

THE GLOBALISATION OF INFORMATION TECHNOLOGY INDUSTRIES: FOREIGN DIRECT INVESTMENT DATA FROM THE UNITED STATES

Information technologies (IT) are among the most international and globalised industries (OECD, 1996a). Their international nature is evident in the trade data which show that, in most large countries, the share of IT production that is exported is two to three times the average of exports from other industries. It climbed to 40 per cent in France in 1991, to 88 per cent in the United Kingdom in 1992, and to 45 per cent in the United States, 52 per cent in Germany, and 27 per cent in Japan in 1993.

Globalisation is best quantified by analysing inward and outward foreign direct investment (FDI) in the IT industry. In 1993, the output of computer equipment manufacturers produced by foreign affiliates of US firms was 40 per cent greater than total domestic production in the United States. Because the comprehensiveness of the data varies considerably across countries, this analysis only covers the United States.

1. OUTWARD FOREIGN DIRECT INVESTMENT

The US data on the IT industry can be broken down into four segments on the basis of the 1987 US Standard Industrial Classification:

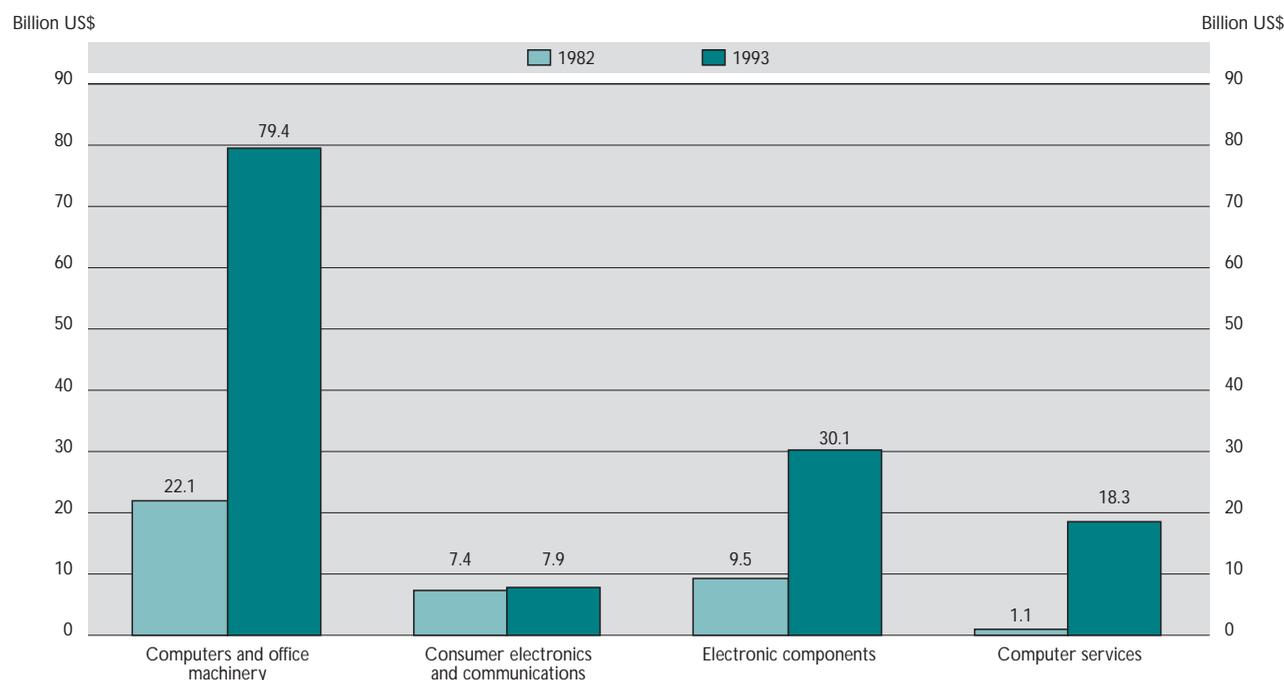
- computers and office machinery: mainframe, mini and personal computers, computer storage devices, computer terminals and peripheral equipment;
- consumer electronics and communications: telephone and telegraph apparatus, radio and television broadcasting and communications equipment;
- electronic components: printed circuit boards, semiconductors;
- computer services: computer processing and services, data preparation, information retrieval, facilities management.¹

Between 1982 and 1993, total IT industry sales by US affiliates operating abroad grew twice as fast as the average for US affiliates in all industries combined and at three times the rate for manufacturing affiliates. Computer services sales rose most sharply (at an annual rate of 29 per cent), followed by computers and electronic components (12.3 and 11 per cent, respectively) (Figure 4.1). In contrast, sales in consumer electronics and communications were sluggish and probably declined in volume. Some hardware manufacturers began to obtain over 50 per cent of sales from software and consulting, a reflection of an overall industry trend (see Part I). Nevertheless, at year-end 1993, turnover in computer services was still less than a quarter that of computers and office machinery, whose sales exceeded those of the other three sectors combined.

Computers and office machinery

Between 1982 and 1993, the number of US affiliates abroad in the computer and office machinery industry rose from 90 to 151; 90 per cent were majority-owned.² Over the same period, sales per affiliate doubled, while average size shrank from 2 000 to about 1 500 employees.

A comparison of total assets of US foreign affiliates (outward FDI) with assets of foreign-owned affiliates in the United States (inward FDI) shows that for the period 1985-93, outward FDI assets were generally well over ten times inward FDI assets. The situation is somewhat better for Asian computer firms than for European ones, but in 1993 US FDI in Asia was still more than eight times inward Asian FDI. Total outward FDI assets were US\$52 billion in 1985 and US\$121 billion in 1993, while total inward FDI assets were US\$2.8 billion and US\$8 billion, respectively (OECD, 1996a).

◆ Figure 4.1. *Sales of US IT affiliates¹ abroad*

1. Majority- or minority-owned firms, except for consumer electronics and communications (majority-owned only).
Source: OECD, Database on the Activities of Foreign Affiliates (DSTI).

In 1993, total assets of US foreign affiliates were distributed as follows: Europe, US\$75 billion; Asia-Pacific, US\$33 billion (and increasing steadily); and rest of the world, US\$13 billion. In the same year, total assets of foreign companies' affiliates in the United States amounted to US\$4.3 billion from Europe and US\$3.8 billion from Asia. Inward FDI assets from the rest of the world were negligible.

In 1982, over 73 per cent of the sales of US affiliates were to Europe, but by the end of 1993, they had dropped to 58 per cent, half of which to the United Kingdom and Germany. This shift corresponds to a restructuring of activity, with virtually all new affiliates being established in the Asia-Pacific area. The latter's share of aggregate sales of computers and business machinery, which amounted to less than 2 per cent in 1988, climbed to over 31 per cent of world sales of US affiliates in 1993.

The strategy of US multinationals in this sector, as in others, appears to have been to give priority to meeting local demand in their affiliates' home-country markets (45 per cent of total sales). Nevertheless, the proportion of sales to the US market rose from 8 per cent in 1982 to 21 per cent in 1993. More-

over, a significant share (over 34 per cent) was destined for markets outside the host countries, with an overwhelming majority of the exports being routed through US affiliates based in those markets.

Over the same years, sales outpaced *employment* in US foreign affiliates by almost three to one. The only significant net job creation occurred in the Asia-Pacific area. While affiliates operating in most other parts of the world cut staff (Table 4.1), those located in Asia created some 74 000 new jobs, to account for 38 per cent of all employees of US affiliates in this sector (Figure 4.2).

The shift of US affiliates to Asia may have been prompted by labour cost differentials. In Asia, average employee compensation in 1993 (wages and salaries plus employer-paid contributions) was only half that in Europe, and only a third or a fourth that of Europe in certain countries. Labour productivity in Asia was 73 per cent that in Europe, but the average annual growth rate was almost three times as high (14 per cent in Asia versus 5 per cent in Europe). Moreover, in the early 1990s, profit ratios in Europe turned negative, and this may have given US investors another reason to look to Asia.

Table 4.1. **Employment in majority-owned US affiliates abroad**

Thousands

| | Computers | | Consumer elec. | | Elec. components | | Comp. services | |
|---------------|-----------|-------------------|--------------------|------------------|------------------|-------|------------------|------------------|
| | 1982 | 1993 | 1982 | 1993 | 1982 | 1993 | 1982 | 1993 |
| Total | 160.2 | 219.6 | 160.8 | 40.5 | 208.1 | 285.0 | 10.0 | 77.6 |
| Canada | 14.6 | 12.2 | 4.2 | 3.9 | 7.6 | 6.0 | 0.5 | 4.6 |
| Japan | 13.9 | ⁴ | 0 | 0 | 5.5 | 14.8 | 0 | 5.0 |
| Europe | 112.8 | 115.1 | 110.5 ³ | 16.1 | 43.8 | 75.4 | 7.0 | 54.2 |
| Latin America | 10.4 | 8.2 | 17.8 | 9.0 | 32.4 | 71.5 | 1.2 | 3.7 |
| Africa | 0 | 0.1 | ⁴ | 0 | 0.1 | 0 | - | - |
| Midde East | 0 | 0.2 | ⁴ | 2.4 | 0.5 | 2.3 | 0.2 | 1.1 |
| Asia-Pacific | 8.3 | 82.8 ¹ | 22.5 | 8.1 | 117.4 | 114.3 | 0.3 | 5.5 |
| Australia | - | 1.0 | 3.5 ² | 0.9 ² | 0.8 | 0.7 | 0.7 ² | 3.2 ² |

1. Excludes Australia.

2. Includes New Zealand and South Africa.

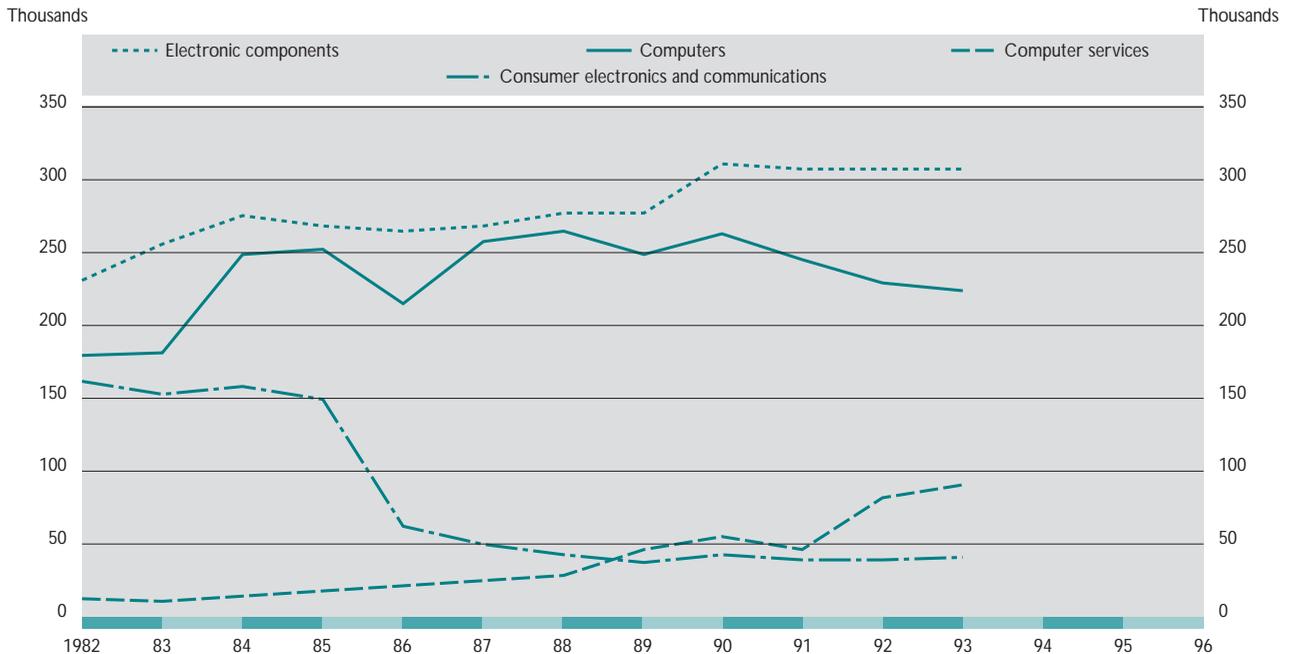
3. EU only.

4. Suppressed to avoid disclosure of individual company data.

Source: OECD, Database on the Activities of Foreign Affiliates (DSTI/EAS)

In 1989, the share of R&D expenditure that US affiliates performed in Europe was roughly the same as that of sales, at around 60 per cent, down from 1982, owing mainly to a shift of R&D expenditures to Japan and the Asia-Pacific area. Computer affiliates spent five times as much on R&D as component affi-

ates and seven times as much as affiliates in computer services. Moreover, computer makers were the only IT affiliates to finance their own research, but they also performed twice as much R&D for their parent companies or other affiliates in the same group as they did on their own behalf. This suggests

◆ Figure 4.2. **Employees of US IT affiliates¹ abroad**

1. Majority- or minority-owned firms, except for consumer electronics and communications (majority-owned only).

Source: OECD, Database on the Activities of Foreign Affiliates (DSTI).

that research performed by affiliates was intended more for international than for local consumption. In addition, the R&D intensity (R&D outlays as a percentage of sales) of US affiliates in the computer industry was considerably below the OECD average, suggesting that most R&D was carried out by parent companies in the United States.

Between 1982 and 1986, the US computer and office machinery *trade balance* surplus fell steadily, and in 1987 it turned negative. By 1993, the trade deficit stood at US\$16.8 billion. It was attributable to trade with the Asia-Pacific area (US\$26 billion overall in 1993, with deficits of US\$132 billion with Japan, US\$6 billion with Singapore, US\$5 billion with Chinese Taipei and US\$1.7 billion with the Republic of Korea), whereas the trade balance showed a solid surplus with the European Union over the entire period.

Three-quarters of the US deficit was with unaffiliated companies, with affiliates, the deficit stemmed exclusively from trade with partners in Asia. *Intra-firm trade* (i.e. the share of trade between affiliates and parent companies in a sector's total trade) was up sharply between 1982 and 1993, climbing from 23 to 35 per cent for exports and from 28 to 32 per cent for imports.

Consumer electronics and communications

Consumer electronics and communications is the only one of the four IT industries from which US firms began to withdraw extensively from affiliates in the latter half of the 1980s. The withdrawal was marked by an initial phase of substantial divestment of majority-owned affiliates, followed by a second phase of massive retreat from minority holdings.

Dollar *sales* of US (majority- and minority-owned) affiliates lost momentum in the period 1982-85, but regained ground in 1986. Between 1987 and 1989, sales trends levelled off for both categories of affiliates, culminating in 1990 with a withdrawal from minority-owned units. One consequence of the restructuring was a reduction in payrolls around the world, especially in Europe (Figure 4.2). *Employment* in European affiliates fell from 103 200 in 1985 to 14 000 in 1986 and remained at approximately that level until 1993. The countries hardest hit were Belgium, Germany, Italy, and Spain. Elsewhere, workforce reductions were more modest, dropping from 22 500 to 8 100 in the Asia-Pacific area and from 17 800 to 9 000 in Latin America.

Exceptionally high *productivity gains* were obtained essentially by cutting staff. Even so, it was not in Europe, where job losses were most severe, that the gains were greatest, but in the Asia-Pacific area. This was due to Europe's decline in nominal sales, which in 1993 were below their 1982 level, whereas sales in Asia rose by a factor of 2.7 over the same period. For majority-owned Asian affiliates as a group, productivity rose at three times the rate of wages and salaries. Profit ratios for Asian affiliates of US firms, between 1988 and 1993 in particular, were among the highest of the four sectors examined, at approximately 9 per cent.

The US *trade balance* deficit in the consumer electronics and communications sector was fairly large, at between US\$12 and 16 billion for the years reviewed. Over half of the trade deficit was with Japan, the rest with China, Chinese Taipei, Mexico, the Republic of Korea, and Singapore. More than 94 per cent of the overall deficit of the consumer electronics sector stemmed from trade with unaffiliated firms.

The direct consequence of these trends was a sharp decline in *intra-firm trade* in consumer electronics. For exports, it dropped from 56 per cent of all trade in 1982 to 9.5 per cent in 1993, and for imports, from 23 to 5.3 per cent. In addition, the proportion of consumer electronics products in parent company imports from affiliates dropped significantly (from 93 to 71 per cent) because of the faster growth in imports from unaffiliated suppliers.

Electronic components

Between 1982 and 1993, US firms created about 150 new affiliates worldwide in the electronic components industry. Most of the *sales* and employment of US foreign affiliates were outside the OECD area. Europe's share of sales remained fairly stable at between 34 and 36 per cent of the total, half of which in the United Kingdom and Germany. The largest share of sales was in the Asia-Pacific area, which in 1993 accounted for over 56 per cent of the total.

Majority-owned US affiliates hired an additional 77 000 *employees* over the period, generating 31 600 jobs in Europe and 39 100 in Latin America. The importance of Latin America, rather than the Asia-Pacific area, as a source of half of all the new jobs is rather surprising, since in 1993 labour productivity in the Asia-Pacific areas was seven times that in Latin America, where wage and salary costs were 60 per cent higher. Moreover, profit ratios of Asian affiliates were well above the overall average through-

out the period, while those in Latin America were very low (and even negative in 1988). The decision to locate in Latin America was probably influenced by other factors, such as stricter local-content regulations, tax incentives or other advantages.

Research and development was aimed more at local than at international needs. In contrast to the situation in computers and office machinery, 83 per cent of the R&D performed by electronic components affiliates was for their own needs. About half of US affiliates' R&D expenditure was in Europe, 10 per cent in Canada, and 27 per cent in Japan.

In the early 1980s, the largest portion of affiliates' sales (39 per cent) went to the US market, 32 per cent to local markets, and the rest to other countries. In 1993, this trend was reversed, in favour of local markets; the United States still accounted for a relatively large proportion of sales (29 per cent), but one that was down significantly.

The US *trade balance* in components ran a constant deficit, essentially with two countries – Japan (80 per cent of the deficit) and South Korea (20 per cent) – but the volume of the deficit was only one-third and one-half that recorded for consumer electronics and for computers and office machinery, respectively. It was split almost equally between affiliated and unaffiliated firms.

In components, the United States seemed to want to lessen its dependence on foreign suppliers, including its own affiliates abroad. Meanwhile, the share of imports by US parent companies of components from affiliates abroad (as a share of their total imports) rose to 95 per cent in 1993, owing to a slowdown in imports from unaffiliated suppliers. In addition, *intra-firm trade* increased appreciably; in the case of imports, it rose from 22.5 per cent in 1982 to 34.6 per cent in 1993, whereas the figures for exports, although higher, showed little change (from 42.3 per cent in 1982 to 45.1 per cent in 1993).

Computer services

Over the past 15 years, US affiliates in computer services experienced extremely rapid growth, in terms of both sales and number of employees. The number of affiliates climbed from 97 in 1982 to 398 in 1993, and computer services were the only one of the four sectors analysed in which the average size of a unit increased, from 125 to 213 employees. The vast majority of computer services affiliates were located within the OECD area (which accounted for over 85 per cent of sales, with 70 per cent in Europe).

Over those twelve years, *employment* in computer services affiliates expanded by around 68 000 jobs – almost as many as in electronic components affiliates and more than in computers and office machinery affiliates. In 1993, a third of the employees in Europe were in the United Kingdom, another third was split between France, Germany and the Netherlands, and the remaining third in other (mainly EU) countries. In Japan, US affiliates only began to be established in 1987-88.

R&D expenditure by computer services affiliates was relatively modest in comparison with outlays by the computer and office machinery and the electronic components sectors. About 40 per cent of R&D was carried out by parent companies on their affiliates' behalf. In Europe, most R&D was performed by and for affiliates in the United Kingdom and the Netherlands.

Over 80 per cent of sales were to host-country markets; barely 2 per cent went to the US market.

2. INWARD FOREIGN DIRECT INVESTMENT³

Foreign investment in US electronics industries was dominated by multinationals from Europe, Canada and Japan. Whereas Japanese investors tended to favour small new US electronics enterprises, European investors generally acquired much larger firms.⁴ In 1994, in the *computer and office machinery* sector, European affiliates accounted for 49 per cent of all foreign affiliate sales and 41 per cent of employment, whereas Japanese affiliates generated 31 per cent of sales and 47 per cent of employment. Among Europeans, French companies made the largest investments: Groupe Bull's take-over of Honeywell's computer division and of Zenith Data Systems. French affiliates provided about 27 per cent of the jobs among the sector's foreign affiliates. Other European countries had more modest shares, led by Germany (10 per cent) and Switzerland (2 per cent). Certain Japanese firms (Toshiba and NEC) acquired US computer makers and employed more people than all of the European companies combined. Since the early 1990s, certain Asian firms – particularly from Chinese Taipei, Hong Kong, the Republic of Korea, and Singapore – made small acquisitions, which represented 1.5 per cent of sales and 6 per cent of employees.

In 1994, in the *consumer electronics and communications* sector, European firms accounted for 42 per cent of sales and 46 per cent of employment of all foreign affiliates combined. Once again, French

affiliates dominated sales and employment (with shares of 30 per cent and 28 per cent, respectively): Thomson acquired the TV manufacturer RCA/GE and Alcatel invested in manufacturers of telephone equipment. Next came the United Kingdom, which specialised in telephone equipment (Plessey), while Germany (Siemens and BASF), the Netherlands (Philips) and Sweden (Ericsson) accounted for less than 2 per cent of telephone equipment sales and employment. Japanese companies, which accounted for 26 per cent of sales and employed 16 per cent of the workforce, specialised in the production of records, video cassettes and CDs through affiliates of Sony and TDK. In addition, Japan's NEC and Fujitsu set up affiliates to make telephone switching equipment. In that area, Canada's Northern Telecom held a strong position, with US market shares just below those of the United States' AT&T. Investment by other Asian firms, including Samsung (Republic of Korea) and Tatung (Chinese Taipei) in television manufacturing, was modest, at less than 2 per cent of aggregate sales by foreign affiliates.

In *electronic components*, European affiliates generated 57 per cent of the sales of foreign affiliates and some 51 per cent of their employment. The

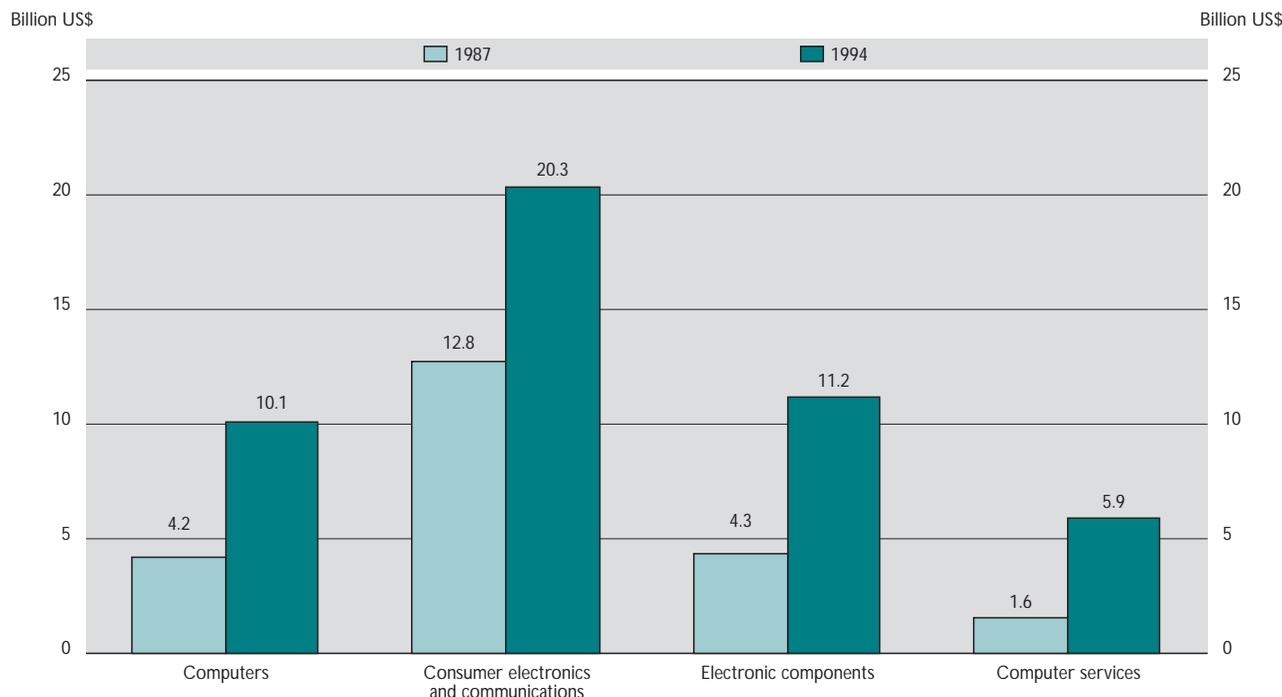
shares of Japanese affiliates in sales and employment were 37 and 41 per cent, respectively. Two European countries, Germany (Siemens) and the Netherlands (Philips), accounted for over 40 per cent of sales and some 23 per cent of the workforce. The chief Japanese multinationals producing electronic components in the United States were Toshiba, NEC, Fujitsu, Hitachi, Matsushita and Sony. Affiliates of firms from Canada (Northern Telecom) and certain Asian countries, particularly the Republic of Korea (Samsung) and Chinese Taipei (Hualong and Tatung), had only very modest shares of sales (between 2 and 4 per cent).

Computer services were dominated by European affiliates, which generated 75 per cent of the sales of foreign affiliates and employed 68 per cent of the workforce. Japanese affiliates had only a relatively modest share, with 5 per cent of sales and employment.

Sales and employment

Between 1987 and 1993, sales of foreign IT affiliates in the United States more than doubled, from US\$23 to US\$47 billion (Figure 4.3). This was twice the growth rate of sales of US affiliates abroad in the

◆ Figure 4.3. Sales of foreign IT affiliates in the United States



same industries, although US sales abroad exceeded foreign sales in the United States by three to one.

Sales of computer services rose most sharply (at an annual rate of 22 per cent), followed by electronic components (14.5 per cent), computers (12.9 per cent), and consumer electronics and communications (10.5 per cent).

The relative withdrawal of US firms from consumer electronics, which also affected US investment abroad, was followed by a substantial influx of foreign affiliates to the United States. Without their presence, the US trade deficit in the sector would probably have been far wider.

Employment rose far less sharply than sales, at least until 1993, with 2.3 per cent annual growth vs. 12.0 per cent for sales. During the 1990s recession, foreign affiliates, which had created 66 400 jobs between 1987 and 1990, trimmed their workforce (cutting 21 100 jobs in 1991, 4 100 in 1992 and 14 700 in 1993). These losses were mainly in computers and office machinery (down 25 200) and components (down 14 600); consumer electronics and computer services maintained their employment levels.

Estimates for 1994, however, show an overall year-on-year loss of 34 900 jobs, concentrated in consumer electronics and communications (down by 24 500) and, to a much lesser extent, the computer industry (down 6 500).

The role of foreign investment in the US economy

Foreign affiliates played an expanding role in US economic activity. Between 1987 and 1993, their share of total employment rose from 10 to over 15 per cent in computers and office machinery and from 11 to 13 per cent in consumer electronics and electronic components. While the overall US computer sector lost 86 000 jobs over this period, foreign affiliates created about 900. Similarly, in the IT industry as a whole, foreign affiliates created 6 000 additional jobs while aggregate employment dropped by 70 000. These jobs paid above-average wages for the sectors involved, and for manufacturing in general.

Returns on foreign investment were very heavily influenced by cyclical trends in each sector. Profit ratios were extremely disappointing in the computer industry throughout the period under review, and were relatively mediocre in electronic components, at least until the end of the recession. They were, however, far more satisfactory in computer services and consumer electronics and communications, which suffered less from the recession.

Research and development

Aggregate R&D outlays of foreign affiliates in the United States in the four sectors rose from \$1.3 billion in 1987 to \$2.7 billion in 1994. Computer services, with 37 per cent annual growth, saw the sharpest increase in R&D expenditure, followed by consumer electronics and communications (14 per cent) and computers and office machinery (7 per cent). In contrast, R&D outlays in electronic components declined by an annual average of 3.7 per cent. In consumer electronics and computer services, the bulk of R&D was performed by European and Canadian affiliates; in the computer sector, by Japanese affiliates; and in electronic components, by European and Japanese affiliates.

In 1994, Japanese affiliates performed 75 per cent of the R&D of foreign affiliates in the computer and office machinery sector and 42 per cent of the R&D in the electronic components industry. European-owned firms accounted for 32 per cent of the R&D of foreign affiliates in electronic components and 76 per cent in computer services, a sector where the presence of Japanese affiliates was modest.

In the four sectors, over 98 per cent of R&D funding was provided by the affiliates themselves, and the work was performed on their own behalf. The electronic components industry carried out some 10 per cent of its research for other customers. Contracts from the federal government represented only a small fraction (less than 0.2 per cent) of the R&D outlays of foreign affiliates.

Trade

Between 1987 and 1993, exports and imports of foreign affiliates grew much more rapidly than trade by all domestic and foreign electronics firms: while aggregate trade almost doubled, exports and imports of foreign affiliates more than tripled. Exports and imports of consumer electronics and communications affiliates grew most sharply, at nearly twice the sector's overall pace. Electronic components and computer equipment affiliates followed.

The aggregate trade balance of the foreign affiliates in the four sectors of the IT industry showed a deficit over the period 1987-94, but the gap began to widen in 1990 and affected all sectors except computer services, where trade was extremely slight. The export/import ratio worsened in the computer sector (from 0.66 to 0.46), changed little in consumer electronics (from 0.33 to 0.36), and bounced back in electronic components (from 0.45 to 0.75). Nevertheless,

in 1993 over 75 per cent of the trade deficit of foreign affiliates was attributable to consumer electronics, 20 per cent to computers and office machinery, and less than 5 per cent to electronic components.

In terms of trade, foreign affiliates in all sectors (and especially consumer electronics and communications) generated deficits, except for computer services, which recorded a slight surplus. Only a small portion of computer services was exported (barely 5 per cent of turnover); the other sectors' export ratios varied between 11 and 16 per cent, *i.e.* well below those of domestic firms. A substantial portion of foreign affiliates' trade, particularly imports, was

conducted with parent companies (between 45 and 70 per cent, depending on the sector).

In the computer and office machinery sector, over 85 per cent of the trade deficit from foreign affiliates came from Japanese firms; European affiliates generated surpluses (US\$140 million). The deficits in consumer electronics and electronic components were more evenly divided between affiliates of Japanese and European corporations. The surpluses in computer services were largely attributable to European firms and, to a lesser extent, Japanese and Latin American companies.

NOTES

1. These categories are based on 1987 US Standard Industrial Classification codes 357, 366, 367 and 741, 742 and 743.
2. Majority-owned foreign affiliates are those in which the combined direct and indirect ownership interests of all US reporters for the affiliate exceed 50 per cent.
3. The data used in this section are only available from 1987. They encompass all foreign affiliates in the United States, whether foreign ownership involved a majority or a minority interest. In this, the figures differ from most statistics on US affiliates abroad, which cover only majority-owned units.
4. Donald H. Dalton, "Foreign Direct Investment in the US Electronics Industry", in *Foreign Direct Investment in the United States: Review and Analysis of Current Developments*, Economics and Statistics, US Department of Commerce, August 1991.