40
Austria	2.59	2.93	3.14	3.09	1.78	–1.59
Belgium	2.24	2.88	2.22	1.70	–2.72	–23.42
Canada	3.76	2.79	2.62	3.00	–2.23	14.50
Denmark	2.24	2.58	2.34	2.71	1.92	15.81
Finland	2.55	2.09	2.27	2.16	–1.65	–4.85
France	4.05	3.03	2.79	2.45	–4.90	–12.19
Germany	2.40	3.43	3.97	3.74	4.54	–5.79
Greece	2.06	3.37	2.35	2.41	1.58	2.55
Iceland	n.a	1.21	1.17	1.11	n.a.[3]	n.a.[3]
Ireland	2.96	5.98	3.82	3.63	2.06	–4.97
Italy	3.35	2.92	3.04	3.34	–0.03	9.87
Japan	2.30	1.92	1.43	1.43	–4.64	0.00
Luxembourg	2.78	1.39	1.92	2.22	–2.22	15.63
Netherlands	1.95	1.69	1.70	1.92	–0.15	12.94
New Zealand	0.00	1.21	3.05	3.58	n.a.	17.38
Norway	2.83	2.67	2.31	2.24	–2.31	–3.03
Portugal	1.54	2.36	2.84	3.67	9.07	29.23
Spain	3.46	3.36	2.37	3.70	0.67	56.12
Sweden	1.23	3.50	3.38	2.90	8.96	–14.20
Switzerland	3.14	2.85	3.20	3.03	–0.36	–5.31
Turkey	1.30	2.22	5.31	3.79	11.29	–28.63
United Kingdom	2.38	2.80	2.56	2.36	–0.08	–7.81
United States	3.42	3.46	2.76	2.13	–4.62	–22.83

n.a. = not available.
1. Total annual gross investments in telecommunications including land and buildings.
2. Excludes land and buildings except Italy.
3. Currency devaluation.
Source: OECD, adapted from the ITU Yearbook.

764.1 Electrical line telephonic and telegraphic apparatus (including such apparatus for carrier-current line systems)

Demodulators for carrier-current line systems
Electro-acoustical telephone apparatus
Exchanges, telephone, automatic or non-automatic
Facsimile apparatus, line telegraphic
Field-telephones, military
Filters, carrier-current, for line telegraphic or telephone systems
Handsets, line telephone or radiotelephonic
Headsets, telephone operators'
Hughes apparatus
Modulators, carrier-current line system
Morse-telegraphic apparatus, electric
Oscillators, carrier-current line system
Panels, switching, telephone
Parlophones for buildings
Picture telegraphic apparatus, electrical line
Retransmitters, telegraphic, electrical line
Receiver-transmitters, line telegraphic
Receivers,operators' headset, telephone
Receivers telegraphic, electrical
Receivers, telephone, electrical line (excluding loudspeakers)
Receivers, teleprinter, electrical line
Receivers, teletypewriter, line telegraphic
Recorders, electric line telegraphic, Morse-type
Scanners for telegraphic picture transmission
Sounders, telegraphic electrical line
Stock quotation ticker apparatus, line telegraphic
Switchboards, telephone, automatic
Switchboards, telephone, central office
Switchboards, telephone, non-automatic
Switchboards, telephone, PAX
Switchboards, telephone, PBX
Tele-autographic apparatus
Telecomposing apparatus, telegraphic
Telegraph apparatus, electrical line
Telegraph apparatus for carrier-current line systems
Telegraph apparatus, high speed, electrical line
Telephone answering machines forming an integral part of a telephone set
Telephone apparatus, electrical line
Telephone apparatus for carrier-current line systems
Telephone equipment, marine (excluding radiotelephonic)
Telephone equipment with special throat microphone and permanently fixed earphones
Telephone instruments, dial type
Telephone sets, operators'
Telephone sets, subscribers'
Telephones, coin-operated
Telephones (excluding radiotelephones)
Telephones, sealed, for use in mines
Telephoto equipment, electrical line
Teleprinter units, wire
Teletype transmitting and receiving apparatus
Tickers, stock, line telegraphic
Transmitters, telegraphic, electrical line (automatic, dial or keyboard)
Transmitters, teleprinter, electrical line
Transmitters, teletypewriter, line telegraphic

Wheatstone high-speed transmitters, telegraphic
Wirephoto sending and receiving apparatus

764.3 Television, radio-broadcasting, radiotelegraphic and radio telephonic transmitters and transmitter-recievers

Interpreting apparatus, radio, for simultaneous multi-lingual interpretation
Multiplex transmitters or transmitter-receivers, radio telephonic or radiotelegraphic
Radios, two-way
Radiotelegraphic staff location systems
Radiotelephones, walkie-talkie type
Relay apparatus, radio-broadcasting or television
Relay apparatus, television, for aircraft
Satellite microwave transmitters or transmitter-receivers, radiotelephonic or radiotelegraphic
Television apparatus for mounting in aircraft, guided missiles, rockets
Terrestrial microwave transmitters or transmitter-receivers radiotelephonic or radiotelegraphic
Transceivers, radio-broadcasting
Transceivers, radiotelephonic or radiotelegraphic
Transceivers, radiotelephonic, incorporating radio-broadcasting receivers and/or sound recording or reproducing apparatus
Transmitter-receivers, radio-broadcasting
Transmitter-receivers, radiotelephonic, for motor vehicles, ships, aircraft, trains
Transmitter-receivers, radiotelephonic or radiotelegraphic
Transmitters or transmitter-receivers, facsimile, radiotelegraphic
Transmitters, radio-broadcasting, amplitude or frequency modulated
Transmitters, radiotelephonic or radiotelegraphic, for induction-type paging systems
Transmitters, radiotelephonic or radiotelegraphic
Transmitters, television, amplitude or frequency modulated

764.81 Radiotelephonic or radiotelegraphic receivers

Diversity receivers, radiotelephonic or radiotelegraphic
Multiplex receivers, radiotelephonic or radiotelegraphic
Receivers, facsimile, radiotelegraphic
Receivers, radiotelephonic or radiotelegraphic
Satellite microwave receivers, radiotelephonic or radiotelegraphic
Terrestrial microwave receivers, radiotelephonic or radiotelegraphic

764.91 Parts, n.e.s. of the apparatus falling within heading 764.1

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n.e.s. = not elsewhere specified.

Table 6. **Standard international trade classifications comparison chart of revision 2 and revision 3**

Rev 3	Rev 2	Description
764.1	764.1	Electrical apparatus for line telephony or line telegraphy (including such apparatus for carrier-current line systems)
764.11	n.a.	Telephone Sets
764.13	n.a.	Teleprinters
764.15	n.a.	Telephonic or telegraphic switching apparatus
764.17	n.a.	Other apparatus for carrier-current line systems
764.19	n.a.	Other telephonic or telegraphic apparatus
764.3	764.3	Transmission apparatus for radio-telephony, radio-telegraphy, radio-broadcasting or television, whether or not incorporating reception apparatus or sound recording or reproducing apparatus
764.31	n.a.	Transmission apparatus
764.32	n.a.	Transmission apparatus incorporating reception apparatus
764.8	764.8	Telecommunications equipment, n.e.s.
764.81	764.81	Reception apparatus for radiotelephony or radiotelegraphy, n.e.s.
764.9	764.9	Parts and accessories suitable for use solely or principally with the apparatus of division 76
764.91	764.91	Parts and accessories suitable for use solely or principally with the apparatus of heading 764.1

n.a. = not available.
n.e.s. = not elsewhere specified.

Table 7. **Telecommunications equipment exports from the world by country**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988	CAGR[1]
Australia	3.0	11.3	19.3	9.0	9.1	3.5	7.4	36.4	28.4
Austria	14.5	21.7	21.1	24.9	41.9	57.2	91.7	164.3	27.5
Belgium/Luxembourg	275.0	414.6	233.7	196.6	203.5	353.5	441.8	351.6	2.5
Canada	111.4	257.3	389.6	650.6	621.0	531.9	581.9	761.7	21.2
Denmark	73.5	99.9	93.1	92.6	114.9	162.2	204.5	205.4	10.8
Finland	16.2	62.3	88.0	97.1	121.6	210.9	320.2	360.1	36.4
France	420.1	228.4	594.4	579.9	617.6	646.9	806.6	866.5	7.5
Germany	874.2	1 109.0	1 005.6	895.7	978.1	1 290.6	1 981.0	1 869.2	7.9
Greece	8.9	17.1	12.6	9.9	12.6	13.5	10.2	6.5	–3.1
Iceland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ireland	20.5	55.2	95.5	100.9	114.2	143.6	168.1	197.2	25.4
Italy	171.2	190.6	247.2	232.1	263.0	344.2	401.2	361.2	7.8
Japan	902.7	976.0	1 503.1	2 445.1	2 664.3	3 346.4	4 506.4	6 342.3	21.5
Netherlands	350.3	543.9	266.3	267.8	167.1	190.7	295.1	317.8	–1.0
New Zealand	0.3	3.9	6.6	7.6	9.4	9.9	9.7	12.5	45.2
Norway	42.7	72.9	65.9	64.0	71.1	100.3	140.6	155.4	13.8
Portugal	6.8	10.2	11.1	5.3	7.1	5.6	4.7	8.2	1.9
Spain	41.0	90.7	57.7	33.1	44.1	65.7	51.8	71.7	5.8
Sweden	673.0	844.2	826.8	882.2	1 010.2	1 011.3	1 010.8	1 684.4	9.6
Switzerland	54.0	79.2	79.0	76.1	65.6	82.0	100.0	276.1	17.7
Turkey	0.1	0.0	0.0	1.3	16.0	6.8	13.3	7.3	53.6
United Kingdom	404.2	518.5	534.3	583.7	617.4	626.3	711.8	604.1	4.1
United States	674.3	888.5	1 235.3	1 109.8	1 275.6	1 219.9	1 305.1	1 778.1	10.2
Total OECD	5 137.9	6 825.4	7 386.2	8 365.3	9 045.4	10 422.9	13 163.9	16 438.0	12.3

1. Compound Annual Growth Rate (1978-88).
Source: OECD.

Table 8. **Telecommunications equipment imports from the world by country**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988	CAGR[1]
Australia	61.8	129.3	220.5	257.5	346.7	415.7	412.1	407.8	20.8
Austria	95.8	91.4	75.2	86.3	88.4	127.1	173.2	223.0	8.8
Belgium/Luxembourg	108.2	186.8	128.2	102.1	127.6	167.6	225.7	317.9	11.4
Canada	212.8	230.7	275.4	445.0	502.3	589.2	695.1	699.8	12.6
Denmark	101.5	118.6	72.0	91.9	101.9	159.6	222.5	231.1	8.6
Finland	42.0	76.2	90.3	79.1	97.9	134.4	187.8	217.5	17.9
France	118.6	187.1	161.3	134.2	149.9	189.2	289.1	444.0	14.1
Germany	208.9	245.0	178.0	183.4	234.5	322.5	551.4	799.1	14.4
Greece	56.6	69.0	40.4	37.3	27.3	51.1	56.0	84.0	4.0
Iceland	4.1	4.0	5.9	7.0	8.9	16.5	21.2	17.5	15.6
Ireland	38.8	78.0	109.4	87.1	88.1	91.2	108.3	118.1	11.8
Italy	100.2	177.7	173.7	220.0	237.7	298.9	484.3	743.5	22.2
Japan	110.7	55.3	134.4	140.8	148.5	212.0	304.1	481.0	15.8
Netherlands	200.3	281.4	159.8	168.6	240.5	353.4	454.9	670.4	12.8
New Zealand	19.0	18.4	30.0	57.9	123.1	142.7	141.2	153.5	23.2
Norway	95.0	105.2	106.0	118.2	172.2	272.0	278.9	240.1	9.7
Portugal	13.5	24.1	36.4	21.2	22.1	35.4	66.2	174.6	29.2
Spain	28.1	108.6	104.4	64.4	90.3	123.7	212.3	389.1	30.1
Sweden	65.7	109.2	110.2	182.6	227.8	299.8	327.9	436.1	20.8
Switzerland	11.0	17.6	19.0	23.4	35.9	73.5	123.7	490.6	46.2
Turkey	22.3	23.3	42.7	111.1	121.7	161.7	228.8	359.6	32.1
United Kingdom	161.5	274.9	372.2	483.2	605.0	747.2	1 149.5	1 221.0	22.4
United States	584.2	674.7	965.1	2 441.7	2 879.9	3 316.2	3 678.9	4 397.2	22.4
Total OECD	2 460.6	3 286.4	3 610.5	5 547.0	6 678.2	8 300.6	10 393.1	13 316.5	18.4

1. Compound Annual Growth Rate (1978-88).
Source: OECD.

Table 9. **Trade balances: total telecommunications equipment**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988
Australia	–58.8	–118.0	–201.2	–248.5	–337.6	–412.2	–404.7	–371.4
Austria	–81.3	–69.7	–54.1	–61.4	–46.5	–69.9	–81.5	–58.7
Belgium/Luxembourg	166.8	227.8	105.5	94.5	75.9	185.9	216.1	33.7
Canada	–101.4	26.6	114.2	205.6	118.7	–57.3	–113.2	61.9
Denmark	–28.0	–18.7	21.1	0.7	13.0	2.6	–18.0	–25.7
Finland	–25.8	–13.9	–2.3	18.0	23.7	76.5	132.4	142.6
France	301.5	371.3	433.1	445.7	467.7	457.7	517.5	422.5
Germany	665.3	864.0	827.6	712.3	743.3	968.1	1 429.6	1 070.1
Greece	–47.7	–51.0	–27.8	–27.4	–14.7	–37.6	–45.8	–77.5
Iceland	–4.1	–4.0	–5.9	–7.0	–8.9	–16.5	–21.2	–17.5
Ireland	–18.3	–22.8	–13.9	13.8	26.1	52.4	59.8	79.1
Italy	–71.0	12.9	73.5	12.1	25.3	45.3	–83.1	–382.3
Japan	792.0	920.7	1 368.7	2 304.3	2 515.8	3 134.4	4 202.3	5 861.3
Netherlands	150.0	262.5	106.5	99.2	–73.4	–162.7	–159.8	–352.6
New Zealand	–18.7	–14.5	–23.4	–50.3	–113.7	–132.8	–131.5	–141.0
Norway	–52.3	–32.3	–40.1	–54.2	–101.1	–171.1	–138.3	–84.7
Portugal	–6.7	–13.9	–25.3	–15.9	–15.0	–29.8	–61.5	–166.4
Spain	12.9	–17.9	–46.7	–31.3	–46.2	–58.0	–160.5	–317.4
Sweden	607.3	735.0	716.6	699.6	782.4	711.5	682.9	1 248.3
Switzerland	43.0	61.6	60.0	52.7	29.7	8.5	–23.7	–214.5
Turkey	–22.2	–23.2	–42.7	–109.8	–105.7	–154.9	–215.5	–352.3
United Kingdom	242.7	243.6	162.1	100.5	12.4	–120.9	–437.7	–616.9
United States	90.1	213.8	270.2	–1 334.9	–1 604.3	–2 096.3	–2 373.8	–2 619.1
Total OECD	2 535.3	3 539.0	3 775.7	2 818.3	2 367.2	2 122.3	2 770.8	3 121.5

Source: OECD.

Table 10. **Telecommunications equipment trade balances**

US$ Millions

Partner Country	1978	1980	1982	1984	1986	1987	1988
	United States						
Canada	–3.8	–74.1	–39.9	–181.5	–155.7	–147.5	–245.1
France	8.6	12.1	8.9	–21.1	–10.2	–2.0	9.4
Germany	4.5	23.3	14.0	11.4	4.3	0.9	–22.1
Japan	–298.1	–266.6	–425.8	–1 169.4	–1 572.7	–1 660.4	–1 867.8
Sweden	–1.9	–0.6	6.9	–11.0	–21.4	–49.8	–60.2
United Kingdom	28.7	52.7	97.7	49.8	67.2	96.6	168.1
EEC (12)	73.1	155.5	166.4	104.1	125.4	130.4	227.9
Total OECD	–204.9	–150.0	–235.0	–1 203.4	–1 569.5	–1 675.0	–1 888.2
Total non-OECD	295.1	363.8	505.2	–131.5	–526.8	–698.8	–730.9
	Japan						
United States	210.0	276.1	386.6	1 265.7	1 242.1	1 575.6	2 057.1
Canada	15.8	16.1	14.7	35.1	80.0	141.0	212.1
France	3.6	6.9	9.4	7.1	12.9	30.4	87.1
Germany	44.6	36.2	31.3	42.7	96.6	222.1	419.1
Sweden	7.0	14.9	17.5	36.4	59.3	80.7	433.7
United Kingdom	2.6	17.4	40.3	60.1	143.5	264.0	428.0
EEC (12)	81.7	128.6	141.1	159.2	420.7	860.0	1 553.5
Total OECD	368.0	485.4	667.7	1 645.5	2 171.0	3 025.5	4 349.4
Total non-OECD	424.1	435.4	700.8	658.8	963.5	1 176.9	1 511.9
	EEC (12)						
Canada	–1.8	–25.8	–39.3	–74.0	–64.9	–76.7	–80.6
United States	–83.6	–179.6	–119.7	–128.6	–235.6	–215.1	–240.7
Japan	–87.7	–150.2	–159.9	–171.2	–412.5	–828.2	–1 378.0
Sweden	–87.1	–122.2	–61.7	–96.1	–148.1	–315.8	–489.9
Total OECD	–35.9	–265.1	–155.9	–132.0	–298.6	–647.7	–1 641.4
Total non-OECD	1 538.7	2 113.3	1 771.5	1 535.9	1 601.7	1 904.6	1 308.2

Source: OECD.

Table 11. **OECD Telecommunications equipment exports**
Main destinations

Percentage

	1978	1980	1982	1984	1986	1987	1988
OECD Total	42.0	43.8	43.9	55.6	59.5	63.0	67.1
Non-OECD Total	58.0	56.2	51.6	44.4	40.5	37.0	32.9
Australia	1.7	1.9	3.0	2.8	3.8	2.5	2.1
Austria	1.6	1.5	1.2	1.0	1.1	1.3	1.4
Belgium/Lux	2.1	2.2	1.7	1.3	1.8	1.7	1.9
Canada	2.2	1.9	2.0	2.3	2.3	2.7	3.2
Denmark	1.9	1.9	1.0	1.1	1.5	1.6	1.3
Finland	1.6	1.3	1.3	1.0	1.2	1.2	1.0
France	1.6	1.9	1.5	2.0	1.3	1.7	2.3
Germany	3.6	3.6	2.4	2.2	3.1	4.0	4.9
Greece	1.1	1.1	0.7	0.4	0.4	0.4	0.5
Iceland	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ireland	0.7	1.1	1.6	1.4	0.8	0.7	0.7
Italy	1.9	2.2	1.9	2.0	2.4	2.9	3.4
Japan	0.4	0.3	0.3	0.6	1.0	0.8	1.1
Netherlands	3.5	3.7	2.0	2.0	3.4	3.6	4.9
New Zealand	0.5	0.2	0.4	0.7	1.1	0.8	0.8
Norway	2.1	1.6	1.4	1.4	2.4	1.9	1.2
Portugal	0.4	0.5	0.7	0.3	0.4	0.7	1.0
Spain	0.9	1.4	1.2	0.9	1.2	1.4	2.0
Sweden	1.4	2.1	2.1	2.0	2.5	2.2	2.2
Switzerland	1.1	0.9	0.9	1.0	1.7	2.6	2.7
Turkey	0.5	0.4	0.7	1.3	2.2	2.8	1.2
United Kingdom	2.5	3.3	4.3	3.9	5.2	6.9	7.5
United States	8.4	8.5	11.4	24.0	18.8	18.5	19.7
EEC (12)	20.2	23.0	19.0	17.4	21.3	25.4	30.4
OPEC	26.3	20.0	19.9	12.5	7.9	6.3	6.1
COMECON	1.7	0.9	1.0	1.0	1.4	1.8	1.6
Non-OECD:							
Africa	8.3	6.3	7.3	6.5	6.2	5.2	5.2
America	8.1	10.9	9.1	7.1	7.6	8.2	7.2
Far East	8.9	13.0	14.5	13.3	13.6	12.7	13.9
Europe	6.8	5.2	5.2	2.9	2.5	2.5	2.3
Asia	39.5	37.5	36.9	20.8	6.9	5.0	4.1

Source: OECD.

Tableau 12. **Share of telecommunications equipment import market**

Percentage

	1978	1980	1982	1984	1986	1987	1988
				Canada			
Japan	10.8	11.6	14.7	21.3	32.3	35.1.	32.8
United Kingdom	3.2	3.2	1.2	1.3	1.3	1.5	1.8
United States	78.2	76.2	73.6	62.3	49.3	45.4	43.3
EEC (12)	5.4	4.7	2.3	4.9	3.2	2.7	3.5
Total non-OECD	4.2	5.7	8.6	10.9	14.0	14.3	17.4
				France			
Belgium	6.6	6.3	3.0	3.8	1.5	1.7	0.8
Germany	14.8	17.8	20.2	16.7	18.1	21.7	18.7
Italy	3.1	3.3	4.5	11.1	10.3	9.3	5.0
Japan	6.2	10.1	15.5	12.4	12.1	17.4	24.5
Sweden	13.1	7.5	2.3	3.2	3.7	2.5	4.2
Switzerland	8.9	5.1	3.9	4.2	4.3	2.9	3.8
United Kingdom	9.4	8.8	12.9	6.9	5.9	6.5	7.1
United States	22.5	22.7	20.7	20.8	21.7	16.2	11.3
Total non-OECD	4.6	8.2	7.4	11.5	7.3	10.1	10.2
				Germany			
Belgium	23.6	8.7	13.5	8.1	12.7	10.5	4.4
France	4.4	5.1	2.0	3.5	2.5	4.0	3.2
Japan	24.0	14.7	17.9	19.9	24.3	31.4	40.5
Switzerland	3.8	6.4	3.9	5.2	3.6	5.3	4.1
United Kingdom	4.5	6.9	6.0	4.9	5.7	4.5	4.8
United States	11.3	15.1	16.7	11.8	11.6	11.3	8.7
Total non-OECD	6.6	10.9	8.8	11.9	10.6	6.7	8.5
				Japan			
Canada	0.2	0.5	0.7	2.3	1.0	1.0	1.0
Sweden	1.4	0.8	0.3	0.1	0.2	0.2	0.1
United Kingdom	2.2	2.8	1.6	0.5	2.2	2.1	1.3
United States	83.0	56.2	83.5	83.0	77.4	69.3	64.2
Total non-OECD	9.2	29.9	10.1	10.7	10.5	20.7	28.9
				United States			
Canada	15.3	26.5	16.5	13.0	9.0	9.2	11.3
Japan	52.5	41.3	46.0	49.2	49.9	47.5	45.9
EEC (12)	5.1	4.2	5.3	3.2	3.8	4.0	4.6
Total non-OECD	25.8	26.3	31.0	33.4	35.8	37.4	36.0
				EEC (12)			
Canada	0.9	1.9	3.1	5.5	3.1	2.5	2.1
Japan	8.7	8.9	10.8	11.1	16.8	22.1	26.8
Sweden	11.7	11.0	8.4	9.9	9.9	11.4	11.9
United States	11.6	13.8	14.4	15.5	16.0	11.9	9.6
Total non-OECD	7.1	8.4	8.8	9.9	8.8	8.5	9.5

Source : OCDE.

Table 13. **Trade balances: telecommunications line equipment**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988
Australia	–58.8	–49.1	–73.8	–90.2	–121.4	–135.0	–164.1	–178.9
Austria	–26.1	–32.4	–19.6	–20.7	–16.6	–23.9	–22.7	–14.3
Belgium/Luxembourg	33.8	6.0	19.8	10.0	–23.7	–1.0	–40.8	–108.2
Canada	55.4	202.3	319.8	524.6	486.4	366.7	357.0	–139.7
Denmark	–52.0	–55.9	–10.8	–16.3	–15.7	–38.9	–48.8	–72.0
Finland	–5.0	–2.5	3.3	12.5	1.6	30.7	121.3	90.2
France	86.3	125.9	122.5	147.4	176.7	142.5	110.9	127.2
Germany	459.0	547.7	510.1	379.6	375.2	435.8	573.2	432.5
Greece	–45.7	–49.8	–2.1	–0.3	2.3	–1.5	–24.7	–51.3
Iceland	–2.1	–2.3	–3.2	–4.1	–6.6	–9.8	–10.7	–6.8
Ireland	–2.5	13.3	0.1	4.2	7.4	37.2	43.4	3.7
Italy	34.1	49.6	46.2	6.7	–8.0	–28.6	–109.1	–308.8
Japan	340.7	376.2	764.2	1 078.5	1 321.6	1 667.7	2 630.4	4 194.8
Netherlands	162.1	306.9	117.5	101.0	22.6	36.4	47.7	–45.0
New Zealand	–18.7	–9.8	–20.3	–44.0	–95.1	–98.5	–113.8	–94.9
Norway	–7.9	11.5	–3.5	3.2	–14.3	–48.8	–32.5	–27.1
Portugal	–6.7	–3.4	–8.0	–4.3	–2.4	–12.3	–29.8	–75.8
Spain	12.9	0.5	1.0	–2.4	–3.8	–22.6	–85.7	–172.6
Sweden	361.3	442.6	457.9	458.0	473.9	466.4	544.3	720.2
Switzerland	43.0	61.6	60.0	52.7	29.7	8.5	–23.7	–94.8
Turkey	–22.2	–23.2	–42.7	–109.8	–11.4	–37.5	–113.8	–237.2
United Kingdom	54.4	43.5	27.0	–43.0	–46.9	–153.6	–326.4	–520.1
United States	149.1	125.5	180.0	–1 116.1	–1 267.2	–1 473.0	–1 836.7	–2 038.9
Total OECD	1 544.4	2 084.7	2 445.4	1 327.2	1 264.3	1 106.9	1 444.9	1 382.2

Source: OECD.

Table 14. **OECD Line equipment exports to OECD countries**

Per cent

	1978	1980	1982	1984	1986	1987	1988
Australia	4.4	3.5	7.3	4.4	5.4	3.6	2.6
Austria	4.9	3.4	2.4	1.6	1.7	1.7	1.7
Belgium/Lux	6.0	5.6	3.7	2.2	2.8	2.6	2.8
Canada	7.0	5.5	5.8	5.2	4.5	5.3	5.6
Denmark	4.4	4.1	2.0	1.5	2.5	2.7	2.0
Finland	4.3	4.1	3.0	1.7	1.6	1.5	1.2
France	3.6	2.6	1.9	1.2	1.3	1.6	2.7
Germany	7.1	7.2	4.5	3.6	5.0	7.1	8.2
Greece	2.1	2.8	1.5	0.5	0.4	0.4	0.6
Iceland	0.3	0.2	0.1	0.1	0.2	0.1	0.1
Ireland	2.8	3.7	4.9	3.2	1.5	1.3	0.7
Italy	4.4	5.8	4.9	4.0	4.5	4.8	5.7
Japan	1.0	0.7	0.7	1.5	2.5	1.7	2.0
Netherlands	7.0	6.1	4.0	3.4	6.5	7.1	9.2
New Zealand	2.0	0.6	1.3	1.3	1.9	1.3	1.2
Norway	4.0	3.0	1.8	1.8	3.0	2.2	1.2
Portugal	1.4	0.9	1.6	0.3	0.5	1.0	0.8
Spain	2.5	3.2	1.8	0.9	1.2	1.6	2.8
Sweden	2.5	3.7	2.3	2.0	2.3	2.0	2.1
Switzerland	2.6	1.8	1.3	1.6	2.3	3.3	3.8
Turkey	1.8	1.4	2.2	3.5	3.9	3.3	0.6
United Kingdom	7.4	7.9	10.4	7.6	9.3	11.9	11.7
United States	16.7	22.3	30.3	46.6	35.0	32.0	30.7
Total (US$ Million)	922.0	1 484.7	1 763.5	2 471.6	3 330.7	470.7	6 522.6
EEC (12)	48.6	49.8	41.1	28.6	35.6	42.0	47.3

Source: OECD.

Table 15. **Regional share of total non-OECD line equipment exports**

Percentage

	1978	1980	1982	1984	1986	1987	1988
Non-OECD							
Europe	3.7	3.8	2.7	3.2	5.3	8.0	6.0
Africa	24.6	15.8	16.9	17.1	16.8	13.9	13.0
America	21.0	23.6	21.9	20.1	24.8	25.1	24.7
Middle East	31.4	33.2	26.0	23.6	14.9	12.0	10.3
Far East	19.1	23.3	32.3	35.7	37.7	40.4	45.6
Oceania	0.3	0.3	0.3	0.3	0.5	0.6	0.4
Total ($ Million)	1 542.2	1 904.8	2 202.6	1 897.3	1 994.9	2 472.5	2 841.0
	Share by economic zones						
COMECON	2.8	1.6	1.5	2.4	3.5	6.3	4.5
OPEC	50.5	38.7	33.4	25.8	18.3	16.1	16.0
NICs[1]	14.1	18.7	26.9	29.0	32.9	31.4	36.4
Total	67.4	59.0	61.8	57.2	54.7	54.3	56.9

1. Brazil, Mexico, Hong Kong, South Korea, Singapore, Taiwan, India.
Source: OECD.

Table 16. **United States: line equipment balance of trade**

US$ Million

	1978	1980	1982	1984	1986	1987	1988
Canada	–17.0	–79.7	–54.0	–185.3	–169.5	–167.5	–273.8
Japan	–91.4	–162.1	–137.1	–960.6	–1 049.7	–1 271.8	–1 492.4
Sweden	–2.6	–2.8	1.6	–13.6	–23.4	–35.8	–23.3
EEC (12)	32.0	83.0	101.9	52.9	75.1	70.0	148.2
France	3.3	3.6	1.2	–26.5	–17.4	–5.7	–3.4
Germany	–9.4	8.0	1.0	2.9	–3.1	–6.1	–34.9
United Kingdom	15.7	29.0	74.9	31.6	44.0	72.6	146.0
Asian NICs[1]	14.5	63.5	147.3	–271.6	–509.0	–582.5	–564.0

1. Hong Kong, South Korea, Singapore, Taiwan.
Source: OECD.

Table 17. **Trade balances: telephone/telegraph transmitters**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988
Australia	0.0	–20.3	–43.5	–60.9	–75.8	–100.5	–103.8	–87.0
Austria	–40.4	–24.3	–22.7	–22.3	–18.6	–21.7	–35.8	–29.8
Belgium/Luxembourg	–10.2	–22.5	–5.9	–10.3	–7.4	–7.3	–4.4	–43.3
Canada	–112.7	–114.7	–142.2	–236.6	–292.0	–362.0	–404.0	–108.3
Denmark	39.7	50.8	31.8	22.4	34.7	47.7	54.0	77.9
Finland	–3.9	–2.7	10.4	4.8	18.9	28.8	41.4	63.6
France	150.0	147.9	169.7	103.8	96.2	84.2	144.5	96.5
Germany	70.6	125.2	126.5	164.5	147.3	239.0	535.8	279.5
Greece	–1.6	–1.1	–2.2	–2.7	–4.3	–3.5	–5.3	–3.3
Iceland	–1.1	–1.2	–2.4	–2.0	–2.0	–6.3	–9.8	–4.4
Ireland	–3.2	–12.6	–5.0	–4.7	–4.2	–7.2	–6.9	–5.3
Italy	7.1	–15.7	16.0	50.2	51.2	62.1	37.1	16.7
Japan	288.2	363.3	367.1	555.4	677.4	856.2	975.9	959.7
Netherlands	20.0	–25.9	–11.7	10.6	–30.8	–47.8	–39.1	–71.5
New Zealand	0.0	0.6	0.9	1.1	0.7	–8.9	–17.6	–19.3
Norway	–24.9	–14.0	–16.2	–26.8	–32.8	–57.7	–51.1	–22.3
Portugal	0.0	–9.1	–11.9	–6.9	–8.3	–7.2	–12.2	–20.5
Spain	0.0	–47.1	–49.2	–20.5	–24.2	–25.0	–54.8	–67.3
Sweden	17.2	–2.1	4.2	–13.9	–26.4	–50.9	–53.4	278.0
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–6.4
Turkey	0.0	0.0	0.0	0.0	–10.8	–23.7	–64.9	–83.5
United Kingdom	148.2	171.2	105.9	174.7	126.4	98.9	22.9	28.0
United States	–24.7	154.3	191.3	–11.3	60.8	–44.0	–145.2	–240.9
Total OECD	518.3	700.0	710.9	668.6	676.0	643.2	803.3	986.8

Source: OECD.

Table 18. **Trade balances: telephone/telegraph receivers**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988
Australia	0.0	–5.0	–5.8	–9.1	–17.9	–9.8	–15.0	–12.2
Austria	–1.3	–1.5	–1.0	–5.0	–3.7	–8.4	–10.3	–6.9
Belgium/Luxembourg	1.6	2.7	2.1	–0.8	–2.3	–0.5	3.8	0.3
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–26.6
Denmark	1.5	1.9	1.8	–0.6	–0.2	–3.2	–1.6	–2.6
Finland	–0.9	–2.1	–1.7	–1.1	1.0	2.0	1.5	–4.3
France	2.8	1.1	–5.9	–5.9	–6.6	–8.6	–15.2	–18.9
Germany	13.8	–2.3	23.2	15.0	6.2	23.7	10.2	14.5
Greece	–0.4	–1.0	–1.6	–1.1	–2.0	–0.4	–0.5	–0.3
Iceland	–0.2	–0.1	–0.2	–0.1	–0.2	–0.2	–0.5	–0.2
Ireland	–0.3	–0.5	–1.4	–0.4	–0.7	–1.0	–0.5	–3.3
Italy	11.6	3.2	9.5	–11.3	–3.0	–3.3	–7.0	–9.8
Japan	35.5	54.4	67.6	107.4	120.8	100.9	128.1	197.2
Netherlands	–10.6	–8.2	–0.2	4.1	0.9	–8.3	–7.2	–9.5
New Zealand	0.0	–0.1	0.2	2.4	2.0	5.0	4.8	–4.6
Norway	–1.2	–0.4	–1.7	–2.1	–5.1	–6.6	–6.4	–7.1
Portugal	0.0	–1.5	–0.7	–0.3	–0.1	–0.5	–1.0	–1.2
Spain	0.0	–0.9	–4.1	–2.6	–1.2	–4.0	–7.2	–12.3
Sweden	0.3	–3.2	–5.5	–3.5	–6.6	–6.1	–7.4	–3.8
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–4.8
Turkey	0.0	0.0	0.0	0.0	–2.4	–2.0	–11.5	–12.3
United Kingdom	8.6	9.2	23.8	–6.5	–17.6	–4.2	–5.6	1.2
United States	–34.3	–66.0	–101.1	–207.5	–397.9	–579.3	–391.9	–339.3
Total OECD	26.5	–20.3	–2.7	–129.0	–336.6	–514.8	–340.4	–266.8

Source: OECD.

Table 19. **Trade balances: parts for line equipment**

US$ millions

	1978	1980	1982	1984	1985	1986	1987	1988
Australia	0.0	–43.6	–78.1	–88.3	–122.5	–166.9	–121.8	–93.2
Austria	–13.5	–11.5	–10.8	–13.4	–7.6	–15.9	–12.7	–7.7
Belgium/Luxembourg	141.6	241.6	89.5	95.6	109.3	194.7	257.5	184.9
Canada	n.a	n.a	n.a	n.a	n.a	n.a	n.a	336.5
Denmark	–17.2	–15.5	–1.7	–4.8	–5.8	–3.0	–21.6	–29.1
Finland	–16.0	–6.6	–14.3	1.8	2.2	15.0	–31.8	–6.9
France	62.4	96.4	146.8	200.4	201.4	239.6	277.3	217.8
Germany	121.9	193.4	167.8	153.2	214.9	269.6	310.4	343.6
Greece	0.0	0.0	–21.9	–23.3	–10.7	–32.2	–15.3	–22.6
Iceland	–0.7	–0.4	–0.1	–0.8	–0.1	–0.2	–0.2	–6.0
Ireland	–12.3	–23.0	–7.6	14.7	23.6	23.4	23.8	84.0
Italy	18.2	–24.2	1.8	–33.5	–14.9	15.1	–4.1	–80.3
Japan	127.6	126.8	169.8	563.0	396.0	509.6	467.9	527.7
Netherlands	–21.5	–10.3	0.9	–16.5	–66.1	–143.0	–161.2	–226.5
New Zealand	0.0	–5.2	–4.2	–9.8	–21.3	–30.4	–4.9	–22.3
Norway	–18.3	–29.4	–18.7	–28.5	–48.9	–58.6	–48.3	–28.0
Portugal	0.0	0.1	–4.7	–4.4	–4.2	–9.8	–18.5	–68.8
Spain	0.0	29.6	5.6	–5.8	–17.0	–6.4	–12.8	–65.1
Sweden	228.5	297.7	260.0	259.0	341.5	302.1	199.4	253.9
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	–108.6
Turkey	0.0	0.0	0.0	0.0	–81.1	–91.7	–25.3	–19.3
United Kingdom	31.5	19.7	5.4	–24.7	49.5	–61.0	–128.6	–126.0
United States	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total OECD	632.2	835.6	685.5	1 033.9	938.2	949.0	929.2	1 038.0

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Source: OECD.

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PRINTED IN FRANCE
(93 91 02 1) ISBN 92-64-13553-7 - No. 45657 1991