



### 3. IST in Sweden

*”Statistics are the triumph of the quantitative method, and the quantitative method is the victory of sterility and death.”*

*Source: Hilaire Belloc*

- \* In 1995, Swedish companies invested 150 billion SEK in IT. 100 billion SEK went into software and 50 billion SEK were spent on hardware and equipment. About 70% of all IT projects fail. How to evaluate IT projects? Three development companies in SoftCenter in Ronneby are collaborating with the university of Karlskrona/Ronneby to develop models, methods, techniques, and tools for — IT evaluation. The project is called Janus.

*Source: IT Nyheterna # 8, 1996*

- \* A description of the transformation of the Swedish telecom market was made in June 1995 by three researchers at the Stockholm School of Economics. Michael Kaplan, Bertil Thorngren and Mats Vilgon presented the essence of the transformation in a paper presented to COTIM 95, a conference on telecommunications and information markets, in Newport, Rhode Island, USA. It may serve as a complement to this chapter about Sweden.

- \* **Amendments to the Swedish Telecommunications Law of 1993:**
  - **Telecommunications Service to All on the Same Conditions, at Reasonable Pricing**
  - **Regulations Adapted to EU Liberalisation**
  - **All Operators Must Register**

On March 12, 1997, the Swedish Government handed its proposition for amendments to the Telecommunications Law of 1993 to the Swedish parliament, Regeringens proposition 1996/97:61 (The Government’s proposition # 1996/97:61). Some of the contents of the proposition are:

- The basic telecommunications objectives are confirmed and reinforced by it being explicitly expressed in the law that telecommunications services shall be made available to all inhabitants on similar conditions and at reasonable pricing
- Current rules about operating licenses are reinforced by new rules about obligatory registration of all operators, even the very small ones
- Current rules about joint traffic are sharpened
- Dominant operators are enforced to provide open information on for instance costs and tariffs

The objectives of the proposed changes are to facilitate for the fulfillment of the telepolitical objectives, and to adapt the local Swedish law to the emerging EU regulation.

*Source: Regeringens proposition 1996/97:61*

\* **Telia's Agreement with the State to Provide Telecom to All is not Prolonged — General Rules for All Operators**

Telia has had an agreement with the Swedish state to provide telecommunications services also to the very distant parts of Sweden on the same conditions and at the same tariffs as for the rest of the country. This includes availability of public telephones in little frequented areas, as well as access to the telecommunications network. The agreement will not be prolonged for the period after July 1, 1997, but be replaced by general rules, common to all operators.

*Source: Regeringens proposition 1996/97:61*

\* **PTS, the Regulatory Authority, to Have Overall Responsibility for the Swedish Telecommunications Market**

According to the March 12, 1997, government proposition to the parliament, the Swedish regulatory authority, Post och Telestyrelsen, PTS, will have an overall responsibility for the function of the Swedish telecommunications market from the user's perspective as well as from a competitive one. The PTS is to be given increased empowerment in order to supervise the adherence of the operators to the laws and regulations.

*Source: Regeringens proposition 1996/97:61*

### **3.1. Basic Facts**

The DTI & Spectrum report "*Development of the Information Society*" (1996) is comparing facts on information and communication technology usage and performance collected from Australia, Canada, France, Germany, Japan, Singapore, UK, USA, and Sweden. The objective is to understand the factors underlying the development towards the information society. The summarising analysis on Sweden states:

**"Despite its relatively low GDP in comparison with the other countries..., Sweden scores very well on a large number of benchmarks considered. It leads in terms of penetration of cellular and personal computers penetration of the European workforce and its baskets of international telephone charges and mobile tariffs are the lowest of the countries considered."**

The report goes on mentioning a number of factors which have facilitated the progress of the information society in Sweden:

- \* the size and the geographical situation, which have made it possible to lay a fibre optic backbone;
- \* the Swedes being competent English speakers;

- \* the geographical distances of some communities have forced their inhabitants to depend on communication technologies and their early applications — Telemedicine is mentioned as one example;
- \* government support by, for instance, using electronic procurement for 90% of frequently purchased goods has encouraged businesses to develop EDI and e-mail systems.

### Sweden's Way Towards the Information Society in 1996, as Seen by DTI & Spectrum

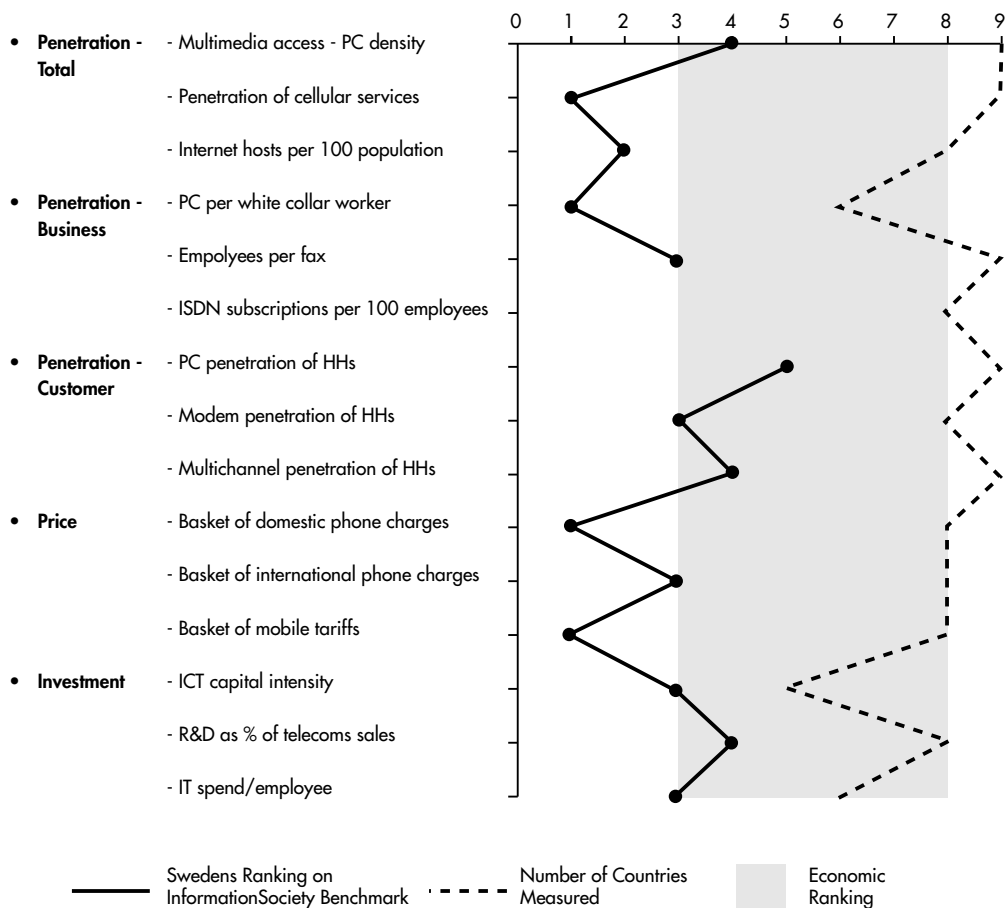


Fig. 12 mars 1: The British researchers have developed a number of benchmarks, against which they have measured nine countries in order to decide to what extent the particular countries are making progress toward the Information Society. The diagram shows how Sweden positions itself against these benchmarks. Of course, the report contains compound comparisons for all the other countries as well.

Source: Department of Trade and Industry & Spectrum: Development of the Information Society, 1996

## Influences on Relative Performance of Sweden Towards the Information Society as Reported by DTI & Spectrum 1996

Factor	Impact	Commentary
Macroeconomic environment	○	<ul style="list-style-type: none"> <li>• High levels of public debt</li> <li>• Emerging from recession</li> </ul>
Geography and demographics	●	<ul style="list-style-type: none"> <li>• Small population (simplifies electronic registers)</li> <li>• Remote communities</li> </ul>
Education	●	<ul style="list-style-type: none"> <li>• Active encouragement of use of computers in schools</li> </ul>
Government/Private sector relationship	◐	<ul style="list-style-type: none"> <li>• Supportive with considerable government investment</li> <li>• Government registers provide companies with access to useful data</li> </ul>
Competitive regime	●	<ul style="list-style-type: none"> <li>• Strong competition in telecommunications early but not pioneering</li> </ul>
Culture of innovation	◐	<ul style="list-style-type: none"> <li>• Fairly strong</li> </ul>
Culture of communication	●	<ul style="list-style-type: none"> <li>• Competent English speakers facilitates access to content</li> <li>• Remote communities</li> </ul>

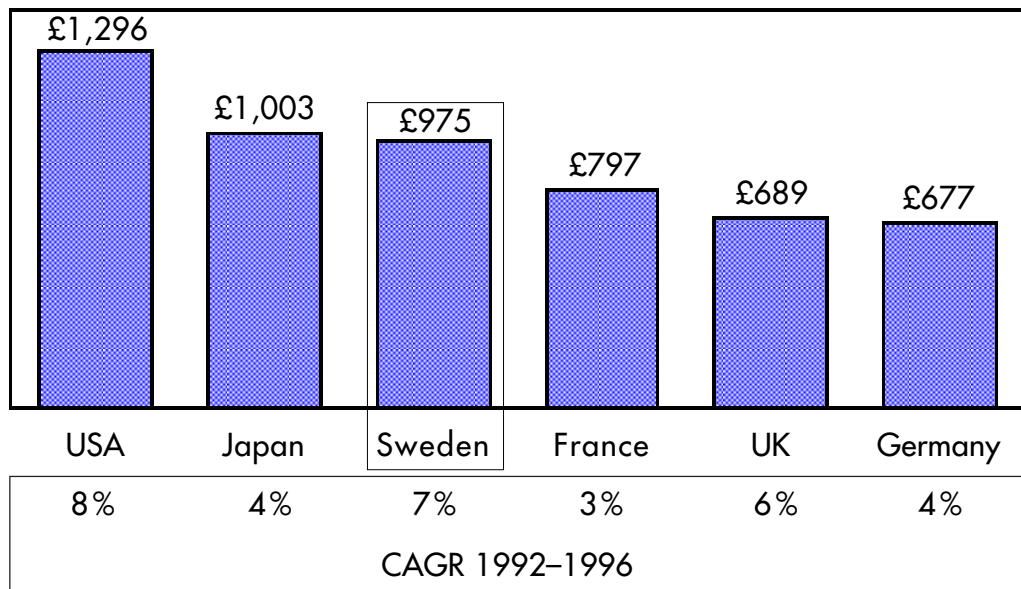
● Very positive      ○ Neutral or negative

*Fig. 25 Feb. 20: The conclusion the DTI is making of these benchmarks is that Sweden has a sound foundation and a good performance in its development towards the information society. But the small size of its market cannot serve as a model for larger and more complex markets.*

*Source: Department of Trade and Industry & Spectrum: Development of the Information Society, 1996*

## Investment in Information Technology per Employee for Countries in DTI Report

Estimation for 1996 in £



*Fig. 25 Feb. 21: The diagram shows the variation in investment in information technology per employee for the countries analysed by DTI and Spectrum. Sources: EITO 1995/Department of Trade and Industry & Spectrum: Development of the Information Society, 1996*

## The Market Value of the Swedish Telecommunications and Information Technology Market 1991 — 1995 In million ECUs

	1991	1992	1993	1994	1995	CAGR 91-93 %	CAGR 93-95 %
Large computers	226	112	173	149	128	- 12.4	-14.1
Medium computers	169	120	146	132	122	- 7.1	- 8.8
Small computers	149	149	166	175	181	5.3	4.5
Workstations	90	80	82	86	92	- 4.9	6.4
PCs - portable	145	122	144	151	167	- 0.1	7.5
PCs - desktop	609	516	467	453	459	- 12.4	- 0.9
PC printers	148	141	139	140	139	- 3.0	0.1
<b>Computer Hardware</b>	<b>1 536</b>	<b>1 239</b>	<b>1 317</b>	<b>1 285</b>	<b>1 288</b>	<b>- 7.4</b>	<b>- 1.1</b>
Typewriters	21	19	17	15	14	- 10.0	- 8.0
Calculators	22	21	20	20	19	- 4.0	- 4.5
Copiers	110	112	113	117	120	1.4	2.9
Other Office Equipment	80	82	83	84	86	2.1	1.7
<b>Office Equipment</b>	<b>233</b>	<b>235</b>	<b>234</b>	<b>236</b>	<b>239</b>	<b>0.1</b>	<b>1.1</b>
LAN Hardware	76	97	114	123	128	22.8	5.9
Other Data Communications	56	64	69	70	68	11.5	- 1.2
<b>Data Communications Hardware</b>	<b>131</b>	<b>161</b>	<b>184</b>	<b>193</b>	<b>196</b>	<b>18.2</b>	<b>3.3</b>
<b>IT Hardware</b>	<b>1 901</b>	<b>1 635</b>	<b>1 735</b>	<b>1 714</b>	<b>1 723</b>	<b>- 4.5</b>	<b>- 0.3</b>
Systems Software	343	362	388	410	434	6.3	5.8
Application Software	331	356	386	419	452	8.4	7.8
<b>Software Products</b>	<b>675</b>	<b>718</b>	<b>777</b>	<b>829</b>	<b>886</b>	<b>7.3</b>	<b>6.8</b>
Professional Services	1 649	1 588	1 771	1 950	2 088	3.6	8.6
Processing Services	534	545	563	586	606	2.7	3.8
Network Services	55	59	72	77	86	13.7	9.7
Hardware Maintenance & Support Services	449	433	411	391	379	- 4.4	- 3.9
<b>Services</b>	<b>2 687</b>	<b>2 625</b>	<b>2 816</b>	<b>3 004</b>	<b>3 159</b>	<b>2.4</b>	<b>5.9</b>
<b>Total IT Market</b>	<b>5 263</b>	<b>4 977</b>	<b>5 328</b>	<b>5 546</b>	<b>5 768</b>	<b>0.6</b>	<b>4.1</b>
Service Providing Equipment	673	586	539	509	471	- 10.5	- 6.5
Customer Premises Equipment	770	753	730	708	763	- 2.6	2.2
Data Network Services	260	295	324	358	386	11.6	9.2
Voice Network Services	3 478	3 817	4 075	4 319	4 566	8.2	5.8
Installation & Maintenance	193	197	199	202	203	1.7	0.9
<b>Total Telecom</b>	<b>5 374</b>	<b>5 648</b>	<b>5 867</b>	<b>6 095</b>	<b>6 388</b>	<b>4.5</b>	<b>4.3</b>
<b>Total Telecom and Computer Industries</b>	<b>10 637</b>	<b>10 625</b>	<b>11 195</b>	<b>11 642</b>	<b>12 157</b>	<b>2.6</b>	<b>4.2</b>

Fig. Feb. N (kap. 3): This table shows the size of the Swedish computer and telecommunications industries per product area and their developments from 1991 to 1995. Each figure is based on value one given in Swedish Crowns, SEK, and then converted to constant 1992 ECU. The exchange rate was 7.56 SEK to 1 ECU.

Sources: SITO/EITO: European Information Technology Observatory 94

## Key Figures of the IST Market Value in Sweden 1994 — 1998, According to EITO 1997

All values are in million ECUs

Industry sector	1994	1995	1996	1997	1998
Computer hardware	1 497	1 837	1 996	2 067	2 161
Office equipment	208	208	204	202	201
Data communications hardware	208	244	277	300	308
<b>IT hardware total</b>	<b>1 913</b>	<b>2 290</b>	<b>2 478</b>	<b>2 569</b>	<b>2 669</b>
Software products	718	781	839	915	992
Services	2 327	2 475	2 621	2 769	2 941
Software and services (subtotal)	3 044	3 256	3 461	3 684	3 934
<b>Total IT market</b>	<b>4 957</b>	<b>5 545</b>	<b>5 938</b>	<b>6 253</b>	<b>6 603</b>
Public network equipment	432	422	422	432	447
Private network equipment	606	686	728	725	755
<b>Telecom equipment total</b>	<b>1 038</b>	<b>1 107</b>	<b>1 150</b>	<b>1 157</b>	<b>1 202</b>
Telecom services	3 622	4 033	4 346	4 667	5 013
<b>Total telecom</b>	<b>4 661</b>	<b>5 140</b>	<b>5 496</b>	<b>5 824</b>	<b>6 125</b>
<b>Total IST</b>	<b>9 618</b>	<b>10 685</b>	<b>11 435</b>	<b>12 077</b>	<b>12 818</b>

*Fig. 20 maj 1: This table, after data from EITO, shows the market values of the major ICT industry sectors in Sweden 1994 to 1998, 1997 and 1998 values being estimates.*

*Source: EITO*

## The Swedish Communications and IT Industries Market Structures and Penetration 1990 — 1992

		1990	1991	1992
Industry leader's share	Hardware	34.8%	30.3%	22.5%
	Software	5.8%	2.5%	2.8%
	Services	7.2%	12.3%	8.0%
10 Top IT Vendors	Hardware	79.4%	78.9%	57.1%
	Software	24.7%	15.6%	17.9%
	Services	24.0%	26.3%	22.4%
Market Comparisons	IT/GDP	2.98%	2.88%	2.59%
	Per Capita IT Expenditure (ECUs)	611	611	574
	Communications+IT/GDP	6.03%	5.83%	5.52%
	Per Capita Communications+IT Expenditure (ECUs)	1 235	1 234	1 226

*Fig. Feb. M (kap 3): This table describes the Swedish communications and information technology market from 1990 to 1992 according to a number of parameters, which EITO is using in international comparisons. Some interesting observations are that the telecommunications industry generally speaking had a larger share of the gross domestic product (GDP) than information technology by 1990 but that IT is taking a larger share. Comparisons between this table and several others in the following chapter are recommended.*

*Source: EITO: European Information Technology Observatory 94*

### \* Total Swedish ICT Industry Turnover in 1995

For 1995, the ICT industry in Sweden, including telecommunications, reported a total turnover of 248 billion SEK (Swedish Crowns).

*Source: Datavärlden, June 7 1996*

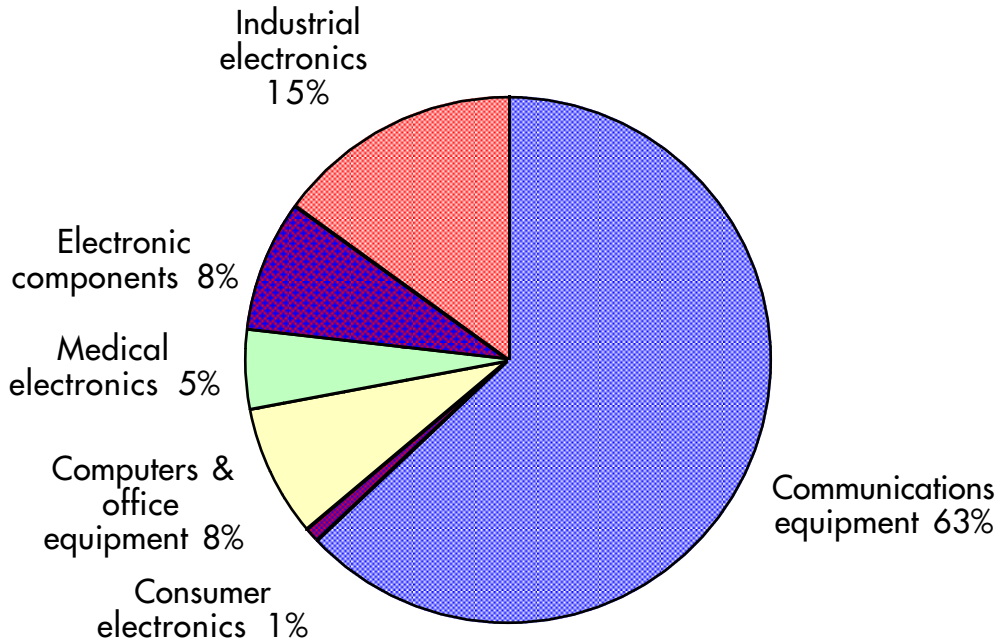
### \* Electronic Production in Sweden in 1993

In the context of production and trade, it should be noted that telecom and IT falls under the terminology "electronics", which also includes areas like medical electronics and industrial electronics. This applies to all of the following diagrams.

## Electronic Products in Sweden in 1993

Trading value in current prices in million SEK  
Percentage per product group

**Total value: 47 billion SEK**

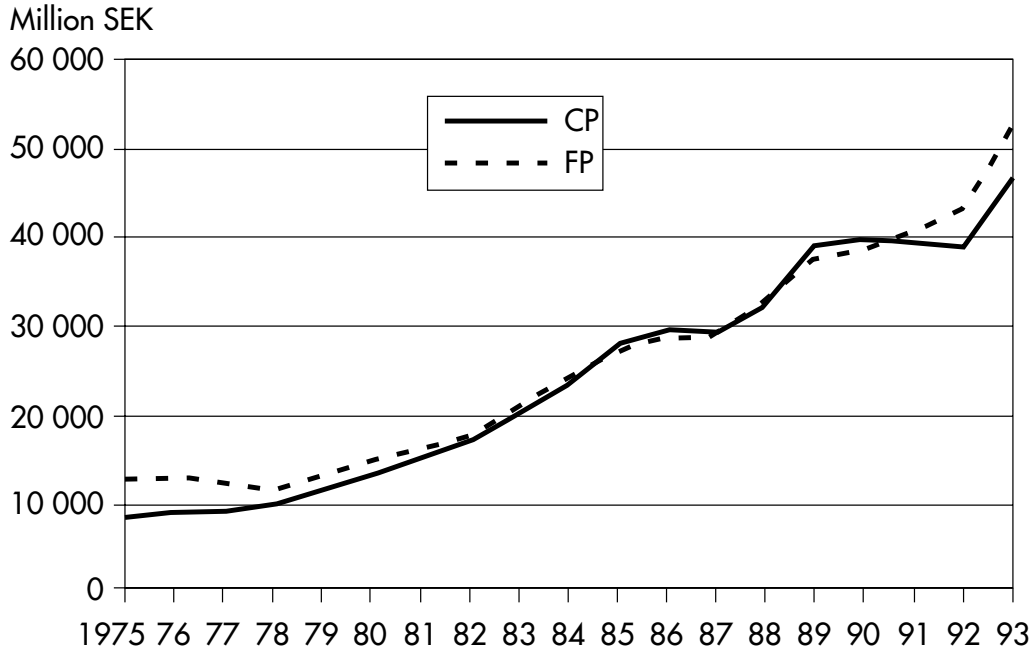


*Fig 2.1 The total value of the production of electronic products in Sweden in 1993 was almost 47 billion SEK. The largest group of goods is the one called communications equipment, making up 63% of the total. In this group is included any equipment for radio communication and mobile telephony, representing 38% of the total, while telecommunications represent 25% of the total.*

*Source: SCBs industristatistik/SCB: Data om informationstekniken i Sverige 1996*

## Total Electronic Production in Sweden 1975 — 1993

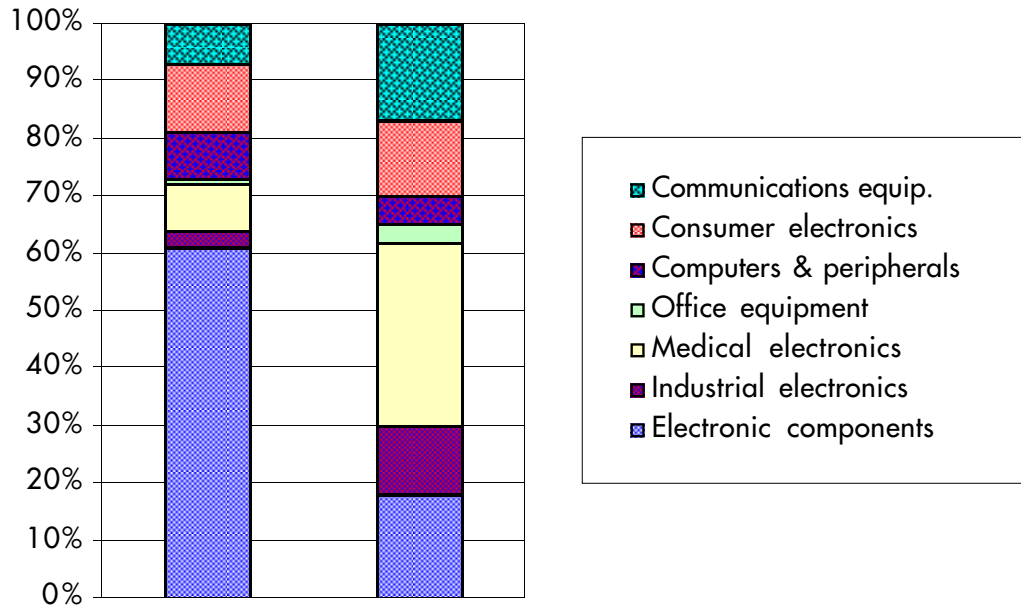
In current prices (CP) and in fixed prices (FP)



*Fig 2.2 During 1988 to 1993, the electronic production in Sweden expanded by 43% in current prices and by 58% in fixed prices. This expansion should be compared to the general environment of slow economic progress in the country. Total industrial production decreased during this period by 5% in real figures, and GNP decreased by 1.5%. Since 1975, electronic production has grown four times in size, measured in fixed prices.*

Source: SCBs industristatistik/SCB: Data om informationstekniken i Sverige 1996

## Export and Import of Electronic Equipment in 1994

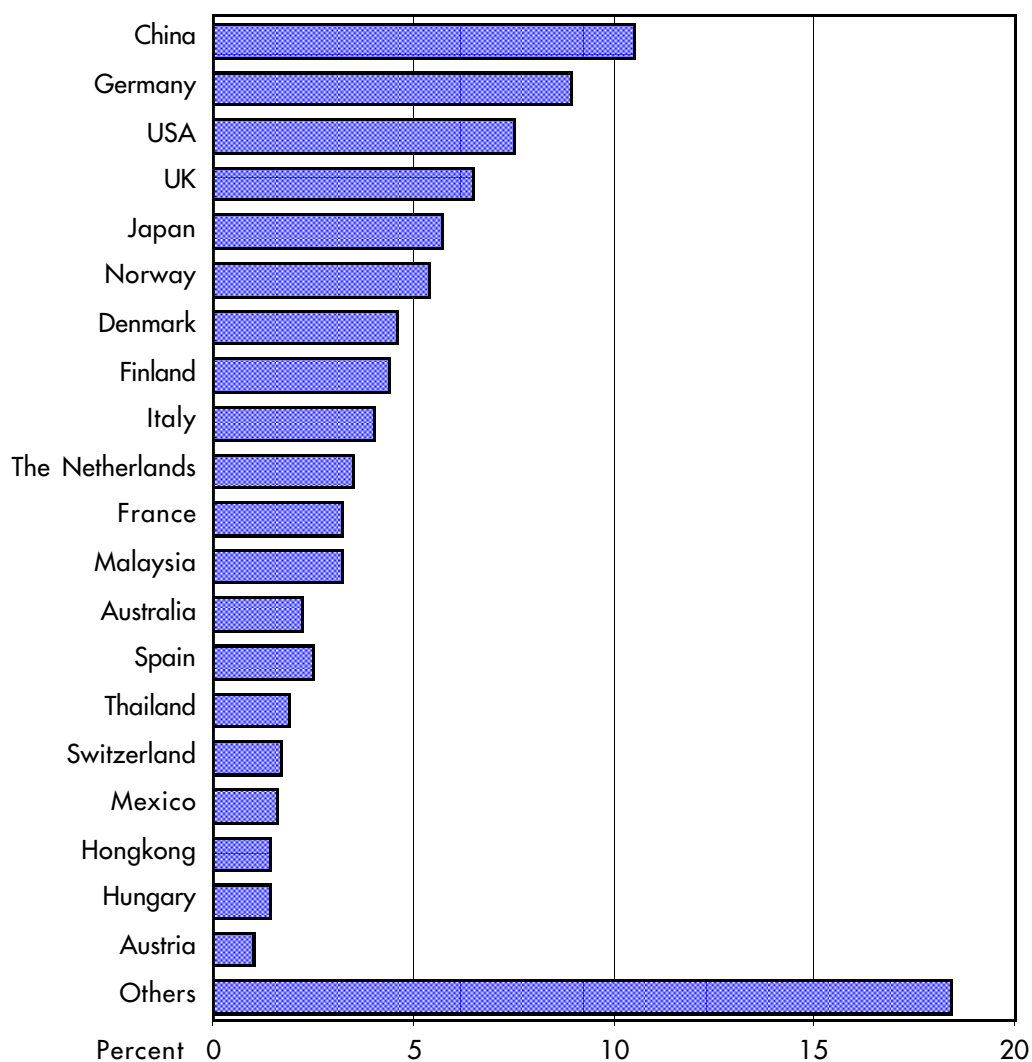


*Fig 2.3 Export of electronic products from Sweden has increased by 450% from 1975 to 1994. Import of electronic products to Sweden has increased by almost 850% during the same period. The trade net was negative during the period 1987 — 1993. In 1994, the trade net was 1.9 billion SEK in the negative.*

Source: SCBs utrikeshandelsstatistik/SCB: Data om informationstekniken i Sverige 1996

## Sweden's Export Partners in Electronics in 1994

Electronic products export in percentage of total by country

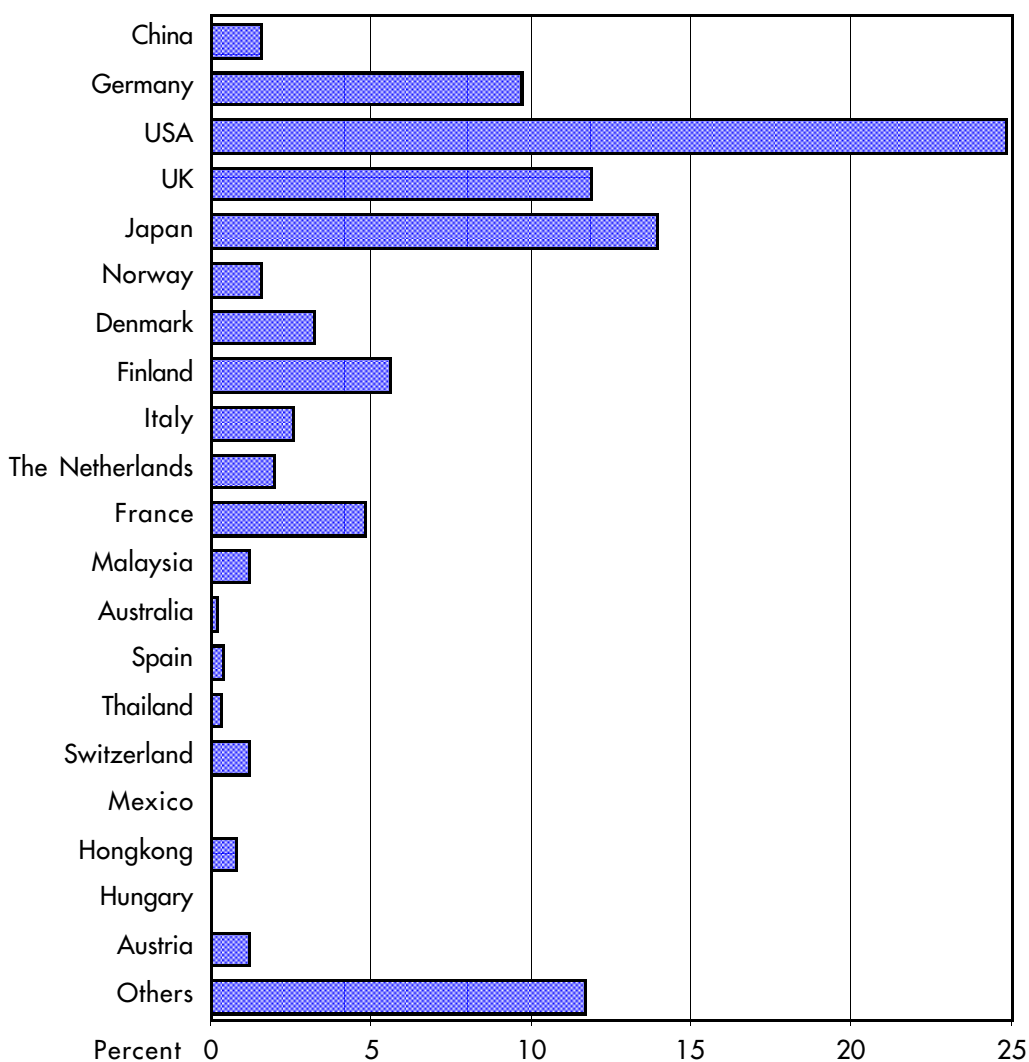


*Fig 2.5.A Germany, USA, UK, Japan, and Norway are traditionally Sweden's most important trading partners for products and services in general. This goes for export of electronic products as well. However, in 1994, China was the most important export partner. 10.4% of the total export value in communications equipment was bought by China.*

*Source: SCBs industristatistik/SCB: Data om informationstekniken i Sverige 1996*

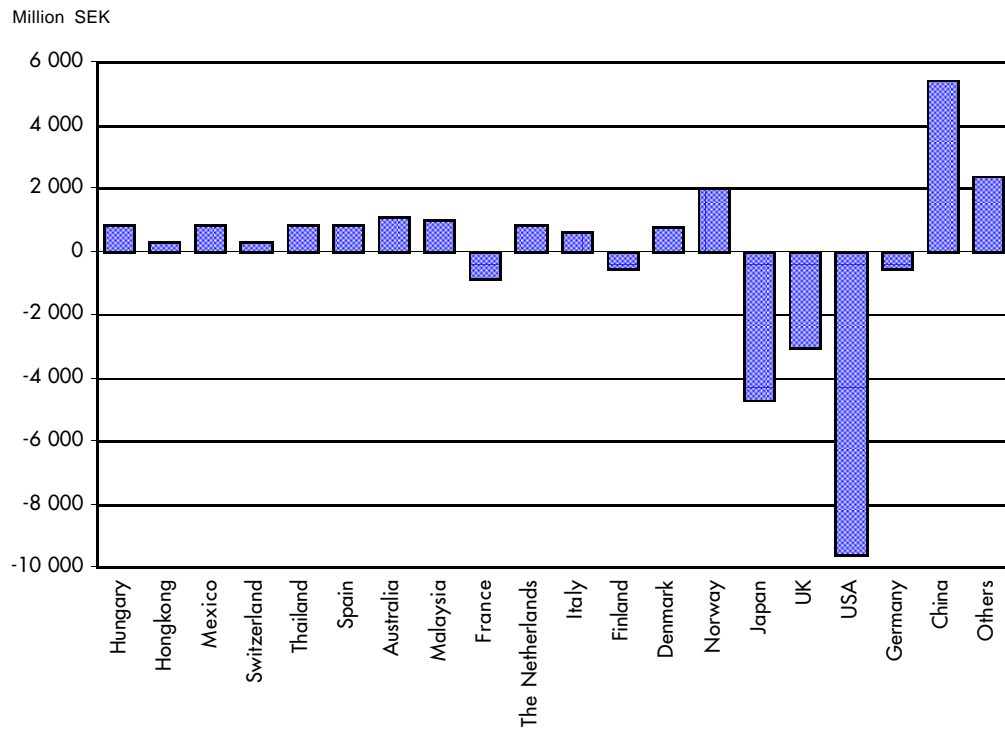
## Sweden's Import Partners in Electronics in 1994

Electronic products import in percentage of total by country



*Fig 2.5. B USA, Japan, UK, Germany, and Finland are Sweden's dominating import partners. Of late, Taiwan, South Korea, and Singapore have become important partners, but so far they are reported among "others" in the trade statistics. In rough terms, it can be stated that Sweden buys computers from the US, consumer electronics from Japan, and medical electronics from Germany. Source: SCBs industristatistik/SCB: Data om informationstekniken i Sverige 1996*

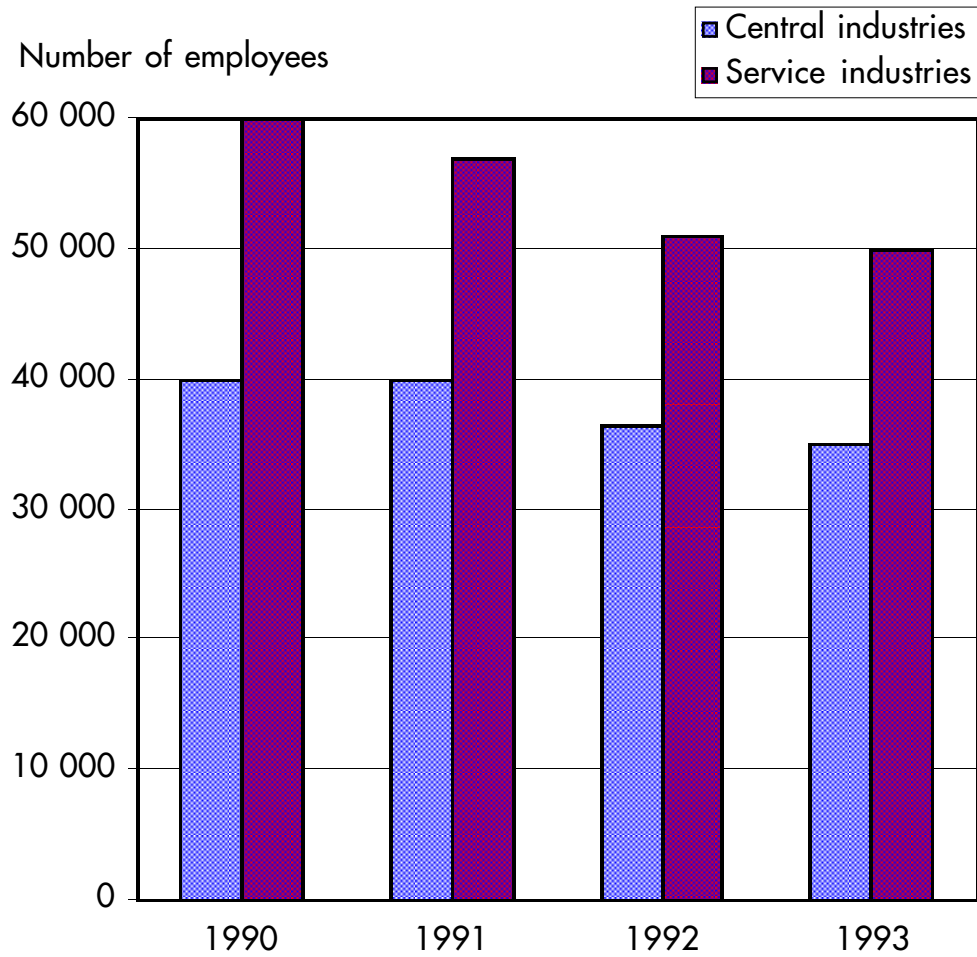
## Trade Balance for Electronic Products per Country in 1994



*Fig 2.6 The Swedish trade balance for electronic products in 1994, in million SEK per country.*

*Source: SCBs industristatistik/SCB: Data om informationstekniken i Sverige 1996*

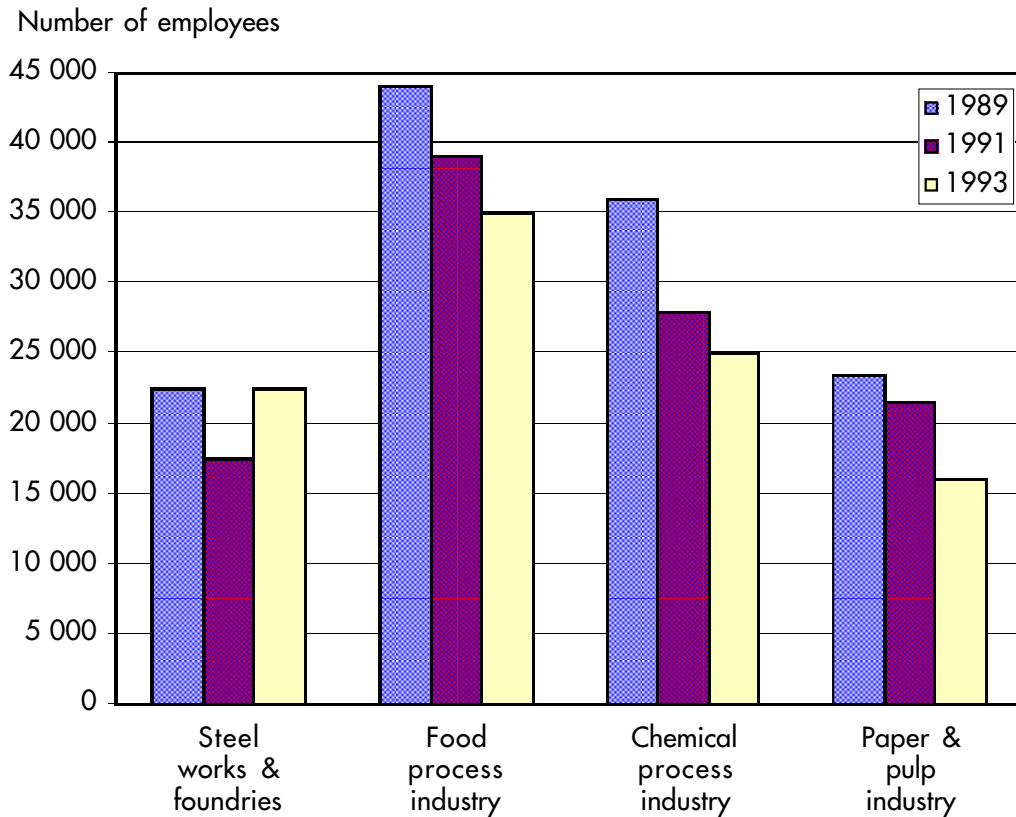
### Number of Swedes Employed in the Electronic Industry 1990 — 1993



*Fig 2.7.B From 1993, the number of persons employed by the electronic industry has decreased. So has the number of employees in most industries. In relative terms, compared to the proportion of the total number of employed persons in Sweden, the electronic industries have increased their part.*

*Source: SCB: Data om informationstekniken i Sverige 1996*

### Number of Swedes Employed by the Process Industry, Using Computerised Tools in 1989, 1991, and 1993

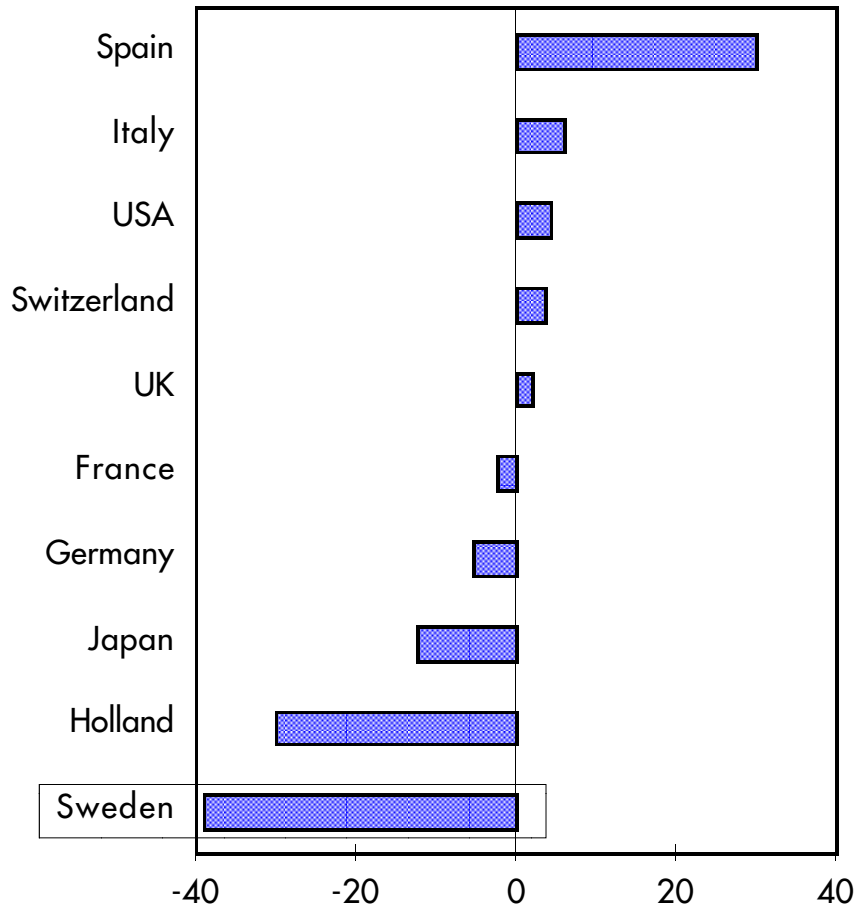


*Fig 1.23 Two tendencies are made evident by this diagram. The first is that the level of computerisation and automation is increasing in these process industry areas. The second one is that the number of employees in all process industries in Sweden is decreasing and productivity gains are made by investment in ITC rather than in people.*

*Source: SCB: Data om informationstekniken i Sverige 1996*

### 3.2. Sweden's Telecom Tariffs Among the Cheapest in the World

Telecom Tariffs Described as Deviations from the OECD Average Tariff



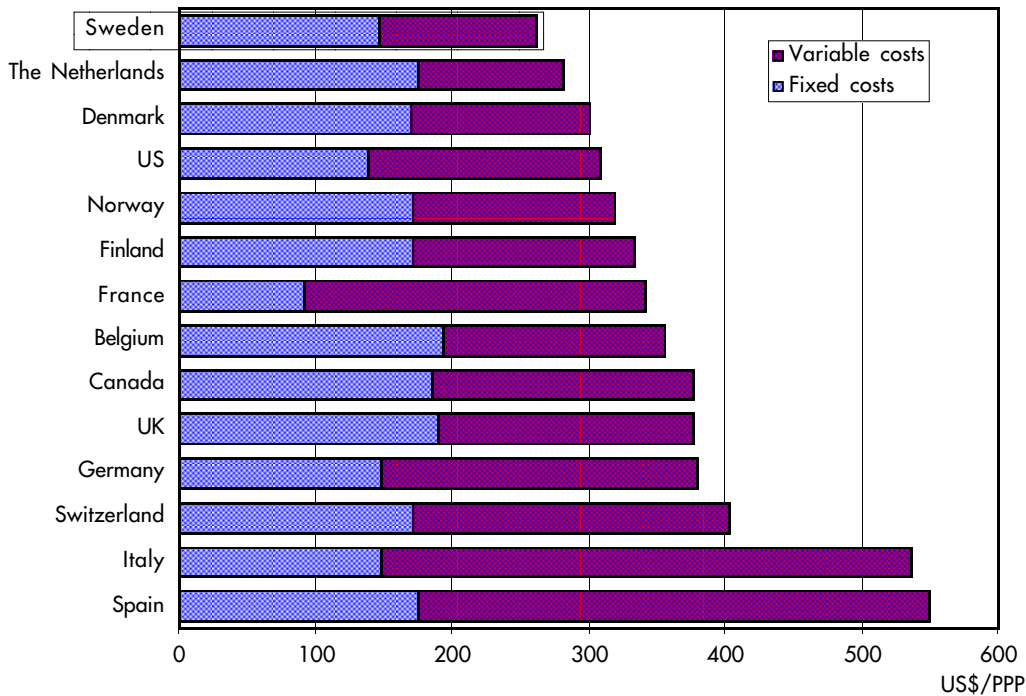
*Fig. 25 Feb 9: Swedish telecom operators are offering their subscribers among the lowest tariffs in the world, according to the OECD. The diagram shows the deviation from the OECD average tariff for some major countries. Also see the OECD "Communications Outlook 1997", vol. 1.*

*Sources: OECD/Computer Sweden, 21 February 1997 (After Fredrik Persson)*

## Basket for National PSTN Tariffs for Residential Subscribers

Including VAT, February 1997

US\$/PPP (Parity Purchasing Power)



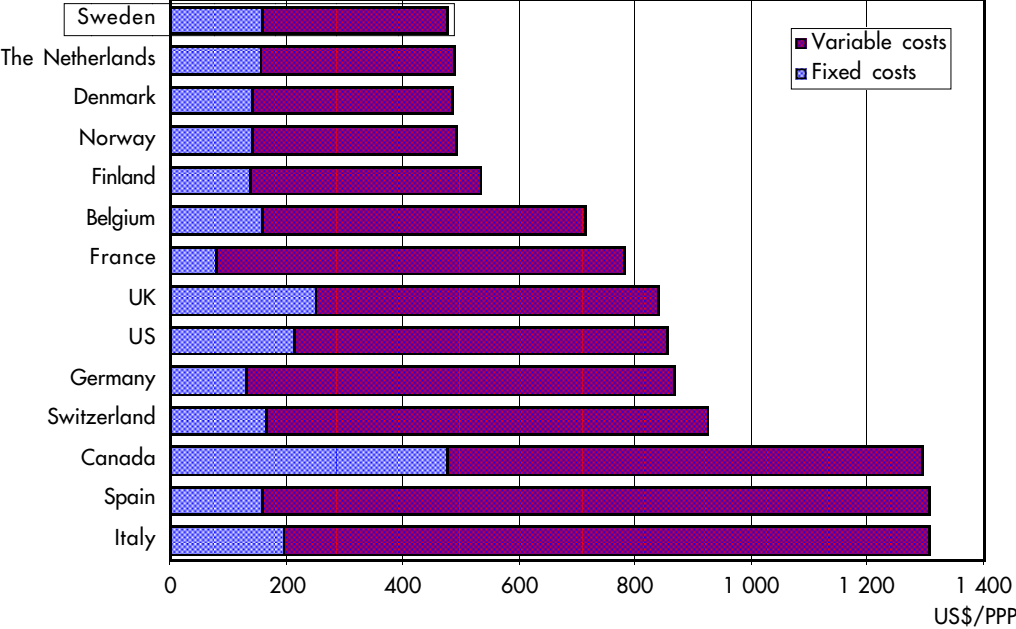
*Fig. April 23:1 According to these data from Eurodata and the OECD, Sweden, the Netherlands, Denmark, the United States, and Norway are offering their residential subscribers the lowest telecommunications tariffs in the industrialised world. It is interesting to note, that the southern European countries Italy and Spain have tariffs for their residential subscribers that are more than twice as high as those of the northern European countries.*

*Sources: Eurodata/OECD*

**Basket of National PSTN Tariffs for Business Subscribers**

Excluding VAT, February 1997

US\$/PPP (Parity Purchasing Power)

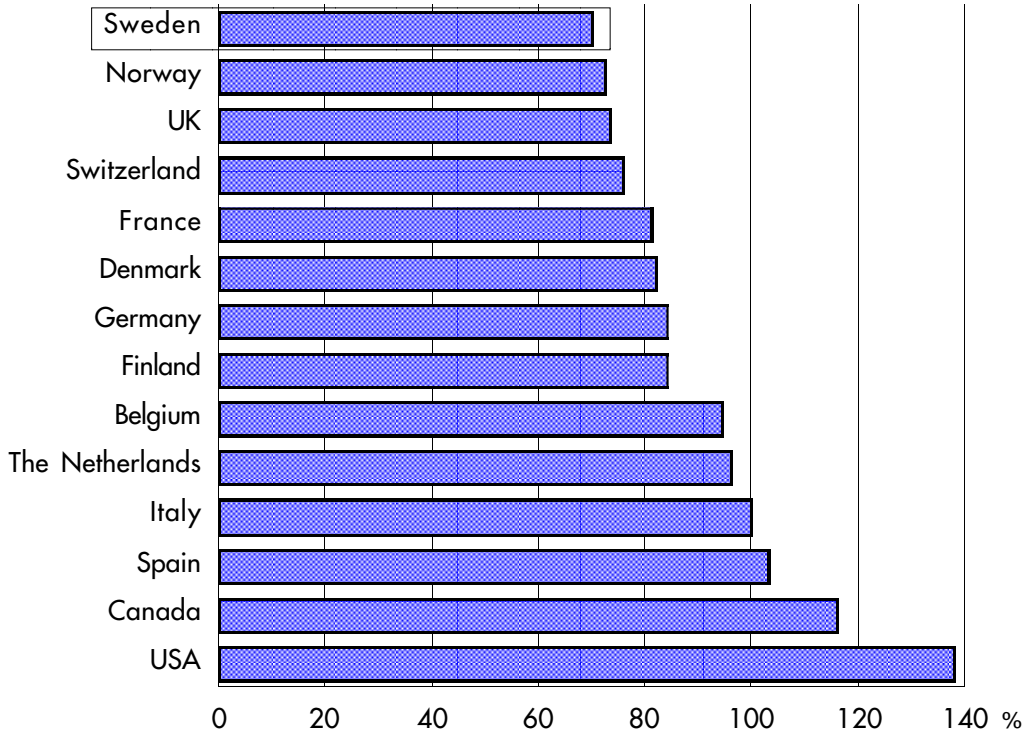


*Fig. April 23:2 Sweden, along with the Netherlands, Denmark, Norway, and Finland, are the countries offering business subscribers the lowest telecommunications tariffs in the western world. Spain and Italy are charging their business subscribers three times the tariffs of the northern countries, and the price level in the US is 84% higher than the one in Sweden.*

Sources: Eurodata/OECD

## Basket of International Tariffs for Business

Excluding VAT, February 1997  
presented as % of OECD-average

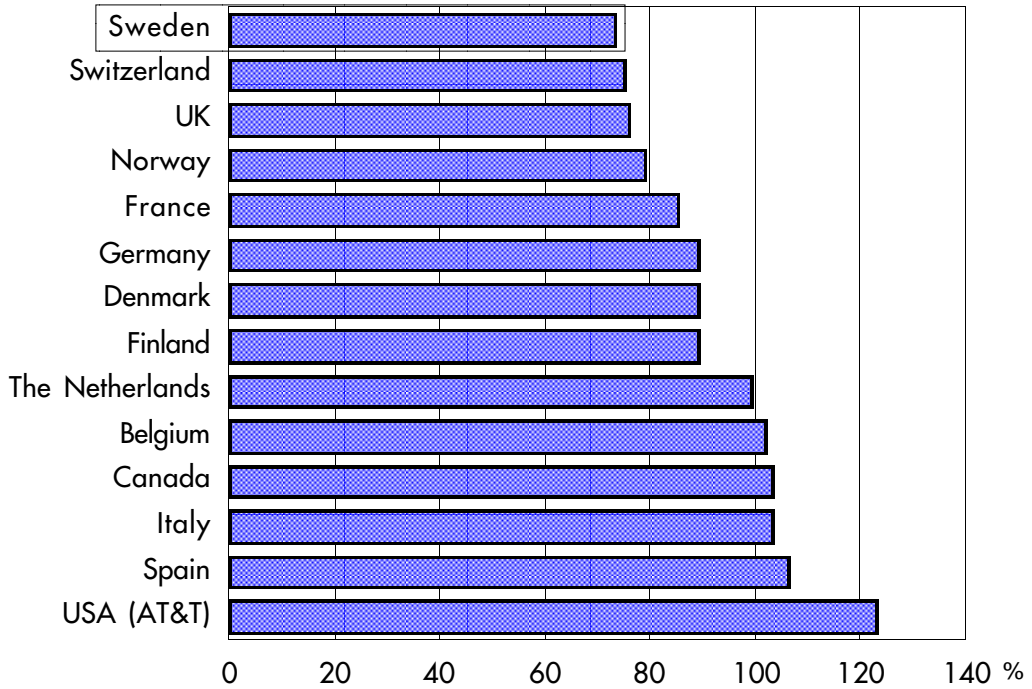


*Fig. m (12/3/9): Sweden, Norway, and BT of Great Britain offer their business subscribers tariffs that are approximately 25% below the OECD average, in this diagram = 100%.*

*Sources: Eurodata Foundation/OECD*

## Basket of International Tariffs for Residential Users

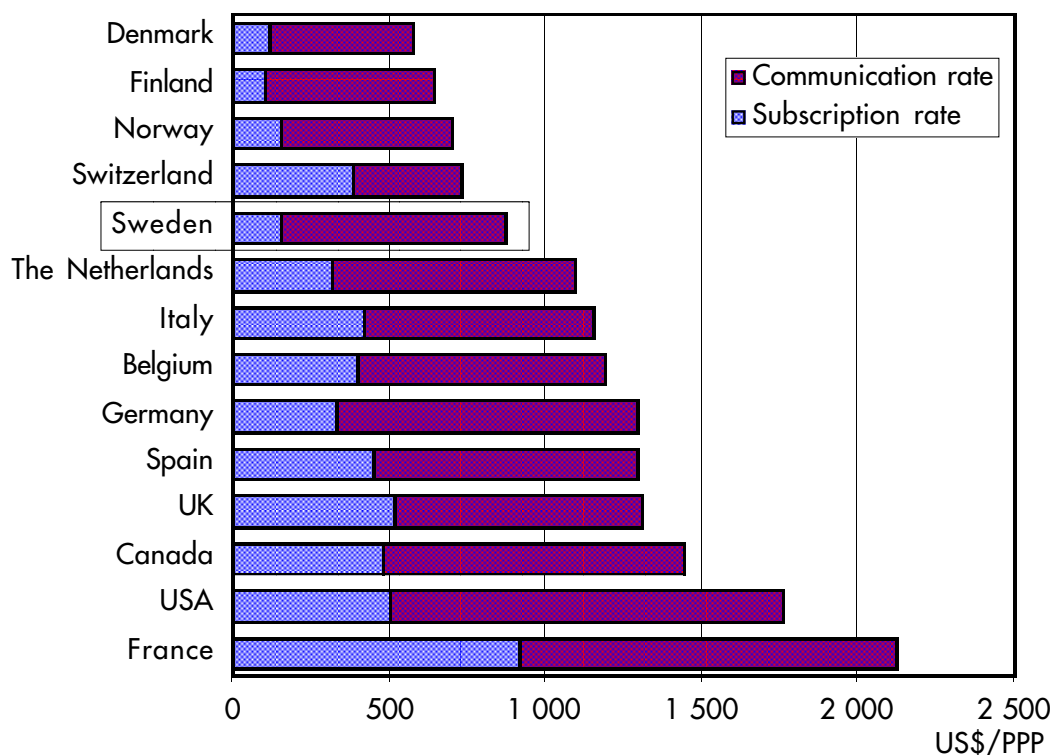
Including VAT, February 1997  
Percent of OECD Average



*Fig. n(12/3/10): This diagram shows the percentual relationship to the OECD average of international telecom tariffs for residential — or domestic — users. Three operators offer their users tariffs that are about 25% lower than the OECD average: BT in the UK, Swiss PTT in Switzerland, and Telia in Sweden. Sources: Eurodata Foundation/OECD*

## Basket of National Mobile Tariffs

Excluding VAT, February 1997  
 In US\$ PPP (= purchasing power parities)



*Fig. o: Mobile tariffs, expressed in US\$ PPP, are low in five countries, Denmark, Finland, Norway, Switzerland, and Sweden. Denmark, Finland, Norway, and Sweden offer their users low subscription rates, and higher communication rates, while Switzerland charges higher subscription rates and lower communication rates. In Canada, USA, and France, subscription rates as well as communication rates are high, France being the most expensive country of the ones compared.*

Sources: Eurodata Foundation/OECD

## Price Development of Telecommunications as Compared to Other Services and Goods in Sweden 1975 — 1995

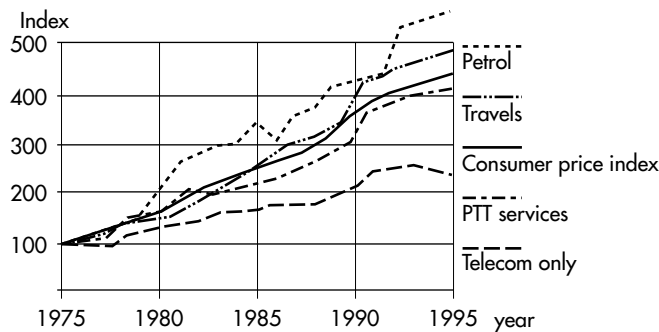


Figure 22 A comparison of price development in Sweden for communication related goods — petrol — and services from 1975 to 1995, compared to the consumer price index. Telecommunications have a unique position, showing a modest increase in relation to other compared goods and services. It should be noted that after 1991, the price development for telecommunications is even slower. This is a direct effect of the opening to competition of the telecom market in Sweden.

Source: Telia: Tele 3/1995, Peter Liedberg

## Price Development for Long Distance Communications Sweden — Germany 1975 — 1995

A call of 5 minutes during peak hours, Monday — Sunday, 08:00 — 22:00 hours

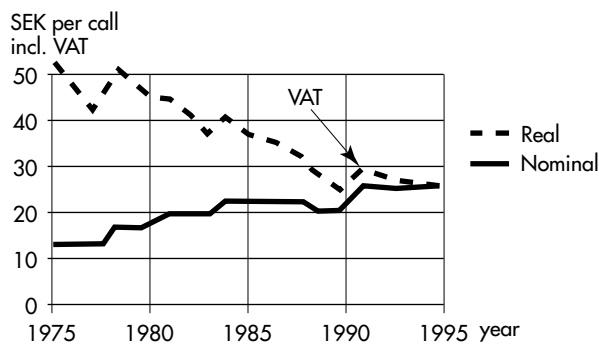


Figure 18: Price development for long distance calls between Sweden and Germany for the period 1975 to 1995, in nominal and real terms. The model call has a duration of 5 minutes and is placed during peak business hours, which in early 1995 were applicable Monday to Sunday, from 08:00 to 22:00 hours. It should be noted that VAT was added to telephone calls in Sweden in 1991.

Source: Telia: Tele 3/1995, Peter Liedberg

## Price Development for Long Distance Communications Sweden — USA 1975 — 1995

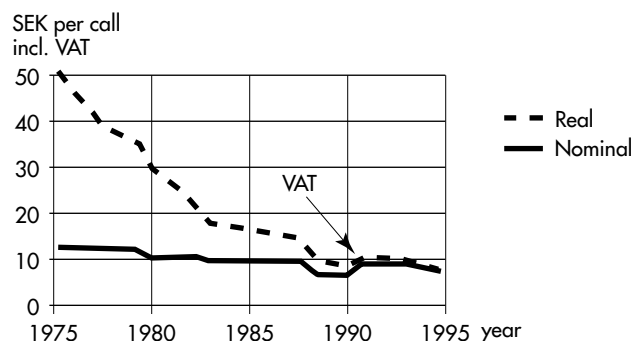


Figure 20 The price development of long distance telephone calls from Sweden to USA during the period 1975 — 1995 in nominal and real terms. A private subscriber calling the US in 1995 paid only 14% of what he paid in 1975, in real terms. In some cases, even the nominal prices were lower in 1995 than they were in 1975 for traffic between Sweden and the US and Canada. It should be noted that VAT was added to telephone calls in Sweden in 1991.

Source: Telia: Tele 3/1995, Peter Liedberg

## Basket of National Tariffs for 64 Kb/s Leased Lines

Excluding VAT, February 1997

In US \$ PPP (= purchasing power parities)

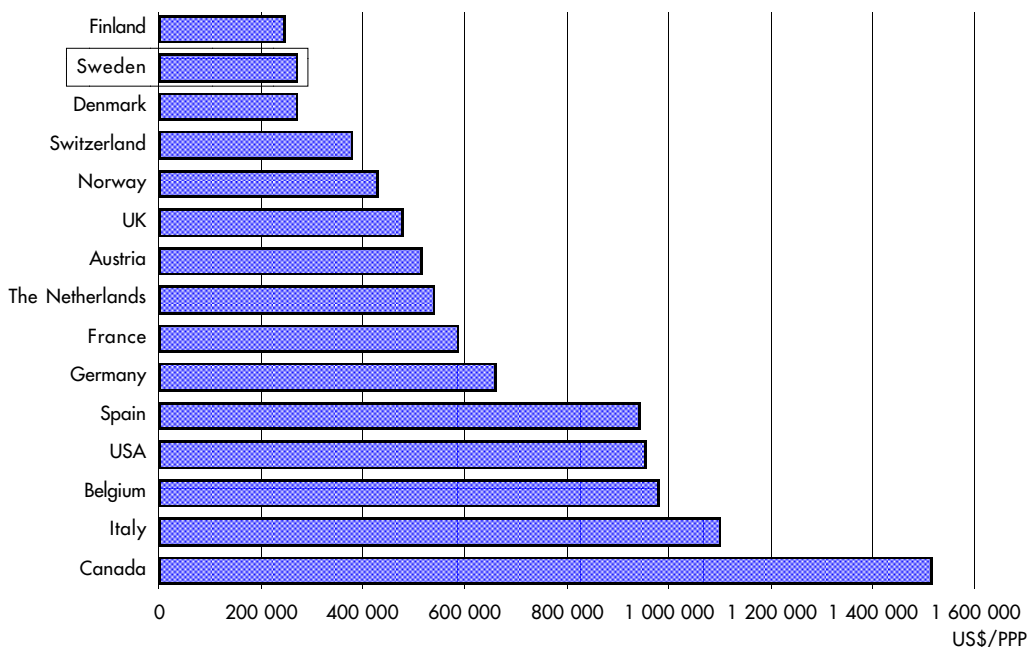


Fig. p(12/3/11): National tariffs, expressed in US\$ PPP, for 64 Kb/s leased lines are the lowest in Finland, Sweden, and Denmark, and the highest in Belgium, Italy, and Canada, among the nations compared in this diagram.

Sources: Eurodata foundation/OECD

## Basket of National Tariffs for 2 Mb/s Leased Lines

Excluding VAT, February 1997

In US \$ PPP (= purchasing power parities)

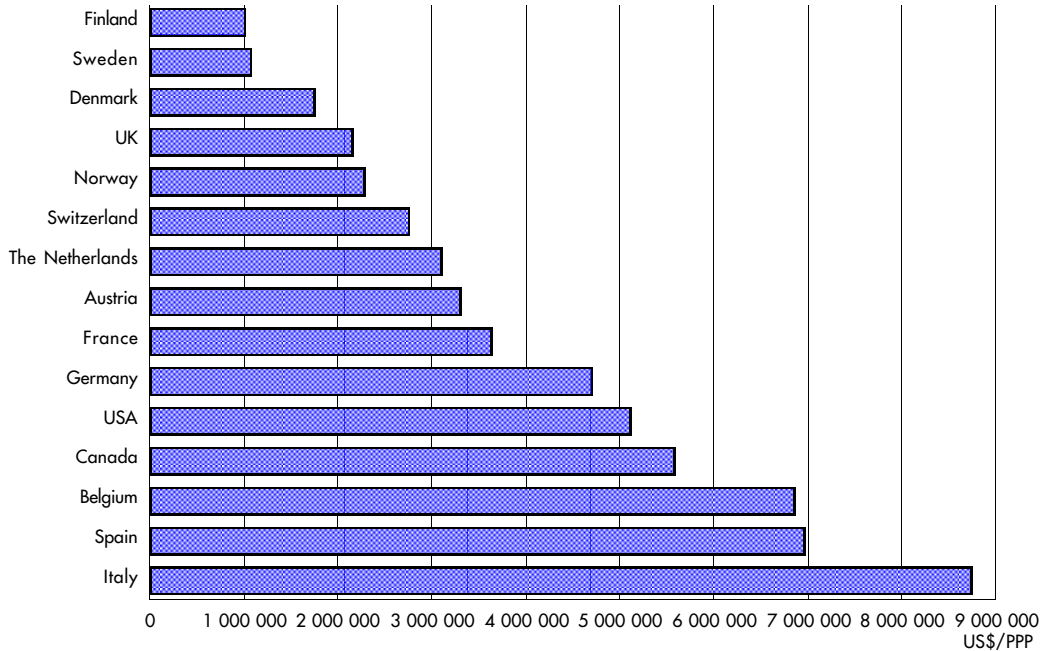


Fig. q(12/3/12): National tariffs, expressed in US\$ PPP, for 2 Mb/s leased lines. Finland and Sweden are the low cost countries, while Belgium, Spain, and Italy belong to the high cost countries among the nations compared in this diagram.

Sources: Eurodata Foundation/OECD

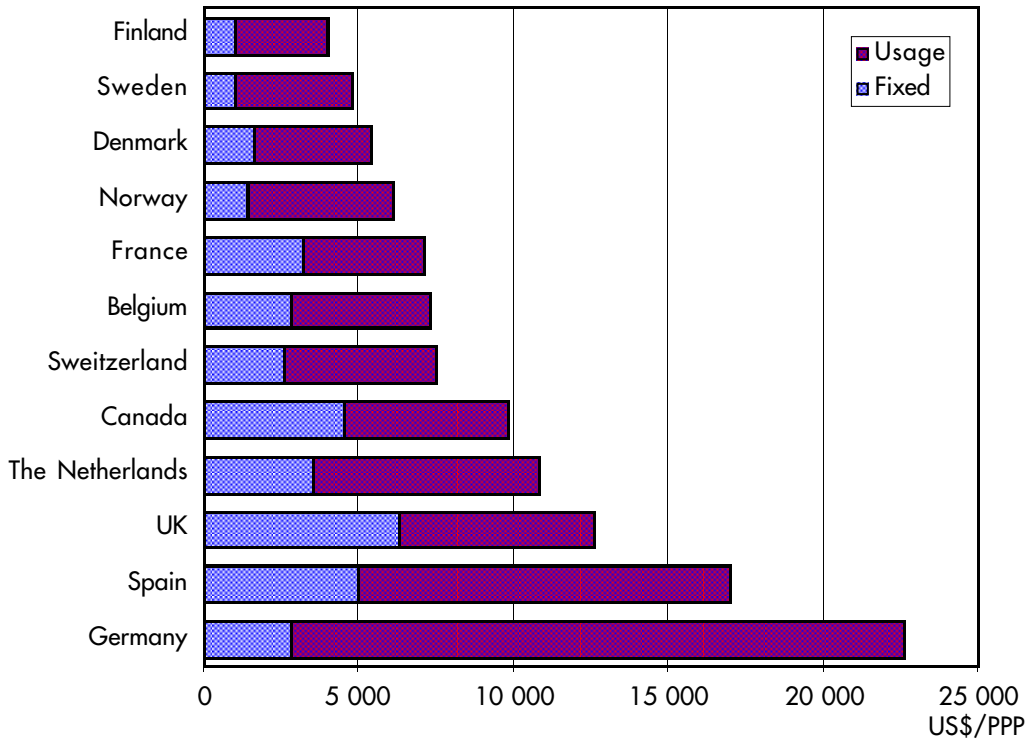
### \* Competition Lowers International Tariffs

Telecommunications operators in Sweden have contributed to lowering the tariffs for international calls by more than 50% during the last two years. The result is that Sweden is offering subscribers among the lowest long distance tariffs in the world. The major contenders in what is sometimes described as a price war are Telia and Tele2.

Source: Computer Sweden, 17 January 1997

## Basket of National Tariffs for X25-lines

Excluding VAT, February 1997  
 In US \$ PPP (=purchasing power parities)



*Fig. r: National tariffs, expressed in US\$ PPP, for X25-lines. Finland Sweden, Denmark, and Norway are the low cost countries, while UK, to a certain extent, Spain, and Germany, are the high cost countries among the ones compared in this diagram.*

Sources: Eurodata Foundation/OECD

\* **Sweden "Best in Class" According to OFTEL Benchmarking Study**

"Benchmarking is one of the mechanisms by which (the British) OFTEL tests the extent to which it has achieved its goals of ensuring the best deal for UK consumers", according to a comparison of UK telecoms with other leading countries, carried out by the British research firm Mason Communications, released in the spring of 1997.

According to the executive summary, "the report presents the findings of a benchmarking study to determine a ranking for the UK, in world terms, with regard to the availability, scope, quality, and value for money of telecommunications services for business customers, and to investigate the underlying reasons."

The countries studied are the UK, USA, Sweden, France, and Australia for all services (see following table), Germany for ISDN and mobile communications, and Japan for Virtual Private Networks (VPNs) and high speed data transmission.

**OFTEL PPP Price Ranking as a Result of Benchmarking Study**

Service	UK	USA	Sweden	France	Australia	Germany
Business telephony	3	2	1	5*	4*	
ISDN	2*	3*	1	5	6	4*
Analog mobile	4	5	1	6	2	3
Digital mobile	3	5	1	4	2	6
Private circuits	3	2	1	5*	4*	
Calling cards	2	4	1	3	5	
Freephone services	3	1	2	5	4	

\* Shows where rankings differed between small, medium, and large firms

Fig. s: The OFTEL report by Mason makes the following conclusions:

- a) Sweden is cheapest for almost all services;
- b) USA has lower telephony and private circuit prices than Sweden when measured in currency (with actual discounts applied);
- c) UK is generally third in the price ranking, but close to Sweden in the currency comparison (except private circuits);
- d) Australia ranks second in price for mobile, but otherwise trails the UK by a significant margin;
- e) France has the highest overall prices.

Another study carried out by Mason Communications in collaboration with Nucleus Consulting for OFTEL is called "Customers views of telecoms: case studies of UK and USA businesses".

Source: OFTEL: Benchmarking Studies for OFTEL: Comparison of UK Telecoms with Other Leading Countries, by Mason Communications in collaboration with Nucleus Consulting, spring, 1997

### 3.3. Telecommunication Operators in Sweden

Sweden got its first telecommunications regulation in July 1993. By October 1996, the following operators were established in the country:

#### Permissions Granted to Operators in Sweden in October 1996

<b>Fixed networks</b> AB STOKAB Banverket Dotcom Data & Tele Communication AB France Telecom Network Services Nordic AB (FTNS Nordic AB) MFS Communications AB Tele2 AB Telecom Finland AB Telenordia AB Telia AB
<b>Telephony Services</b> Cyberlink Sweden AB Dotcom Data & Tele Communication AB First Telecom Europe AB France Telecom Network Services Nordic AB (FTNS Nordic AB) FT Nordphone AB MFS Communications AB NETnet International S.A. Nordiska Tele8 AB Singapore Telecom International Svenska AB Telenordia AB Tele 1 Europe AB Tele2 AB Telecom Finland AB Telia AB TELiT-Galesi TeleCom International AB
<b>Mobile Services</b> Cable and Wireless FlightNet Limited (TFTS) Comviq GSM AB Europolitan AB Europolitan PCN AB (DCS 1800) Netcom Systems AB (DCS 1800) Tele8 Kontakt AB (DCS 1800) Tele Danmark International (ERMES) Telia AB Telia AB (DCS 1800) Telia AB (ERMES) Telia AB (TFTS)

*Fig.10.2. The list above gives the names of operators and their operating licenses per service area (in alphabetic order): fixed lines, telephony services, and mobile services, as granted by the National Post & Telecom Agency by October 1996. See chapter 10 for further details.*

*Sources: The National Post & Telecom Agency/Telia AB*

### 3.4. The Networks in Sweden

The Telia Network is the oldest one for telecommunications in Sweden and still the most extensive one. From a technical point of view, it is one of the most modern networks in the world in the sense that new technologies like Synchronous Digital Hierarchy, SDH, and Asynchronous Transfer Mode, ATM, are built into the structure of the network, making it suitable for all kinds of now foreseeable applications. The Telia Network is open to all standardised interfaces and to all operators.

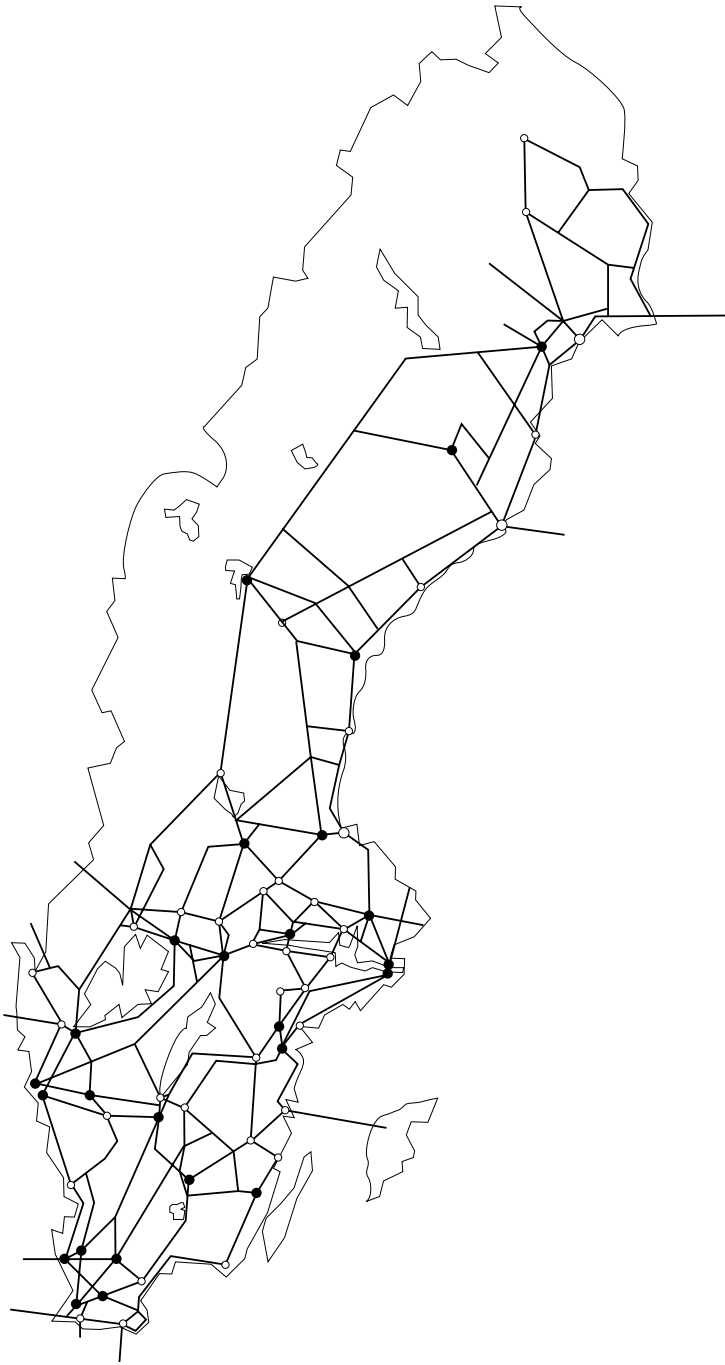
\* **Facts about the Telia Network**

*(Data from 1997, source: Telia AB)*

- \* So far, some 86 billion SEK has been invested in building a modern network;
- \* The total length of the Telia Network would take us 15 times around the Equator;
- \* 1997 is a key year for the Telia network. By then, the number of stations will be reduced from an original 4 300 to 250;
- \* By the end of 1996, 96.1 % of all Telia customers were connected to a modern AXE-station, making available PLUS services such as call forwarding, completion of call to busy subscriber, call waiting, three party call, call waiting tone, etc. By 1997, all subscribers to the Telia Network will have AXE connections and PLUS services;
- \* In 1996, there were more than 6 million fixed line subscriptions, and 1.8 million subscribers to mobile connections in the Telia networks;
- \* Each day, on an average 20 million telephone calls are carried out in Sweden, each Swede spending about 42 minutes on the phone;
- \* Swedes make 250 000 international calls each day of the year;
- \* In 1994, 65% of the Telia network was digital; in 1997, 99% of the network is digital;
- \* In 1996, Telia cut tariff income by 1 billion SEK by lowering prices to their subscribers. In spite of this, the company made a handsome profit;
- \* Telia is the first telecommunications operator in the world to transmit highresolution television pictures over the television network. A technology called VDSL - Very High Speed Digital Subscriber Line - makes it possible to transmit 52 million bits/sek via ordinary copper wire. Eight different digital channels can be accessed simultaneously, television programs, video conferencing, Internet, or video-on-demand. Next step is to develop a high speed, low cost modem for the home.

*Sources: Svenska Dagbladet 5 April, 1997/Ny teknik, 10 April 1997*

## Telia's National Optical Fiber Network



*Fig. 3.2.1. Telia's national optical fiber network. In addition, there are regional fiber networks.*

1994 = 29 000 km of optical cable

1997 = 45 000 km of optical cable

## International Traffic on the Telia Network

Destination	Traffic volume %	Earth stations #	Satellites #
The Nordic countries	41	100	0
Rest of Europe	43	90	10
North America	8	86	14
Rest of the world	8	10	90

*Fig. 3.2.2.: It is evident from this table that the great majority of all telephone calls Swedes make abroad are to their Nordic neighbours and to their European counterparts. As the slogan says: "Business is local" — 16% of the total traffic volume go outside Europe, 8% to North America, and 8% to the rest of the world.*

*Source: Telia AB*

## ISDN — Telia Compared to Other Major Operators December 1995

Country	Operator	Basic Access Subscribers
Denmark	Tele Denmark	4 700
Finland	Telecom Finland	550
	Finnet Group	5 200
France	France Télécom	250 000
Germany	Deutsche Telekom	850 000
Italy	Telecom Italia	6 000
Japan	NTT	520 000
	KDD	1 400
UK	BT	120 000
Sweden	Telia	30 000

*Fig. 25 Feb 10: Basic access ISDN services have been very successful in Germany. In Sweden, users have been less interested so far. This should be compared to fig s. p. 93.*

*Sources: OECD/Computer Sweden 21 February 1997 (After Fredrik Olsson)*

### \* Tariff Agreement Between Telia and Tele2

The Swedish operators Telia and Tele2 have signed a new agreement, regulating the technical and financial conditions for the utilisation of the networks in Sweden. The basic principle for the agreement on common traffic is that "sender keeps all". Both operators have about the same level of transmission.

*Source: Nätvärlden # 1 1997*

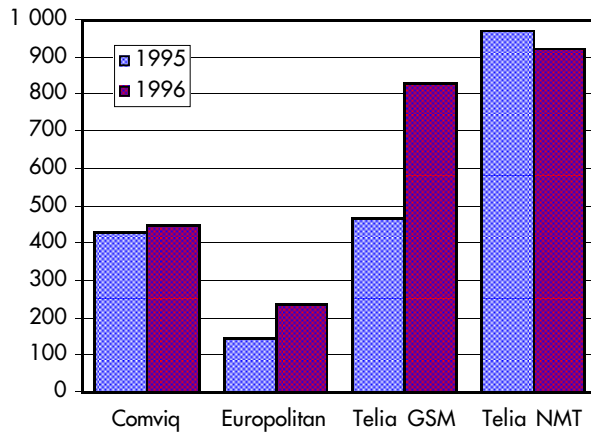
### **3.5. Swedish Operators in the International Markets**

- \* Telia AB is strengthening its international position and looking for new markets, focusing on the Nordic countries, the Baltic area, and Europe. The operator has formed an alliance, Unisource, offering international services, in collaboration with Dutch PTT Telecom Netherlands, KPN, Swiss PTT Telecom, and Spanish Telefónica. In april 1997, Telefónica announced that it is leaving Unisource.
- \* Unisource has formed a strategic alliance with American AT&T, which makes the operator the third largest supplier of international communications in the world.
- \* By the end of March 1996, rumour had it that Telia and Dutch PTT Telecom wanted to buy a third of the Irish Telecom Eireann. The Irish are looking for a partner to help them face EU deregulation.
- \* Telia and Norwegian Statnett have agreed to construct a new, nationwide telecommunications network in Norway, in order to compete with Telenor. Some 800 million SEK will be invested in the network for a start.

*Source: TT-NTB, May 1997*

### 3.6. Mobile Communications

#### Mobile Telephone Users in Sweden by the End of 1996 Subscribers in Thousands



*Fig. 4 mars 1: There are in total some 2.5 mobile telephone subscribers in Sweden. During 1996, 1.1 million mobile phones were sold in the country, compared to 0.8 million in 1995. The number of NMT subscribers decreased from 975 000 to 921 000. Less than five percent of the mobile phones sold in December 1996 were to be used in the old NMT system, the rest, 95%, were digital telephones. 924 000 GSM telephones were sold in 1996. The number of new subscribers amounted to estimated 550 000. Only Telia is willing to reveal real figures — they had 361 000 new GSM subscribers during 1996, making Telia's GSM takers total 824 000. The figures for the other two GSM operators, Comviq and Europolitan are extrapolations made by Svenska Dagbladet, based on the number of subscribers in September 1996. Also see the following diagrams.*

*Sources: Mobiltelefonleverantörerna/Svenska Dagbladet 17 January, 1997*

## Number of Sold Mobile Telephones in 1995 and 1996

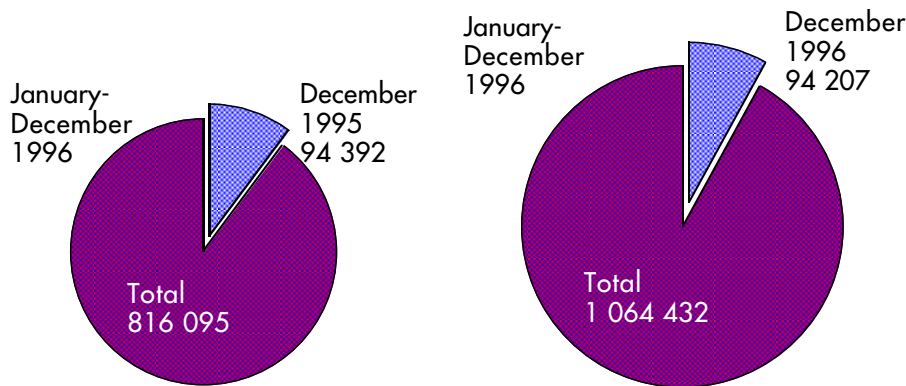


Fig. 4 Mars 2: In total, approximately 3.5 million mobile telephones were sold in Sweden during past ten years. The diagram shows the sales in number of telephones in 1995 and 1996, with the peak month, December, separated from the rest of the year.

Sources: Mobiltelefonleverantörerna/Svenska Dagbladet 17 January, 1997

## Penetration of Cellular Services by Year End 1994 and 1995

Penetration of the total population, in countries studied by DTI

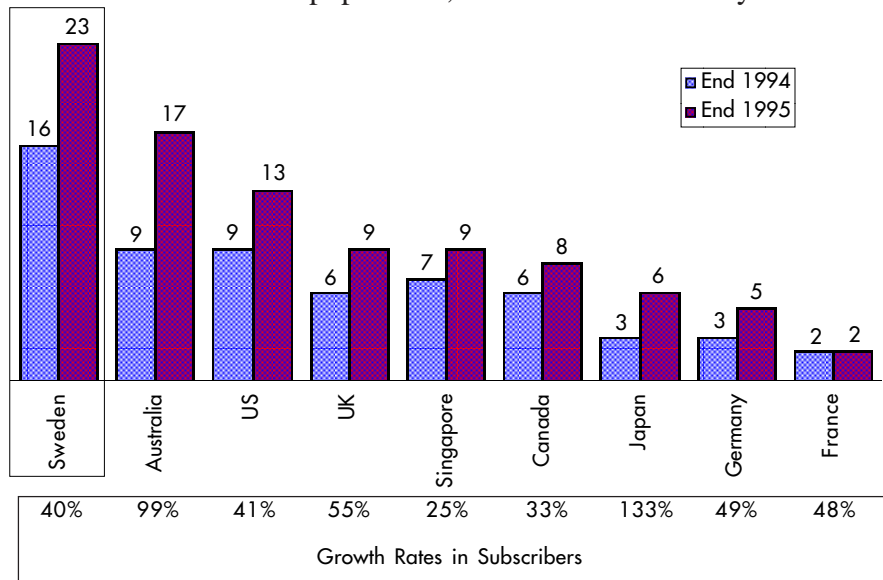


Fig. 12 mars 5: Cellular services show rather impressive growth rates in the countries studied by the DTI. According to this diagram, Japan has the highest growth rate of 133%, while Singapore is expected to grow by 25% "only". Sweden, which already has a mobile phone penetration of almost 30% of the population, can look forward to a growth rate of 40%.

Sources: Global Mobile/Spectrum analysis/Department of Trade and Industry & Spectrum: Development of the Information Society, 1996

\* **Every Fourth Swede Has a Mobile Phone**

In total, about 2.5 million mobile telephones are used in Sweden, which means that about every fourth Swede has one, according to Mobiltelefonleverantörerna, MTL.

In 1996, 1 064 000 mobile telephones were sold in Sweden. This should be compared to 816 000 mobile phones sold during 1995. Of the ones sold in 1996, 924 000 were GSM compatible, while 140 000 were NMT compatible. In January 1997, 388 891 mobile telephones were sold in the country, 36 678 GSM phones, and 2 213 NMT phones. This should be compared to 51 715 mobile telephones sold in January 1996.

For 1997, another million of mobile telephones are estimated to be sold in Sweden.

*Sources: Mobiltelefonleverantörerna/Ny Teknik - Teknisk Tidskrift 1996:6Dagens Nyheter 19 februari 1997*

\* **Mobile Subscriptions in Sweden vs. Fixed ones**

In 1995, 18.8% of all telephone subscriptions in Sweden were mobile, compared to 5.6% for Europe.

*Source: SCB: Data om informationstekniken i Sverige 1996*

\* **DSC Operators in Sweden**

Swedish telecom operators Telia, Comviq, Europolitan and Tele8 have been granted permission by the Post and Telecom Commission to operate nationwide mobile telephony systems based on the new DCS 1800 system. DCS stands for Digital Cellular System and offers digital telephony over a different band of frequencies than for instance the earlier NMT and GSM systems.

*Source: Ny Teknik - Teknisk Tidskrift 1996:6*

### 3.7. IT Equipment

#### PCs Sold in Sweden 1996

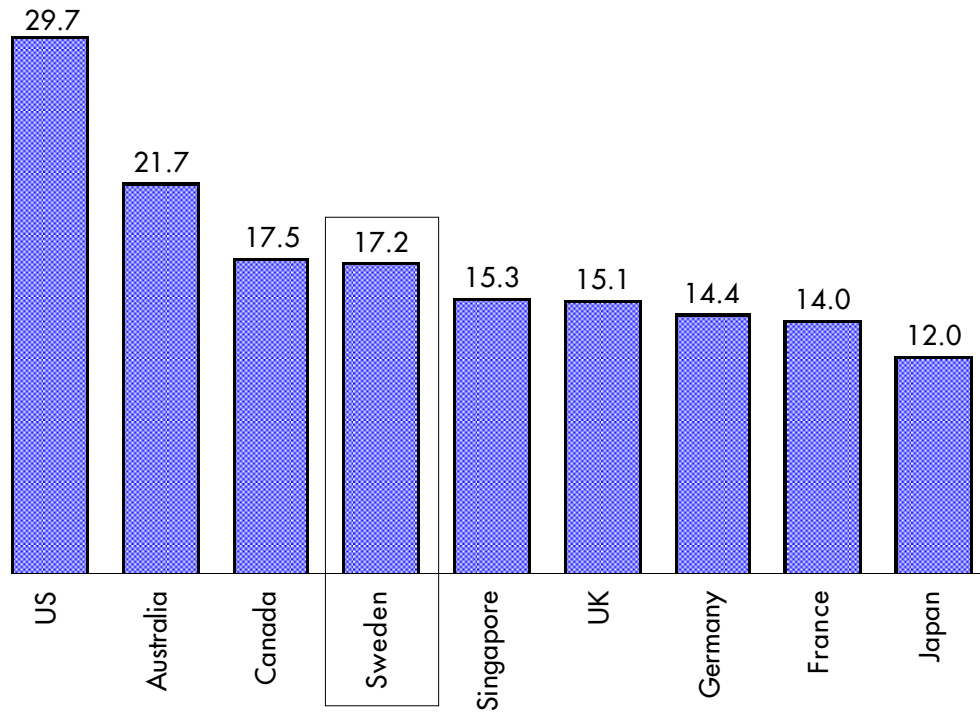


*Fig. 28 april 1: In 1996, 219 200 PCs were sold in Sweden, which is an increase by 7% over 1995. In the same period of time, the number of complaints regarding malfunctioning PCs increased by 155%!*

*Sources: IT Research/Ny teknik, 6 March 1997*

## Penetration of Personal Computers per 100 Inhabitants in 1994

In Countries Studied by DTI

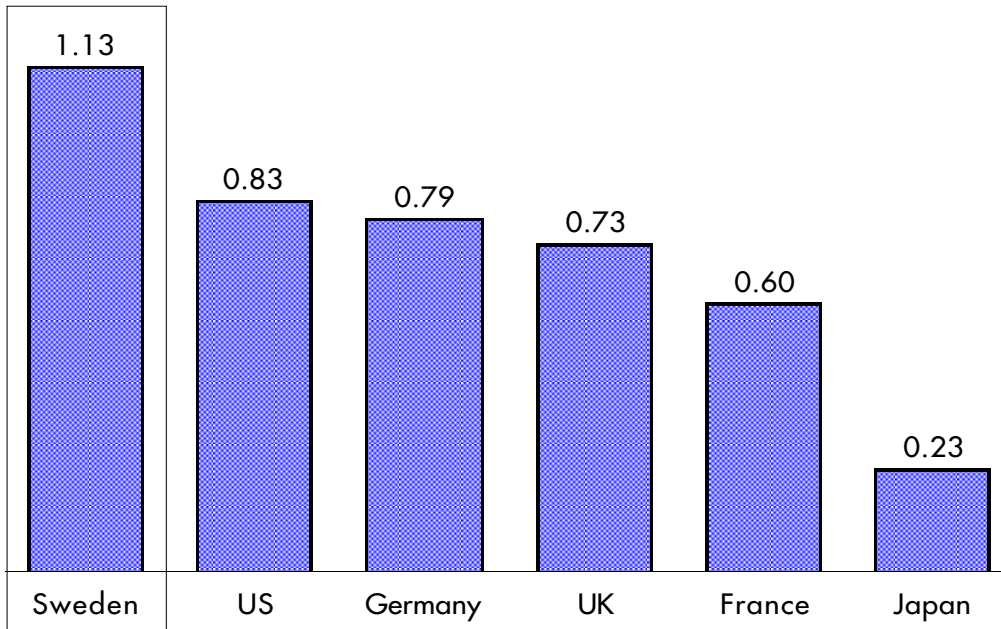


*Fig. 12 mars 2: Personal computer utilisation is seen as one of the major development paths to the Information Society by the DTI researchers. The diagram shows the 1994 penetration per 100 inhabitants of personal computers in the countries studied by DTI.*

*Sources: ITU World Telecommunications Indicator Database/Department of Trade and Industry & Spectrum: Development of the Information Society, 1996*

## Penetration of Personal Computers Among White Collar Workers 1994

*In Countries Studied by DTI*

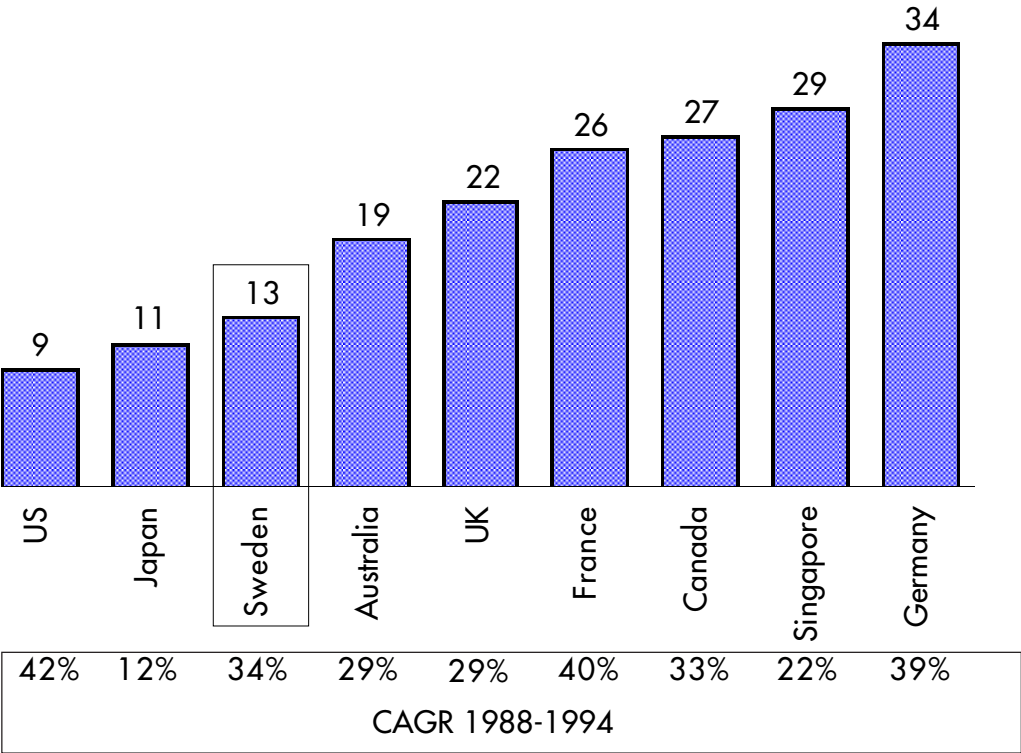


*Fig. 12 mars 3: Swedish white collar workers are among the most frequent users of personal computers in the world in their professional roles. This diagram is closely related to the one above, and shows the professional usage of PCs in some of the countries studied by DTI. See also chapter 4 for further comments on the utilisation of PCs by Swedes, etc. in the professional world.*

*Sources: EITO/Department of Trade and Industry & Spectrum: Development of the Information Society, 1996*

**Fax Machine Penetration in Work Environments in 1994**

In countries studied by DTI; Number of employees per fax  
(Total fax machines divided by working population)

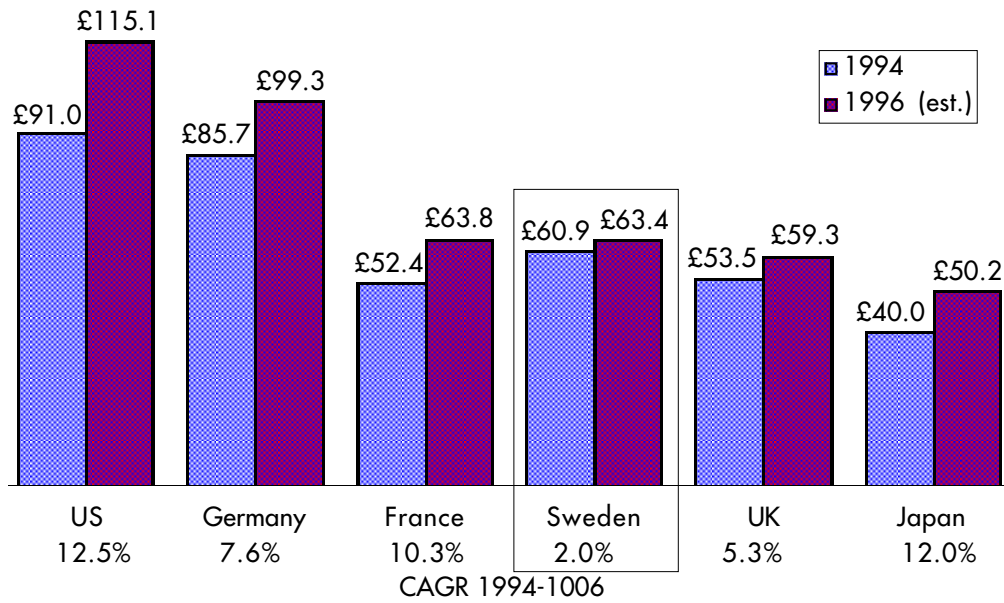


*Fig. 12 mars 6: Data transmission is an important indicator when it comes to decide the extent to which a country is becoming an information society. But data transmission is difficult to measure, because there are so many means of doing it. One method the DTI reseachers have chosen, is to measure the penetration of fax machines in professional environments. This is a rather uncertain measurement, however, since almost any PC with a modem most likely has a fax program as well, a program used to send and receive fax messages from a PC to another terminal, a fax machine, a PC, a personal assistant, and even a mobile telephone. According to the diagram above, US, Japan, and Sweden are the heavy fax users among the countries studied.*

*Sources: ITU World Telecommunications Development Report, 1995/Department of Trade and Industry & Spectrum: Development of the Information Society, 1996*

## Software Spending per Capita 1994 & 1996 (est.)

Countries Studied by DTI, in UK Sterling



*Fig. 12 mars 4: According to the DTI study, the Swedes are less generous spenders when it comes to computer and communications software. One reason for this may be, that relatively little of the software available to the general public is translated into Swedish. Swedish software production for the home market is still an emerging industry.*

*Sources: EITO1995/Spectrum analysis/Department of Trade and Industry & Spectrum: Development of the Information Society, 1996*

### 3.8. Special Solutions for Less Populated Areas

Sweden being a large country with several less densely populated areas, and also subject to political decisions that all telecom services should be available at the same costs for every citizen, has resulted in a number of special technical solutions for these areas. The solutions are often based on a combination of several technologies, optical fibers being the common backbone, combined with radio links. Thus, point-to-point (P-P) or point-to-multi-point (P-MP) radio communications make high speed communications available to the end users. Depending on the local environment, the telecommunications solutions offered to Swedes living in the outback, are varying but always very reliable, with extra security built in.

#### \* **The Community of Pajala — The Highest Computer Density in the Least Densely Populated Area**

8 000 persons live in 80 villages within the borders of the community of Pajala, north of the Polar Circle, close to the border between Finland and Sweden.

This vast but not so densely populated area of Sweden has the highest computer density in the country. So, for instance, are there four students to one computer in the local schools, compared to anything from 5 to 19 students per computer in the schools in the rest of Sweden — also compare table 1.11.

In Pajala, computer training starts early, before primary school. This in order to prepare for life as a college student, which means spending a lot of interactive education hours. Since a few years back, the local authorities have invested in computer and IT training and education in order to create new jobs to replace those disappearing in the traditional industries, mainly forestry.

It looks as if they are succeeding. So far, local electronic industries are employing 160 persons, which is more than the forest industry ever employed. Now, ambitions are growing among the bilingual — Finnish and Swedish — inhabitants and their representatives. Thus, the authorities are creating their own, local university, concentrating on computer and electronics related subjects, and a "House of Knowledge", where a number of databases containing qualified knowledge about Russia, and development of design and computer production will be available to the inhabitants.

The distance to the big urban areas is not seen as a problem — the inhabitants of Pajala know how to build high quality, high precision electronic instruments in niche areas, and that is what their customers care about.

*Source: Dagens Nyheter, Oct. 24, 1996*

### 3.9. Do You Know This About IST in Sweden?

#### \* "Toppleदारforum" — IT Coordination of Public Services

"Toppleदारforum" is an organisation under the Department of Finance, concentrating on the coordination of IT projects for the Swedish public sector on all levels. A number of seminars, work shops, and project groups on various aspects of IT and the public sector have been and are carried out, involving a good number of specialists in public service all over the country. Among the projects, initiated and carried out are:

- \* PROSIT, concentrating on solving problems related to different definitions implemented by different organisations, shifting standards, pricing policies etc. PROSIT is there to create one standard for all services involved;
- \* PILOTGIS, based on GIS, is developing the correct maps needed for future planning of the society, and the tools for reading and interpreting these maps correctly. It contains a number of sub-projects;
- \* Y2K, problems related to computers' inability to handle the millenium shift, and its implications to the public sector, are the subject of one group of problems solvers;
- \* "WWW for public information" has as its objective to create a national public information service of high quality, available on the Internet;
- \* The EDI project has generated frame agreements for electronic trade and commerce in the public sector. EDI took off during 1996. The project group is now working in three subgroups, covering the dissemination of EDI; the technical requirements related to the frame agreements; and the legal aspects of electronic trade and eventual adjustments of existing laws.

*Source: Nyhetsblad från Toppleदारforum*

#### \* Bangemann Award to STEHLA

STELHA, Stockholms ELEktroniska HANdel, (Stockholm's Electronic Trade) started in March 1966. In January 1997, the project leader received the Bangemann Award for electronic trade. The City of Stockholm annually handles one million invoices in payment of goods and services purchased for more than six billion SEK. Administration costs can be drastically cut thanks to EDI. STELHA is an EDI project developed for testing the electronic purchasing process, from order to payment, in the City of Stockholm.

*Source: Nyhetsblad från Toppleदारforum*

#### \* IT Award for Schools

The Royal Academy of Engineering Sciences has founded an award for information technology at school. In 1996, six science and mathematics teachers and their schools shared the prize sum for their introduction of IT as a tool for information search, data processing, and interactive learning.

*Source: IVA Aktuellt 1997:1, homepage: <http://www.iva.se>*

### **\* Stockholm Arts and IT Lab**

In 1998, Stockholm will act as the official European cultural capital. From the preliminary program, it is evident that IT will be an important tool in many of the planned activities. Several projects are under development, for instance:

- An international meeting place in the shape of an IT lab is planned at Skeppsholmen, a traditional "museum island" in the center of Stockholm. The objective is that all kinds of artists and masters of the plastic arts should be able to meet those specialising in electronic, IT and IT artwork in order to find new working methods, develop ideas, collaborate with artists all over the world... you name it. The anchor theme is "In the steps of Lionardo";
- A specific web-site is being developed for those who want to walk through the historic Stockholm;
- "Interact" is an Internet based project for young people all over the country. Basically oriented towards creativity and artistic creation, but also including film making, broadcasting, literature, etc.

*Source: Stockholm 98, E-mail address: info@98.stockholm.se; Internet: www.kultur98.Stockholm.se*

### **\* Electronic Cash Under Government Scrutiny**

The Department of Finance is looking into how electronic cash is handled via smart cards and Internet-based pay systems. A recommendation for who may issue e-cash will be proposed, what kind of illegal problems are to be expected will be mapped, and what the legal status of e-cash is, are further areas for the scrutiny.

*Source: TT/Computer Sweden, 17 January 1997*

### **\* Recycling Your Old Computer**

What do you do with your old computer (and any other electronic equipment) when it has served its time? Give it to the nearest school? Not too many schools would know what to do with it. Pass it on to your kids? Most likely, they already have their own computer, quite a number of generations ahead of the one you want to scrap. If you live in Stockholm, Sweden, you may place a telephone call to GRE, a company specialised in recycling electronic equipment. They will pick up whatever you want to get rid of, and break down the old equipment into its basic components, which will be recycled. The only thing not quite settled yet — in March 1996 — is "who pays".

*Source: Ny Teknik - Teknisk Tidskrift 1996:6*

### **\* Recycling Metal in Mobile Telephones**

Sweden is participating in a EU operation called "Operation Return Telephony" dedicated to the recycling of used mobile telephones. The project has two objectives; to find out if mobile phone users are interested in getting rid of their old telephones, and to find the best methods for recycling the materials used in the phones. Alacatel, Ericsson, Motorola, Nokia, and Panasonic are the participating companies. The project was initiated by Ectel, the European mobile telephone suppliers' organisation. Some 500 Swedish retailers have said, so far, (February 18, 1997) that they are interested in collecting used telephones. So far, it is estimated that 800 000 mobile telephones have been taken out of service.

*Source: Dagens IT, February 18, 1997*

### **\* Swedes as IT Users**

\* When it comes to buying and using multifunction machines, for instance fax + printer, or fax+printer+copier, the Swedes are more similar to the Japanese than to the Americans — Swedes don't buy multifunction machines, they want the best of everything and are still buying more according to technical specifications than to actual needs and usage. Thus, the manufacturers who sell multifunction machines do not even introduce them to the Swedish market — it is nonexistant for this type of equipment!

*Source: Nya Datamarketing, # 2/96*