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Globalisation and Employment in the EU Electrical Industry: A Case Study with Emphasis on Germany

by

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Abstract:
The development of production, prices and employment in the EU electrical industry between the mid-1970s and the mid-1990s is analysed in order to test the hypothesis that the competitive pressure from low-income countries has led to the observed decline of the employment share of low-skilled workers. The direct effect of increased import competition on relative employment seems to be small, except for the case of consumer electronics. Apparently, adjustment strategies induced by globalisation pressures (e.g., investment in machinery and R&D) had a large skill bias. Structural change both between and within major subsegments of the electrical industry is analysed in more detail for the case of West Germany.

Keywords: international trade; employment; process innovations; international outsourcing; capital-skill complementarity.

JEL classification: F14, J31, L63

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Contents

1. Introduction

Since the late 1970s, demand for low-skilled workers has declined in high-income countries which either led to a deterioration of the earnings or to higher unemployment rates of low-skilled relative to high-skilled workers. At the same time, many low-income countries have become important producers of manufactures and gained significant market shares in high-income countries. Mainstream trade theory offers a simple explanation that links these two stylised facts in high income countries. Accordingly, the increasing supply of low-skilled labour intensive manufactures leads to a decline of the relative world market prices of these products. In consequence, the sectoral structure of production in high-income countries towards changes towards high-skilled labour or capital intensive products and the relative wage of low-skilled workers declines (Stolper-Samuelson theorem). However, many empirical studies on the determinants of this development concluded that exogenous labour-saving technological progress has been more important to explain the deterioration of the wage position of low-skilled workers than increasing manufacturing imports from low-income countries. Probably, this is not the final answer to the question. Other factors such as labour market institutions may have been equally important. Moreover, entrepreneurial activities such as process and product innovations or the relocation of relative low-skilled labour intensive stages of the production process cannot be treated as exogenous but may also be the result of the perceived increasing import competition.

This study examines these questions for the case of the European electrical industry. Although the electrical industry in total is regarded as relative skill intensive, import competition from low-income countries has increased significantly over the last two decades, at least in some segments. Hence, it is interesting to study the sectoral development of relative wages and employment on the one hand and entrepreneurial strategies on the other hand.

The electrical industry[1] (section 383 of ISIC Rev. 2 or section 34 of NACE 1970) is a heterogeneous industry (Table 1). Whenever possible, the following subsectors are treated separately:

- Industrial machinery (ISIC 3831), producing capital goods like electrical motors, generators and transformers, electrical transmission equipment, and other specialised machinery for industrial applications.
- Consumer electronics (ISIC 3832), producing mainly radios, TV sets, sound and video recorders and telecom equipment. Import penetration from DCs is particularly high in this segment. Until recently, the telecom industry has been a highly regulated industry segment which sold parts of its equipment under arrangements similar to government procurement. Thus, it could benefit from oligopolistic price mark-ups when selling to the public sector.
- Household electric appliances (ISIC 3833). It has to be noted that the production of some household electric appliances (e.g., refrigerators) is classified as "non-electrical machinery".
- Other electrical apparatus (ISIC 3839), manufacturing products like batteries, cable and wire, electric lamps and equipment for non-industrial application.

Since the production of office machinery and automatic data processing equipment (ISIC 3825) is not classified as part of the electrical industry, it is not analysed here.

In the next section, major trends in production and employment in the EU electrical industry are identified. The analysis is restricted to the four largest countries (Germany, France, Italy and the United Kingdom). It is shown that labour productivity has always increased faster than the manufacturing average. This leads to the question whether this productivity growth is due to increasing capital intensity of production,

[1] It has to be noted that statistical data from 1995 onwards are not strictly comparable to data for previous years. Due to the harmonisation of international classification systems (ISIC Rev. 3, NACE Rev. 1), some segments of the electrical industry (383 ISIC Rev. 2) are now recorded in non-electrical industries (for details cf. Table 1).

Table 1 — Electrical industry (section 383 of ISIC, Rev. 2) and related industries

ISIC (Rev. 2)	Typical products	NACE 1970	SITC (Rev. 1)	SITC (Rev. 2)
3831	Electrical motors, generators, transformers	ex342	722.1	**716**, 771
	Switchgears etc. for industrial application, electrical equipment for vehicles	ex343.1	ex722.2, 729.41, ex729.9	**ex737.32**, ex772, 778.31, ex778.8
3832	Radios, TV, sound and video recorders	345.1	724.1, 724.2, **891.1**	761, 762, 763
	TV tubes, electronic parts and components	ex344	ex722.2, 729.3, ex729.9	ex772, 776
	Records and tapes[a]	345.2	**891.2**	**898.3**
	Radar equipment[b], telecom. equipment	ex344	ex724.9	764
	Electro-medical app.[b]	ex344	726	774
	Signalling apparatus	ex343.1	ex729.9	ex778.8
3833	Electrical household appliances (excl. items in ISIC 3829)[c]	ex346	725 (excl. items in ISIC 3829)	775 (excl. items in ISIC 3829)
3839	Batteries, insulated wire and cable, electric lamps, switches etc. for other than industrial application	341, ex342, ex343.1, 343.2, 347	ex722.2, 723.1, ex723.2, 729.1, 729.2, 729.42, ex729.9	ex772, 773 (excl. ex773.2), 778 (excl. items in ISIC 3831, 3832, 3851)
*	Installation of electrical equipment	348	(not applicable)	(not applicable)
ex 3823	Electr. hand tools	ex343.1	729.6	778.4
ex 3829	Refrigerators, household washing and drying machines[c]	ex346	725.01, 725.02, ex725.05	775.1, 775.2, 775.3, ex775.8
3825	Office machinery, computers	**33**	**714**	**75**
ex 3851	Electrical measuring and controlling instr.[b]	ex 344	729.5, 729.7, ex729.9	778.85, 778.86, **ex873.1, 874.8**

*Included in the respective subcategories of ISIC 383. — [a]In ISIC (Rev. 3) and NACE (Rev. 1) classified under "publishing and printing". — [b]In ISIC (Rev. 3) and NACE (Rev. 1) classified under "medical, precision and optical instruments". — [c]In ISIC (Rev. 3) and NACE (Rev. 1) classified under "non-electrical machinery". — Codes in bold types refer to items that are not classified as electrical products in the respective classification system.

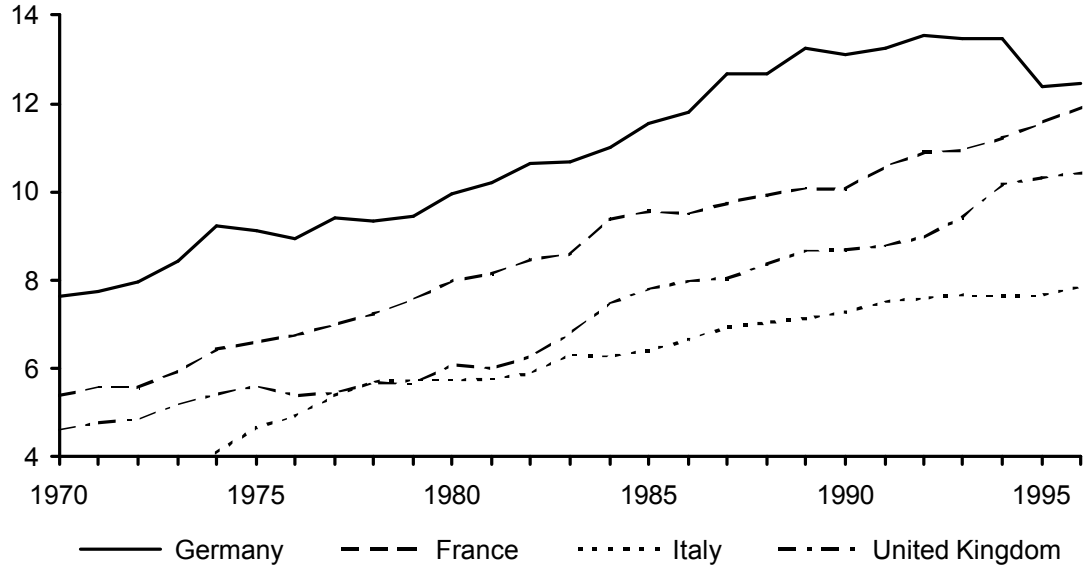
improved skills of the workforce, or technological change. In the third section, the scope and different patterns of the globalisation of production and markets are described. It is shown that the emergence of new suppliers in low-income countries has led to significant increases of import market penetration in the EU. At the same time, however, EU exports have also increased. In the fourth section, possible links between the globalisation of electrical industries and the observed labour market developments are considered. Unit values of EU exports relative to unit values of extra-EU imports are analysed on a disaggregated level to determine whether producers in the EU have shifted to higher value-added products. Since quantitative information is only limited, evidence from firm level surveys and other anecdotal evidence is added here. This analysis is deepened for the case of Germany in the fifth section. The sixth section concludes.

2. Production and employment in the EU electrical industry

Within the EU, the electrical industry is highly concentrated on a few countries. In the mid 1990s, Germany accounted for almost half of the value added and about 40 per cent of employment in the EU's electrical industry, followed by France, Italy and the UK with about 15 per cent each (see appendix table 1). In the latter three countries this share is roughly equivalent to their share in total EU manufacturing, whereas it is significantly above the total share in the case of Germany. In the following, only these four countries are described.

The electrical industry is one of the largest industries within the manufacturing sector in these four countries. In the mid-1990s, it contributed more than 12 per cent to the total manufacturing value added in Germany, 10 per cent in France, 9 per cent in the UK and 7 per cent in Italy. Moreover, the electrical industry is highly export oriented but at the same time faces stiff competition from extra-EU producers. Finally, the European electrical industry is still dominated by long established large companies (e.g., Philips, Siemens, Thomson) in some segments while elsewhere small and medium enterprises are very innovative.

Figure 1 — Output[a] of the electrical industry, 1970–1996



[a]Value added at constant prices of 1990, share in total manufacturing (per cent).

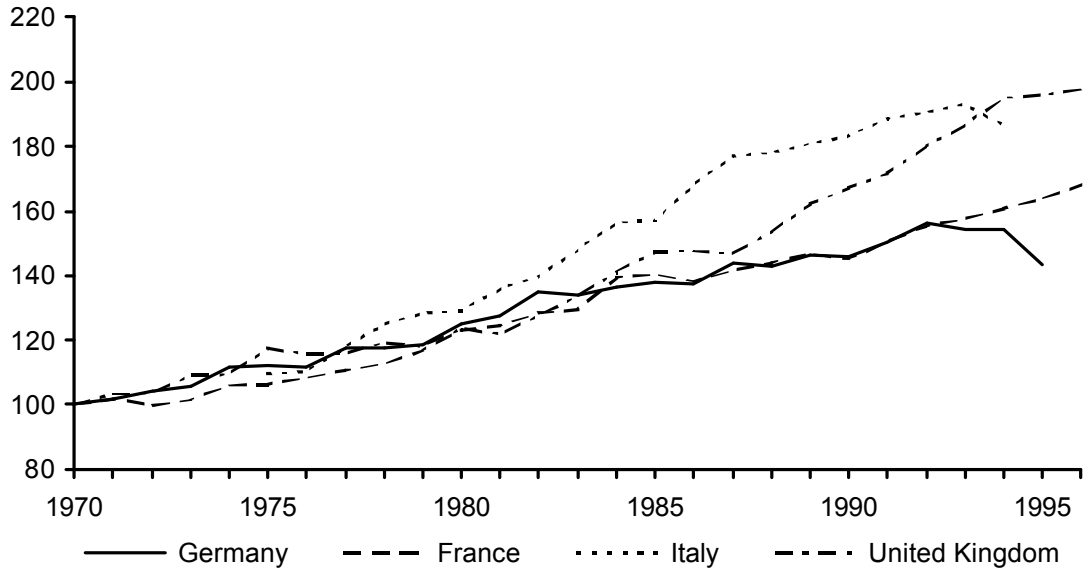
Source: OECD, STAN; own calculations.

During the 1970s and the 1980s, real value added growth in the electrical industry of the four countries was relatively high at an annual average rate of 4 to 5 per cent. This is not only a high growth rate in absolute terms, but also relative to the total manufacturing sector. Hence, the share of the electrical industry in the total manufacturing sector increased by several percentage points over the last decades (Figure 1). However, growth slowed down significantly in the 1990s, most notably in Italy and Germany, whereas it sustained in the UK[2] – despite a severe recession in the early 1990s – and in France. The main reason for the slowdown in Italy and Germany[3] seems to be the strong link of the industry's output to the business cycle. Moreover, structural changes within the electrical industry may have been more severe in these countries.

2 It has to be noted that the analysis of value added shares at current prices would be misleading. In the second half of the 1980s, growth of value added at current prices in the UK electrical industry was well below the average rate for the manufacturing sector. This is due to the steep decline of relative value added prices which has been stronger than in other EU countries (see below).

3 The marked decline in Germany in 1995 is probably due to a change in the industry classification (see section 1) which is not fully corrected in OECD data.

Figure 2 — Labour productivity[a] in the electrical industry, 1970–1996



[a]Real value added per employee, relative to total manufacturing (1970=100).

Source: OECD, STAN; own calculations.

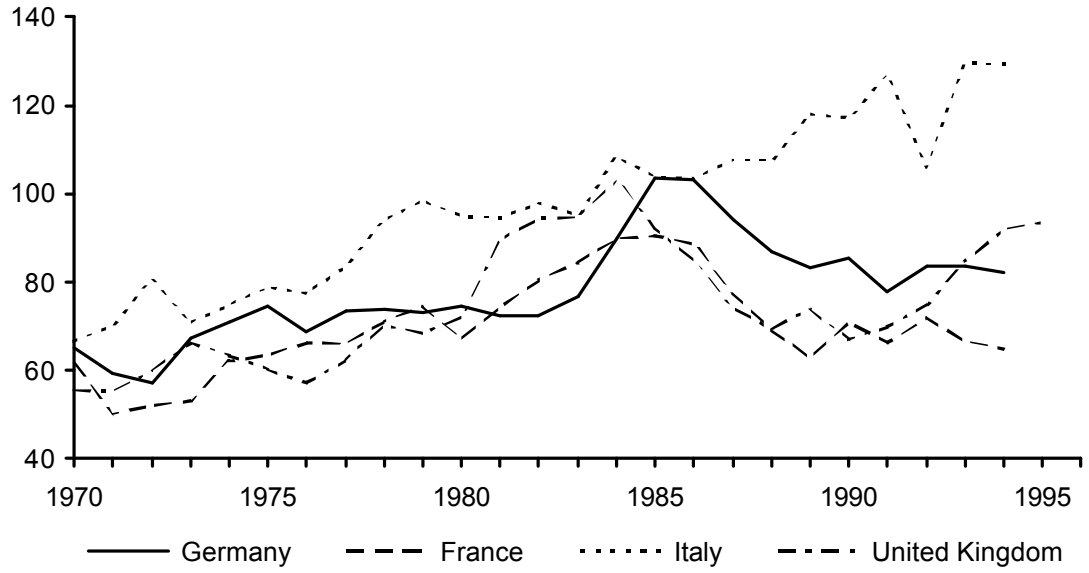
Average labour productivity (i.e., real value added per employee) in the electrical industry has increased significantly at an annual average rate of about 2 percentage points above the manufacturing average (Figure 2). In principle, this could have been the result of relatively large increases of the capital intensity in the electrical industry or of an increase of total factor productivity (TFP).

Information about the sectoral capital stock per worker is limited[4]. Therefore, investment per worker has been employed as a proxy for capital intensity. This indicator shows that the capital intensity in the electrical industry increased faster than the manufacturing average in the 1970s and the early 1980s, although its *level* is still below the manufacturing average (Figure 3). Thereafter, investment efforts have slowed down relative to the manufacturing average. Only in Italy and in the UK, investment per worker recovered in the 1990s. This development fits the observed productivity increases perfectly. It will be discussed in the fourth section whether the

4 The International Sectoral Database (ISDB) of the OECD contains no capital stock data for individual capital goods industries in the UK and in France. However, calculations based on capital stock data for Germany show the same trend as described below, which is derived from data for investment per worker.

relatively strong investment growth was due to a steady decrease of machinery prices relative to labour cost or due to globalisation pressures.

Figure 3 — Capital intensity[a] of electrical industry, 1970–1996



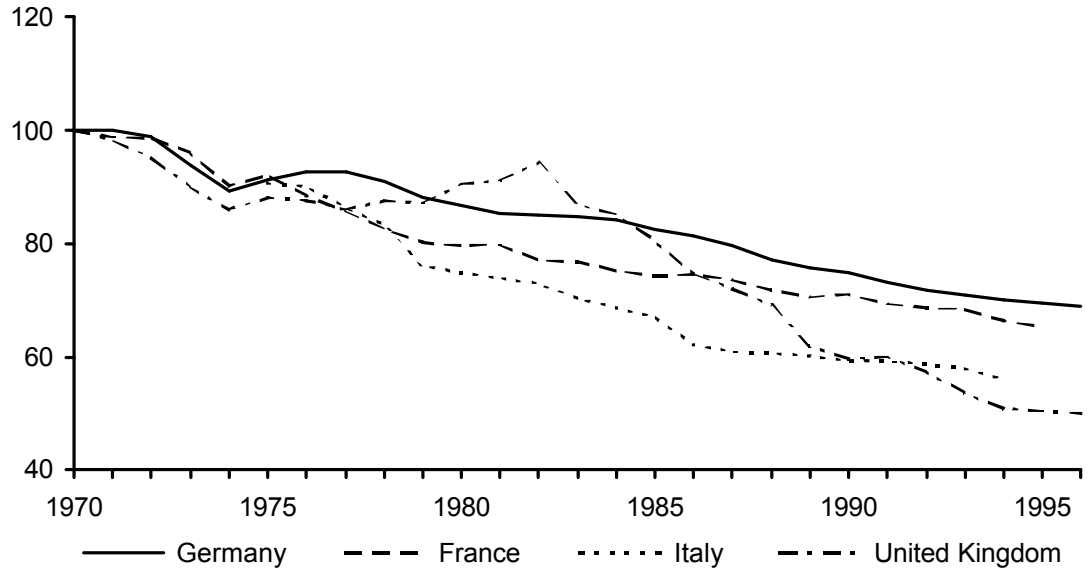
[a]Investment per worker, relative to total manufacturing (per cent).

Source: OECD, STAN; own calculations.

In the same vein, information about TFP growth is limited[5]. However, information on relative price changes can be used to infer about the relative productivity growth in the electrical industry. According to a simple model of structural change (Baumol 1967), relative price changes are inversely related to productivity growth differentials, i.e., the relative price of the sector with the highest productivity growth decreases. This proposition is based on the assumption of identical wages for each skill level across industries. Since both the skill composition and the average labour cost per worker in the electrical industry deviated only slightly from the respective value for the total manufacturing sector (cf. section 4), the simple model is a reasonable framework.

5 ISDB data show that TFP growth in the German electrical industry have been slightly higher than the average rate for the manufacturing sector (about 1 percentage point as an annual average).

Figure 4 — Relative price[a] of electrical industry, 1970–1996



[a]Real value added price, relative to total manufacturing (Index 1970=100).

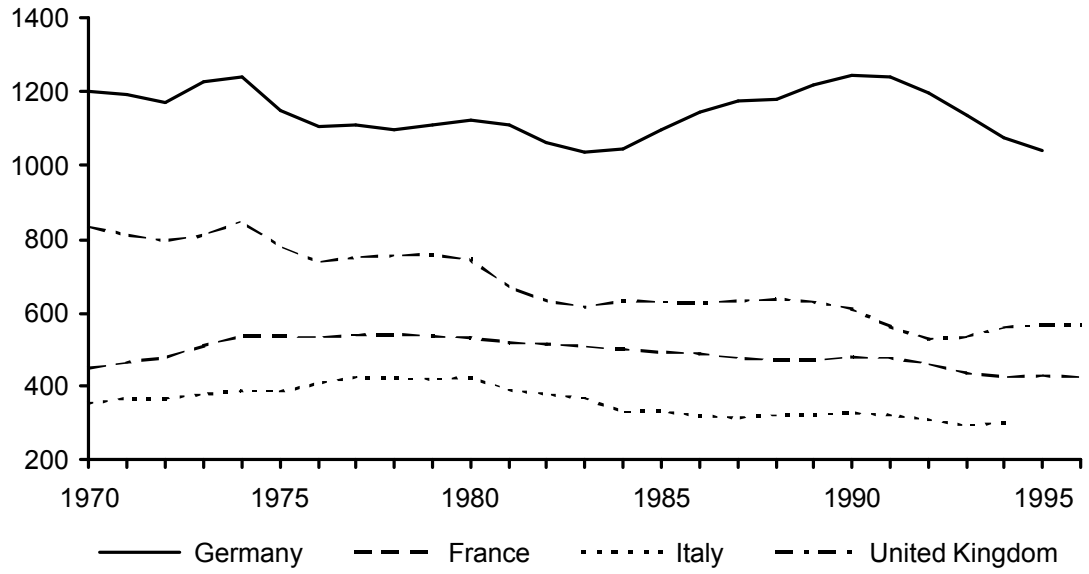
Source: OECD, STAN; own calculations.

Over the last three decades, the value added price of the electrical industry declined steadily relative to the manufacturing average (Figure 4). This trend was strongest in Italy and the UK, where the relative price decreased on average by more than 2 per cent per year, in contrast to Germany and France where it decreased by roughly 1.5 per cent per year. This pattern is exactly the inverse of the observed trends of the relative labour productivity growth, supporting the assumption of relatively high TFP growth in the electrical industry. The different price trends are probably due to differences in the intrasectoral structure of the electrical industry (see section 4).

Almost by definition, high labour productivity growth goes hand in hand with a shrinking workforce although this is not a statement about causality. Indeed, employment in the electrical industry decreased in absolute terms since the mid-1970s. This downward trend was particularly strong in the UK where the workforce shrank by almost one third between the early 1970s and the mid-1990s (Figure 5). Employment in the German electrical industry showed strong cyclical movements with a slump in the early 1980s and a boom in the late 1980s/early 1990s, which was

partly due to unification. The long-run trend in Germany over the last three decades points slightly downwards, just like in Italy and France, although recent data show signs of recovery. Like in terms of value added, however, the electrical industry performed better than the total manufacturing sector in terms of employment, with the exception of Italy (Figure 6).

Figure 5 — Employment[a] in the electrical industry, 1970–1996

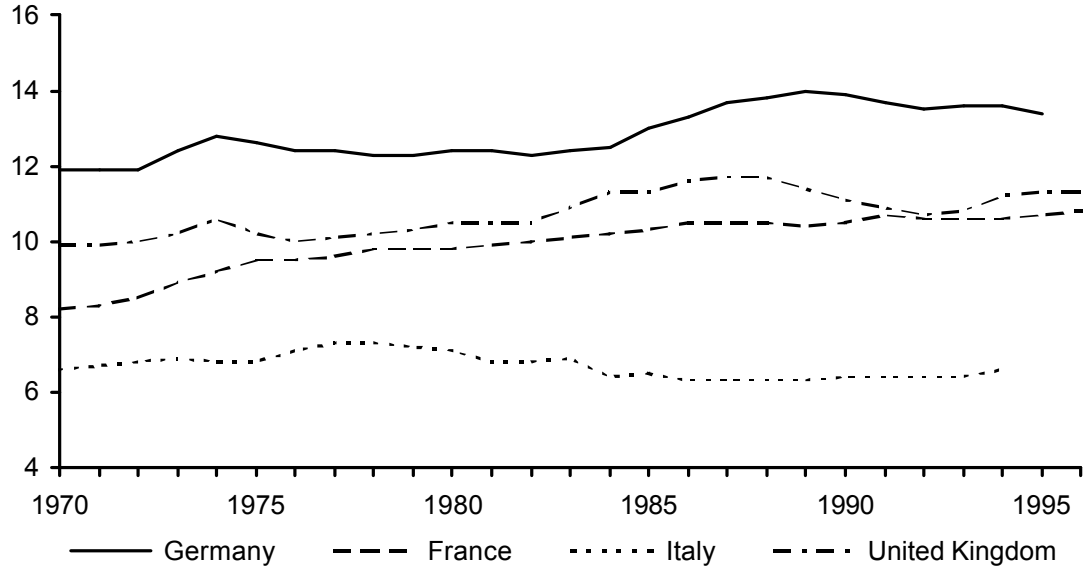


[a]Total employment in 1,000.

Source: OECD, STAN; own calculations.

Average labour cost per worker can be used as an indicator for the skill intensity of an industry. Accordingly, the skill intensity of the electrical industry in France and Germany was only slightly higher than in the total manufacturing sector whereas it was significantly higher in Italy and below the average in the UK (Figure 7). In the case of the UK, this is probably due to the relatively high share of low-skilled labour and a different intrasectoral structure of the electrical industry and (see section 4) whereas a sectoral structure of the manufacturing sector different from that in the other countries may be the explanation in the case of Italy.

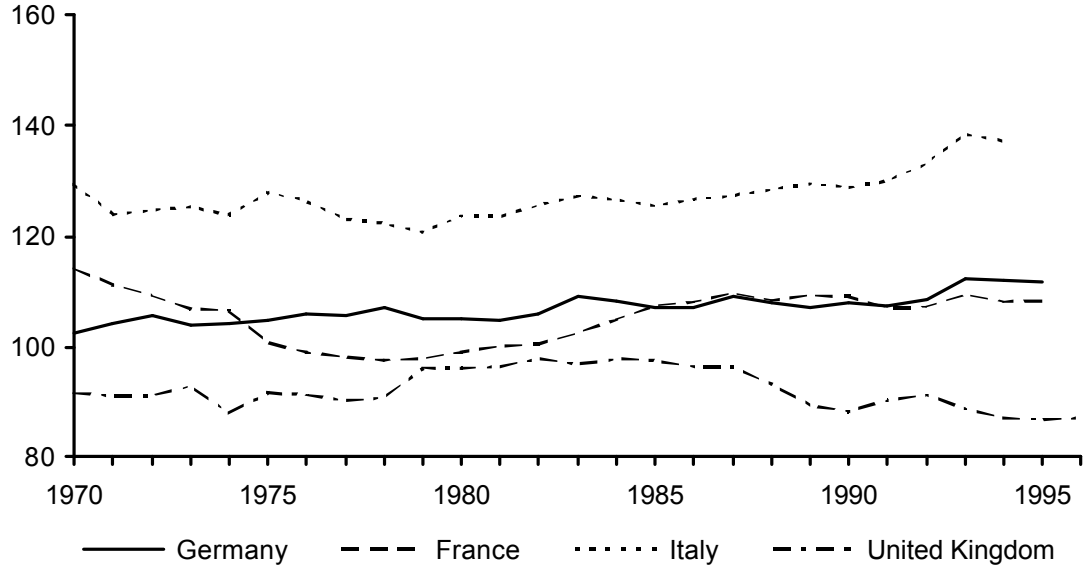
Figure 6 — Employment share[a] of the electrical industry, 1970–1996



[a]Share in employment of total manufacturing (per cent).

Source: OECD, STAN; own calculations.

Figure 7 — Skill intensity[a] of the electrical industry, 1970–1996



[a]Average labour cost per worker, relative to total manufacturing (per cent).

Source: OECD, STAN; own calculations.

3. Globalisation of world production and world markets

In 1980, the major world producers of electrical products were (Table 2):

- the EU with 35 per cent of world value added and 2.6 million employees
- Japan with 24 per cent of world value added and 1.3 million employees
- the USA with 22 per cent of world value added and 2 million employees
- the East Asian NICs with 3 per cent of world value added and 0.7 million employees.

Since then, the locational pattern of production in the electrical industry has changed significantly. Lower-income countries in Asia (e.g., PR China, Malaysia and Thailand) have been the main beneficiaries of this shift. The evidence is mixed for the Asian and Latin American NIC's: employment in the electrical industry of Korea, Taiwan and Mexico almost doubled between 1980 and 1994 whereas Brazil and Hong Kong recorded a significant decrease of the industry's employment. By contrast, total employment in high-income OECD countries' electrical industry decreased by about 800,000, except for Japan and Germany where employment rose by almost 200,000. The consumer electronics subsector accounted for the bulk of these employment shifts. In Malaysia and Korea, for example, more than two thirds of the total workforce of the electrical industry was employed in this subsector in the early 1990s.

Between 1980 and 1995, world exports of electrical products have grown by about 13 per cent as annual average (Table 3), well above the trade in total manufactures (less than 9 per cent p.a.). As a result, electrical products accounts for about one sixth of total world trade in manufactures in 1995, compared to one tenth of total trade in 1980. Particularly strong was the growth of exports of electronic components like TV tubes and transistors (about 18 per cent p.a.) and of telecommunication equipment (about 14 per cent p.a.). Trade in industrial electrical machinery is dominated by the EU which supplies about 40 per cent of world exports. The same holds for trade in some other segments (household appliances, electricity distribution equipment etc.), whereas the world market share of the EU is relatively small in

consumer electronics. This reflects the comparative advantage of EU suppliers in skill-intensive products.

Table 2 — Major producers of electrical products (ISIC 383)

	Share in world value added (per cent)[a]		Employment (1,000)		Labour cost (US=100)[b]		Share in world exports (per cent)[c]	
	1985	1994	1980	1994	1985	1994	1980	1995
USA	21.6	24.0	1,985	1,520	100	100	16.1	14.2
Japan	24.3	25.7	1,315	1,489	82	123	21.5	16.9
Germany	13.7	12.5	925	942	147	162	15.2	9.1
France	6.3	4.7	526	421	105	104	6.9	4.4
Netherlands	1.6	1.3	111	85	118	117	4.4	2.2
Italy	6.0	4.8	330	228	124	100	4.3	2.9
UK	6.6	3.4	665	332	84	75	6.4	4.7
Singapore	0.4	0.7	88	98	25	n.a.	3.1	6.3
Hong Kong	n.a.	n.a.	128	38	19	30	2.5	6.0*
Taiwan	1.4	2.7	310	478	25	32	3.2	3.4
Korea	1.1	3.0	217	409	24	35	2.0	6.0
Malaysia	0.2	0.8	77	370	n.a.	n.a.	1.2	4.6
Thailand	n.a.	n.a.	n.a.	120	n.a.	n.a.	0.3	1.5
China	n.a.	n.a.	1,525	3,960	n.a.	n.a.	n.a.	3.0
Mexico	0.8	0.8	40	75	9	13	0.4	3.2
Brazil	2.0	1.7	297	211	n.a.	n.a.	0.4	0.2

[a]Share in world value added of the electrical industry at constant 1990 prices. — [b]Based on hourly compensation costs for production workers in the electrical industry in US$. — [c]Exports of section 716, 76 and 77 of SITC Rev. 2 (cf. Table 3). — *Including re-exports, mainly from China PR. With the share of re-exports in total exports of electrical products estimated at about 80 per cent (Census and Statistics Department of Hong Kong, 1994), domestic exports accounted for only about 1 per cent of world trade in electrical products in 1995.

Source: UNIDO, IYIS 1997; UNIDO, Industrial statistics (CD-ROM); ILO (1998); UN, Yearbook of international trade statistics 1982 and 1996; own calculations.

Lower-income countries, in particular the PR China, Malaysia, Mexico and the East Asian NIC's, have significantly increased their share in world exports of electrical products (Table 2). Whereas the triad countries (EU, Japan and USA) accounted for about 75 per cent of world exports of all electrical products in 1980, this share declined to about 55 per cent in 1995. This shift has been particularly strong in the subsector producing TV sets, radios and sound or video recorders, which was dominated by Japan in 1980 with about 50 per cent world export share. Between 1980 and 1995, the world market share of Japan decreased by more than 30 percentage points and that of the USA by about 8 percentage points. Likewise, the share of the USA and the EU in electronic components decreased by about 8 percentage points each.

By contrast, the triad countries kept their world market share stable or even improved their position in other subsectors. For example, Japan's share in world exports of electronic components and electro-medical equipment increased by 6 and 7 percentage points, the US share for electricity distribution equipment increased by 5 percentage points, and the EU share stagnated for electro-medical equipment, TV sets/radios/recorders and household appliances. The picture changes slightly if the net position in international trade is analysed (cf. appendix tables 3-8): the USA are strong net importers in all three subgroups, except for electro-medical apparatus, whereas the EU is a net importer only in consumer electronics. Japan has been a strong net exporter in all three subgroups during the last two decades. Korea and Malaysia have become net exporters of consumer electronics and other electrical products during the 1980s, but are net importers of industrial machinery. Hong Kong has changed into a net importer of electrical products in all segments which is probably due to relocation from Hong Kong to China PR.

This development supports the hypothesis that structural change within the electrical industry took place according to the respective factor endowment of suppliers. Accordingly, relatively high-skill intensive products or parts of the

Table 3 — World exports of electrical products, 1980 and 1995

Products	Code	1980		1995		1980-1995[a]
	(SITC, Rev. 2)	(bill. US$)	thereof: EC 10 (per cent)	(bill. US$)	thereof: EU 15 (per cent)	(per cent)
Electrical motors	716	6.4	50.0	25.1	40.2	+ 9.5
Electric power machinery, parts	771	3.3	50.3	22.0	34.5	+ 13.5
Switches, relays etc., parts thereof	772	13.1	53.4	63.6	41.2	+ 11.1
TV sets	761	5.6	36.6	22.1	24.8	+ 9.6
Radios	762	6.1	12.7	22.3	14.2	+ 9.0
Record players and sound recorders	763	5.5	15.2	21.6	15.1	+ 9.5
Telecom. equip-ment, parts of 76x	764	17.8	42.2	118.5	34.7	+ 13.5
TV tubes, semiconductors etc.	776	14.2	26.3	180.0	18.1	+ 18.4
Electro-medical apparatus	774	2.7	51.9	12.4	50.8	+ 10.6
Household type equipment	775	8.4	55.7	33.0	53.3	+ 9.5
Electricity distribution equipment	773	5.3	48.9	27.5	37.8	+ 11.5
Electrical products n. e. s.	778	14.4	50.3	77.8	38.0	+ 11.9
Total electrical products	716, 76, 77	102.9	41.5	625.8	31.0	+ 12.8
Memo: Total world exports	0-9	2,000.9	34.5	5,012.1	40.0	+ 6.3
thereof: manufactures	5-8 less 68	1,085.2	54.1	3,745.1	45.4	+ 8.6

[a]Annual average rate of change.

Source: See appendix tables 3–8.

production process are kept within the triad countries whereas the production of relatively low-skill intensive final products are relocated (for examples see, e.g., Dicken 1998).

Direct investment of high-income countries has contributed to the shift in the locational pattern of production and world trade of electrical products. This is most obvious in the case of Japan: about one quarter of the total 1995 stock of Japanese FDI in manufacturing was in the electrical industry, compared to only about 10 per cent in 1980 (Table 4). By contrast, the corresponding 1995 figures for the USA and Germany were only 10 per cent and 15 per cent respectively. In absolute numbers, FDI in the electrical industry took place largely between high-income countries. Japanese FDI in North America, and US and German FDI in Western Europe accounted for almost one half of each country's total FDI in the electrical industry abroad. However, the share of FDI in the electrical industry that is allocated to Asia has increased significantly for all triad countries, and reached about 30 per cent in the case of Japan. This fits the above finding that the world market share in consumer electronics and electronic components has decreased for the triad countries.

Table 4 — Direct investment position abroad in the electrical industry (bill. US$)

	USA		Japan		Germany	
	1980	1995	1980	1995	1981	1994
Total	7.3	25.6	1.6	35.4	3.3	13.1
thereof in:						
- Europe	3.7	11.5	n.a.	6.4	1.5	5.3
- USA and Canada	1.3	1.5	0.7	17.6	0.9	3.0
- Japan	0.2	2.2	-	-	0.0	0.1
- other Asia	0.7	7.8	0.5	10.4	0.1	0.8
- Latin America	1.0	1.7	0.2	0.8	0.6	1.8
Memo: total manu-facturing	89.1	257.6	12.3	148.3	21.0	86.1

Source: US Department of Commerce; Japan Ministry of Finance; Deutsche Bundesbank.

Aggregate statistics on direct investment show that the European electrical industry has always been a net capital exporter, although compared with US and Japanese firms, European producers had a smaller propensity to establish offshore production facilities in developing countries (Dicken 1998). Moreover, foreign investment in the EU has become more important with the Single Market completion project. This is especially the case in the UK where inflows exceeded outflows in the mid-1990s (Table 5). Asian producers (e.g., from Japan, Korea and Taiwan) have accelerated their investment in Europe since the late 1980s[6]. Possible motives are the appreciation of the Yen, the significance of transport costs (e.g. for large TV tubes) and access to the European market in fear of increasing non-tariff protection. The last motive has raised serious debates about so called "screwdriver plants" (see below in this section).

Table 5 — Direct investment in the electrical industry[a] (bill. US$)

	Inflows		Outflows		Stocks 1995	
	1985-1987[b]	1993-1995[b]	1985-1987[b]	1993-1995[b]	Inward	Outward
France	0.15	0.27	0.46	1.08	7.2	11.9
Germany	-0.10	0.29	1.02	0.86	11.5[a]	16.4[c]
Italy	n.a.	0.25	n.a.	0.13	n.a.	n.a.
Netherlands	n.a.	0.17	n.a.	0.40	10.1	18.0
UK	0.52	0.95	0.71	0.14	10.3	9.6[c]

[a]Incl. office machinery. — [b]Annual averages. — [c]1992 figures; due to changes in the classification system of the German FDI statistics, more recent figures are not comparable.

Source: OECD, International direct investment statistics yearbook 1997. Paris 1997.

Between 1980 and 1995, import market penetration ratios in high-income countries have increased significantly in the USA and in the EU, but less so in Japan (Table 6). Developing countries accounted for a large part of this increase but not for all. At the

6 See UNCTAD (1996, 25-35) and Schultz (1995). The following builds on Line (1990).

same time, the USA and the EU have increased their export shares of electrical products in a similar order of magnitude. This fits the hypothesis that trade in electrical products is to a large extent intra-industry trade[7], most obviously within the EU.

Table 6 — Imports and exports of electrical products in the Triad countries

	EU15[a]		USA and Canada[b]		Japan	
	1980	1995	1980	1995	1980	1995
Imports[c]	9.1	19.9	10.6	30.3	2.7	8.2
thereof: from DC's[c]	1.9	7.3	5.3	18.2	0.9	4.5
Exports[d]	11.9	18.8	8.9	16.4	26.3	27.0

[a]Excluding intra-EU trade. — [b]Excluding trade between Canada and the USA. — [c]In per cent of apparent consumption. — [d]In per cent of production.

Source: UNCTAD, Handbook of international trade and development statistics 1996/1997.

A closer look at individual subsectors reveals that by the early 1990s import market penetration in the EU was highest for consumer electronics and in the same order of magnitude as for office machinery and computers (Table 7). In contrast to other electrical products (ISIC 383 excl. 3832), this was mainly due to imports from developing countries. However, there are significant differences between EU countries. For example, in 1990 intra-EU imports accounted for a relatively high share of total imports of consumer electronics in Italy. In the same vein, the market share of developing countries was surprisingly low for office machinery in France and Italy and for other electrical products in Italy. This pattern persisted during the 1990s. Given the fact that no EU country-specific quotas existed for these products after 1992, differences in import market penetration ratios point to a considerable degree of

7 Weiss (1978, 61-67) and Heitger et al. (1999, 113-116) provide empirical calculations for the case of Germany.

market segmentation not caused by explicit trade policy[8]. This could be the result of differences in consumer preferences or of quality differences. With respect to the latter, different degrees of quality upgrading within the electrical industry may provide an explanation. The analysis of import and export unit values in the next section will shed some light on this hypothesis.

Table 7 — Imports of electrical products (per cent of apparent consumption), 1990

	Radio, TV, telecom. equipment (ISIC 3832)		Other electrical prod. (ISIC 383 excl. 3832)		Memo: Office machinery, computer (ISIC 3825)	
	Intra EC	Extra EC	Intra EC	Extra EC	Intra EC	Extra EC
EC average	18.6	25.7	28.9	17.3	31.6	43.2
France	19.2	15.9	34.4	14.2	37.8	22.7
Germany	12.5	21.4	16.1	15.8	28.6	44.1
Italy	30.8	22.0	23.3	2.3	30.3	16.5
UK	20.6	32.2	38.4	28.8	37.9	42.7

Source: GATT Secretariat (1993).

However, EU trade policies cannot be ignored in this industry. As concerns tariffs, rates for electrical products in the 1990s were relatively low compared to the average for manufactures (Table 8). A notable exception are consumer electronics which face relatively high import tariffs (14 per cent in most cases[9]) with significant escalation between parts and finished products. Moreover, imports of consumer electronics from Asia were subject to non-tariff barriers in the 1980s and early 1990s (Table 9). The most widely used instrument in the 1980s was the anti-dumping duty (Line 1990). Moreover, Asian suppliers were urged to restrain exports ("voluntary export restraints") or increase export prices. In the late 1980s, the Commission reserved the right to apply anti-dumping duties on goods from assembly plants within the EU that

8 However, retail price comparisons point to a high degree of price dispersion among national consumer electronics markets within the EU (GATT 1993). This may reflect barriers to price arbitrage such as restrictions by manufacturers on re-exports from one EU member state to another.

9 The relatively low average values in Table 8 are due to low import tariffs for telecom equipment.

do not meet certain local content requirements ("screwdriver plants"). Whether the relatively high import protection for consumer electronics has helped to cushion globalisation pressures will be discussed in the next section.

Recently, the possible use of technical standards as a new form of trade protection has been raised in the discussion. The relevance of this issue is clearly demonstrated by the existence of exclusive transmission systems for colour TV (PAL) throughout the 1970s and 1980s (cf. Bowen 1991) and the recent EU policy with respect to the development of high-definition TV.

Table 8 — EU tariff rates for electrical products (per cent), 1995-2001

	1995		1997		2001
	Average	Range	Average	Range	Average
Manufacturing excl. food	n.a.	0-25	5.0	0-71	n.a.
Office mach., computer	4.6	0-12	2.7	0-8.4	1.8
Electrical industrial mach.	4.0	0-8.5	2.9	0-6.2	2.2
Radio, TV, telecom. eq.	7.3	0-15	5.2	0-14.4	4.4
Household appliances	5.0	0-7	3.6	0-6.9	2.7
Other electrical apparatus	5.6	0-9	4.0	0-6.4	3.0

Source: WTO, Trade policy review European Union 1997, Vol. I. Geneva 1997.

Table 9 — Selected EU trade restrictions for electrical products in the 1980s and 1990s

Instrument	Important examples
Import tariffs	14 per cent on colour TV and components
Import quota	car radios from PR China
Voluntary export restraints	portable TV sets from China and Japan (UK)
Voluntary minimum export price agreement	memory chips from Japan and South Korea
Antidumping tariff	DRAM from East Asia, VCR from Korea, CD players from Japan, small screen TV from China and Hong Kong
Art. 134 (former Art. 115 EC treaty)	ban on intra-EU TV imports connected with local content rules (France 1988-1991)

Source: GATT Secretariat (1993); Line (1990); various press reports.

In summary, globalisation in the electrical industry has led to significant shifts of the locational pattern of production and trade during the last two decades, mostly in favour of East Asian suppliers. However, the simultaneous increase of import penetration ratios and export ratios in the EU shows that EU producers have adjusted to these globalisation pressures, to some extent supported by import protection measures. In addition, the increasing inflows of FDI from non-European countries shows that the EU is on aggregate still an attractive location for the production of electrical industry.

4. Employment effects of globalisation and technological change

Possible adjustment strategies towards increasing globalisation pressure comprise increased investment in machinery (e.g., automated assembly), changes in the product mix, international outsourcing and increased R&D efforts. Investment trends have already been described above. Other strategies are described in the rest of this section. Since about 60 per cent of world trade of electrical products in 1995 consisted of radios, TV sets, telecommunication equipment, and electronic parts and components, structural change in this subsector[10] (ISIC 3832) will be described in more detail.

Fierce competition characterises this subsector world-wide. The once prosperous US consumer electronics industry was largely displaced during the 1950s ad 1960s by Japanese manufactures. European firms managed to remain sheltered from foreign competition somewhat longer, but have become subjected to stiff competition as well. In order to improve productivity, the European industry has undertaken a wide-ranging process of industrial restructuring. The result has been an extremely high level of concentration, most notably in France (cf. Savary 1996).

10 It has to be noted that this subsector includes not only consumer electronics in the narrow sense but also some industrial electrical machinery and some non-electrical goods (see Table 1). The recently introduced ISIC (Rev. 3) and NACE (Rev. 1) classifications have shifted these products to other (i.e., non-electrical) industries. Hence, statistics in these new classifications show a smaller share of this subsector in electrical industry, most notably in Germany.

Nevertheless, the share of consumer electronics in total value added of the electrical industry remained virtually constant in the period 1975 to 1995 (Table 10). By contrast, the respective employment shares declined significantly by 2-4 percentage points. This supports the hypothesis that structural change within the electrical industry has led to a higher weight of products with a relatively high value added (see below in this section). Although this trend is fairly similar in the major EU countries, the analysis of the composition of the labour force by skill reveals large differences.

Table 10 — Share of consumer electronics (ISIC 3832) in total electrical industry, 1975-1995

	France		Germany		Italy		UK	
	value added[a]	employ-ment	value added[a]	employ-ment	value added[a]	employ-ment	value added[a]	employ-ment
1975	44.7	42.4	53.1	42.8	33.6	24.3	49.5	50.4
1980	44.4	42.0	50.0	43.0	27.6	23.5	48.1	46.4
1985	47.6	44.4	51.6	42.8	34.4	22.3	52.1	47.7
1990	46.0	41.2	54.8	41.5	40.2	20.7	50.8	47.2
1995	45.3	40.6	52.7	39.3	36.6*	22.1*	50.9*	46.6*

[a]At current prices of 1990. — *1993.

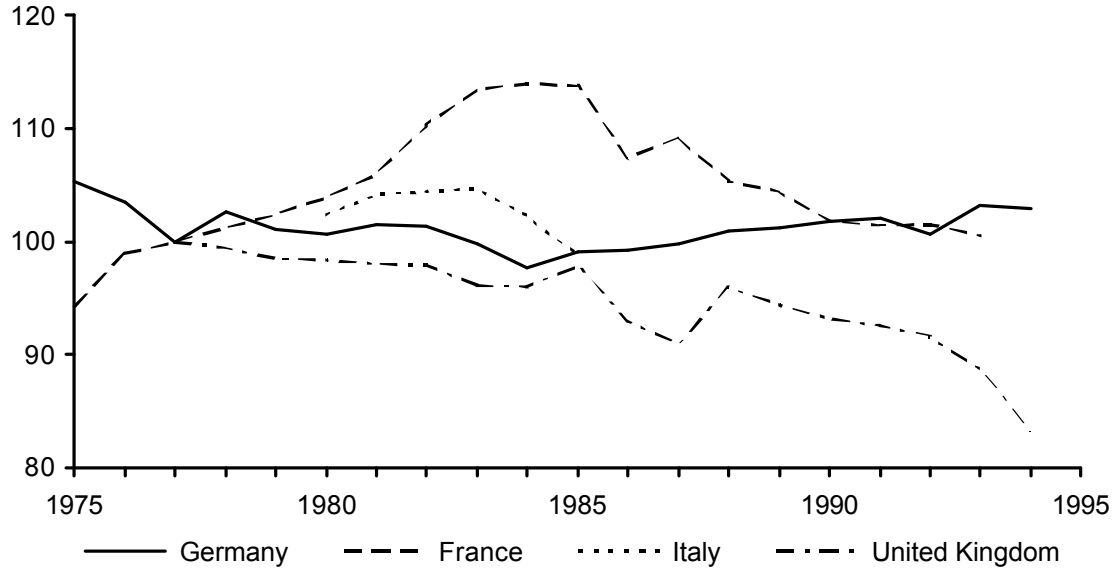
Source: OECD, STAN; own calculations.

In general, information on employment and wages is limited to the two broad categories of manual ("blue collar") and non-manual ("white collar") workers, especially with respect to wage data[11]. EUROSTAT earnings statistics provide information about wages of manual and non-manual workers. Accordingly, the relative wage of manual workers in the German electrical industry was almost constant over the last two decades, whereas it showed a clear downward trend in the UK. In France, the relative wage of manual workers has increased significantly in the

11 The *number* of high and low-skilled workers within these two categories is available (see below).

early 1980s and returned to its previous level in the early 1990s (Figure 8). These industry trends are broadly in line with the respective national trends for the manufacturing sector as a whole. Hence, if technical progress had been unbiased with respect to skill groups, one would expect the share of manual workers to decline (except in the UK) in consequence of the increased import penetration in the EU market for low-skill intensive electrical products. In other words, globalisation pressures were cushioned in the UK by adequate wage policies but not in Germany and in Italy.

Figure 8 — Relative wages[a] in the electrical industry, 1975–1994



[a]Wage of manual relative to non-manual workers (Index 1977 = 100).

Source: EUROSTAT, Earnings in Industry and Services (various issues); own calculations.

Employment data for the electrical industry[12] show a declining share of manual workers during the 1980s in all EU countries[13] except for the case of the UK. Moreover, these changes were larger than the respective change for the manufacturing sector as a whole (Table 11). However, there are some exceptions to this rule: The share of manual workers declined only moderately in "other electrical industry" in

12 Table 11 is based on internationally comparable data from national labour force surveys. National data have been adjusted by OECD-DSTI to national accounts via ISDB and STAN.

13 The increase of manual workers in Germany between 1980 and 1990 is only due to a cyclical upswing (see above, section 2) which has been compensated since then.

Table 11 — Employment in the electrical industry by skill (in 1,000)

	France			Germany			Italy			United Kingdom		
	1982	1990	%[a]	1980	1990	%[a]	1981	1991	%[a]	1981	1991	%[a]
Consumer electronics (ISIC 3832)												
high-skilled manual	19	20	+5	100	105	+5	32	14	-56	60	49	-18
low-skilled manual	91	65	-29	174	159	-9	25	21	-16	113	97	-14
high-skilled non-manual	81	90	+11	124	153	+23	20	20	0	86	82	-5
low-skilled non-manual	29	22	-24	47	50	+6	14	9	-36	53	37	-30
manual share	50	43		62	56		63	55		55	55	
low-skilled share[b]	55	44		50	45		43	47		53	50	
Other electrical industry (ISIC 383 excl. 3832)												
high-skilled manual	37	47	+27	155	175	+13	141	100	-29	78	60	-33
low-skilled manual	155	119	-23	201	207	+3	81	83	+2	157	101	-36
high-skilled non-manual	69	87	+26	178	211	+19	45	46	+2	69	91	+32
low-skilled non-manual	35	29	-17	56	66	+18	32	28	-12	55	47	-15
manual share	65	59		60	58		74	71		65	54	
low-skilled share[b]	64	52		44	41		38	43		59	49	
Memo: total manufacturing sector												
high-skilled manual	1048	964	-8	3179	3208	+1	2873	2338	-19	2297	1787	-22
low-skilled manual	2581	2021	-22	3069	2557	-17	1757	1496	-15	1909	1362	-29
high-skilled non-manual	930	1065	+15	1617	1907	+18	620	736	+19	1108	1273	+15
low-skilled non-manual	592	509	-14	1229	1260	+3	500	471	-6	1051	728	-31
manual share	70	65		69	65		80	76		66	61	
low-skilled share[b]	62	55		47	43		39	39		47	41	

[a]Total rate of change (per cent). — [b]Share of low-skilled manual and non-manual workers in total employment.

Source: OECD-DSTI (1998); own calculations.

Germany and Italy, which could be explained by the relatively low import competition from low-wage countries in this subsector. The surprisingly low changes in UK consumer electronics are probably due to the surge of Asian FDI in low-skill intensive assembling.

It has to be noted that there are level differences in the share of manual workers both between subsectors of the electrical industry and between EU countries. For example, the 1993 employment share of manual workers is relatively high in the manufacturing of electrical domestic appliances, except in the UK, but relatively low in the manufacturing of consumer electronics, except in France (Table 12). Hence, the decline of the employment share of manual workers in "other electrical industry" (section 383 excl. 3832, ISIC Rev. 2) may partly be the result of structural change in this subsector.

Table 12 — Manual workers[a] in subsectors of the electrical industry, 1993

	Germany	France	Italy	UK
Radios, TV sets and telecom. eq.	60.8	64.8*	58.4	64.2
Electric motors, generators etc.	67.2	60.8*	63.5	65.3
Electricity distribution apparatus	49.8	54.8	65.6	63.3
Electrical domestic appliances	n.a.	70.9*	80.3	65.9
Lighting equipment and lamps	68.0	62.6	69.2	67.5

[a]Share of manual workers in total employment (per cent). — *1994 figures.

Source: EUROSTAT, Industrial statistics (CD-ROM); own calculations.

From the analytical point of view it is more interesting to look at the share of low-skilled[14] manual and non-manual workers rather than at the share of all manual workers since the range of qualifications within the group of manual workers is higher than the difference between an average manual and an average non-manual worker. In France, Germany and the UK, these data show the same trend as the data analysed above (Table 11) which could lead to the conclusion that data on manual workers' share are sufficient to analyse the skill composition of the sectoral labour force. By contrast, in Italy the share of low-skilled workers increased by 4-5 percentage points. This indicates that the Italian electrical industry has shifted towards low-skilled labour intensive electrical products during the 1980s[15] which could be explained by an increasing division of labour within the EU.

The decline of the share of unskilled workers could be explained by the increasing automation in the electrical industry. However, automation is only one possible strategy to adjust to globalisation pressures. Another strategy is the change of the product mix in favour of products with higher skill requirements. Since higher skill requirements are related to higher unit value added, this alternative hypothesis can be tested by analysing relative prices. In the following, the average value of imports per metric ton[16] in per cent of the average value of exports per metric ton (relative unit value index) is employed. Accordingly, a decline of the value of this indicator could

14 Skill categories are based on the International Standard Classification of Occupations (ISCO-88) of the International Labour Office. Accordingly, low-skilled manual workers comprise 'plant and machine operators and assemblers' and 'elementary occupations', and low-skilled non-manual workers comprise 'clerks' and 'service workers and sales workers' (OECD-DSTI 1998, p. 15).

15 There seems to be an inconsistency in the data for Italy: according to the indicator used in section 2, the skill-intensity of the Italian electrical industry is relatively high and increasing compared to other Italian manufacturing industries (Figure 7), whereas employment data discussed above indicate a relatively high and increasing share of low skilled workers in the Italian electrical industry (Table 11). The relatively high productivity growth in the Italian electrical industry (Figure 2) may provide an explanation for this puzzle since it allowed for higher average wage rates although the share of unskilled workers has increased. However, data in table 11 should perhaps not be stressed to much with respect to skill shares.

16 For simplification, unit value indices have been calculated for the product group as a whole, although weighted averages of unit values for all items in product group are better indicators.

be interpreted either as stronger price competitiveness of imports[17] or as a shift of exports towards products with a relatively high value added share. Conversely, a rise of this indicator could be interpreted as a shift of exports towards products with a relatively low value added share, enabling the domestic industry to compete better with imports.

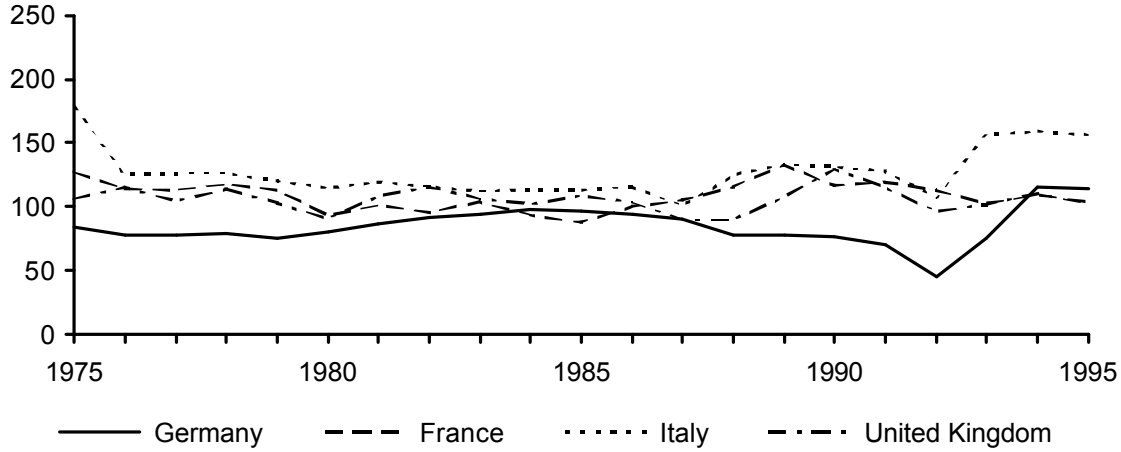
The analysis of relative import unit value indices for the subsector producing consumer electronics yields the following result: In many cases, the value of the indicator was below 100 per cent in the period 1975-1995, most clearly in the case of radios and telecommunications equipment (Figure 9). This indicates a gap between relatively cheap imports and sophisticated exports (and probably also domestic sales) in these segments. In other cases, for example in the case of TV sets, the value of the indicator was close to or above 100 per cent, indicating a similar composition of imports and exports. However, in virtually all cases the indicator showed no clear trend, contrary to the expectations that relatively cheap imports have gained in importance. The only exceptions are radios in Italy and the UK (showing a long-run decline with a cyclical upswing around 1985), sound recorders in Italy (showing a sharp decline in the early 1980s) and telecom equipment in Italy (showing a steady increase since 1985). This leads to the conclusion that import pressures have become stronger in these subsectors of the respective domestic industry in the first two cases, and that the structure of domestic production has changed towards relatively cheap products in the latter case.

Contrary to expectations, the large cyclical swing of the US$ exchange rate during the 1980s had no impact on relative import unit values although Asian exports were largely tied to the US$. This leads to the conclusion that EU producers have taken the opportunity to increase their export prices in national currency (exchange rate pass-through). However, these windfall profits in the first half of the 1980s have probably

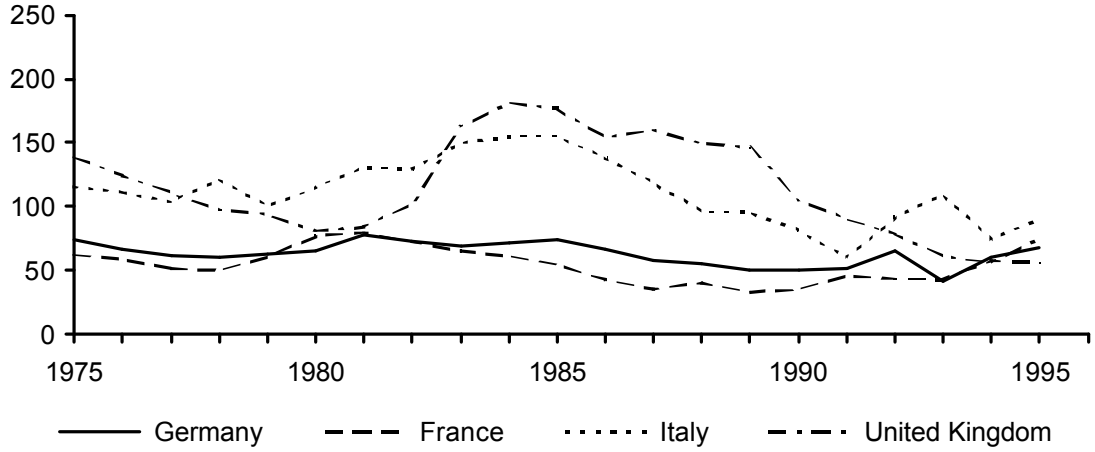
17 Here, export unit values are regarded as a proxy for domestic output prices.

Figure 9 — Relative import unit values[a] of consumer electronics, 1975–1995

Television receivers (section 761 of SITC, Rev.2)



Radio-broadcast receivers (section 762 of SITC, Rev.2)



Gramophones, sound recorders etc. (section 763 of SITC, Rev.2)

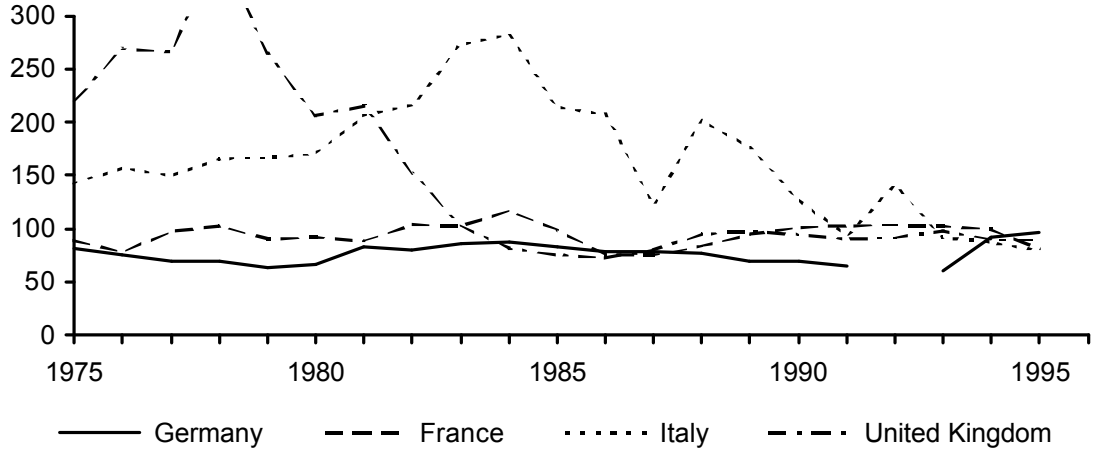
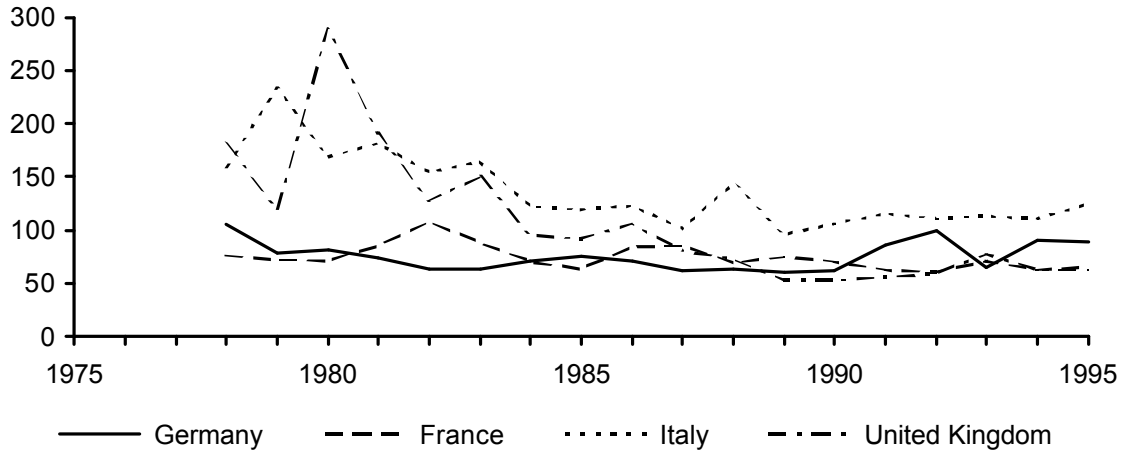
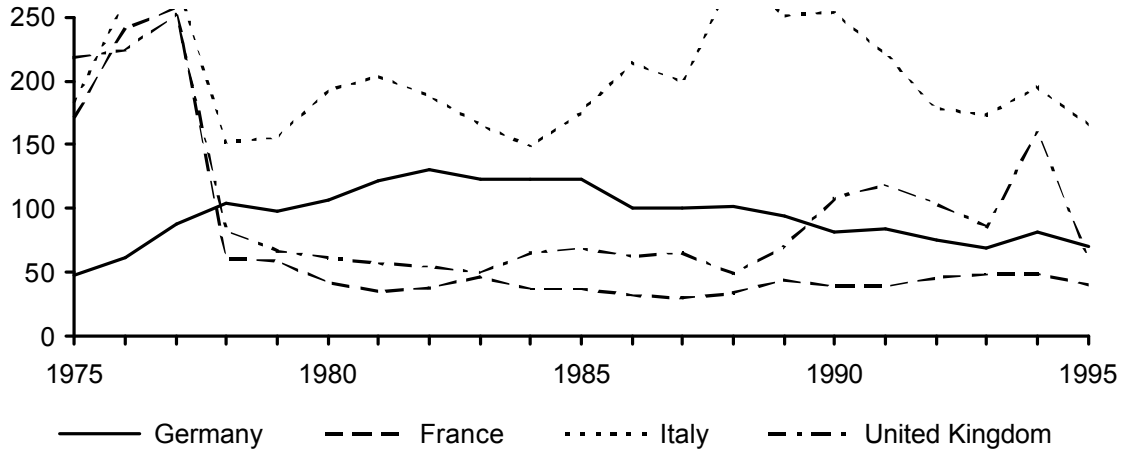


Figure 9 — continued

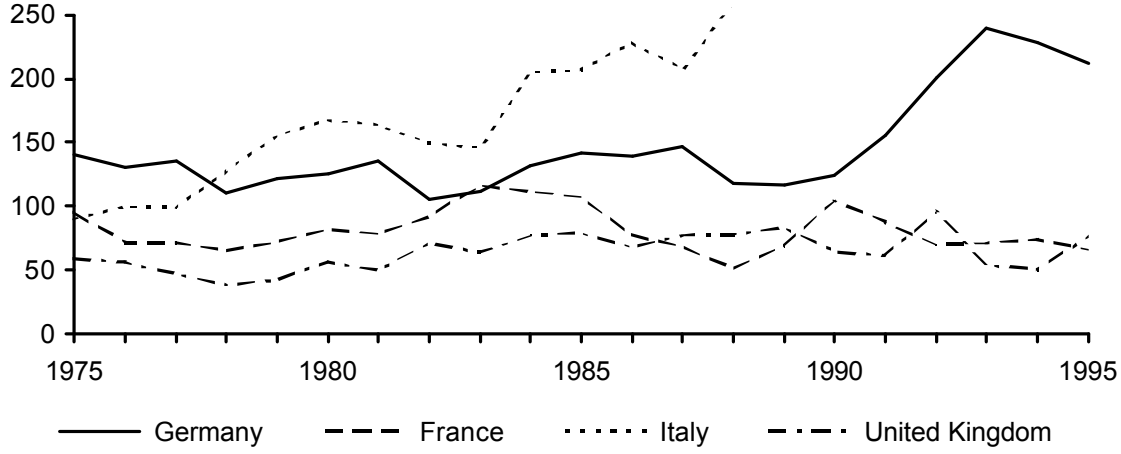
Line telephonic and telegraphic apparatus (section 7641 of SITC, Rev.2)



Parts of apparatus of division 76 (section 7649 of SITC, Rev.2)



Valves, TV tubes and parts thereof (section 776 of SITC, Rev.2)



[a]Import unit values in per cent of export unit values, based on volume figures in metric tons.

Source: OECD, ITCS; own calculations.

delayed the sectoral adjustment to globalisation pressures, leading to more intensive restructuring efforts in the second half of the 1980s when the US$ returned to its previous level.

In conclusion, the relative price changes for consumer electronics fit the development of employment and relative wages in the UK and in Italy. By contrast, the decrease of employment in France and Germany, though relatively moderate, cannot be explained by the change of relative prices. To explain this puzzle, the sectoral changes in the German electrical industry will be analysed in more detail in the next section.

A third strategy is international sourcing.[18] The production process for consumer electronics is subject to significant scale economies, deriving from fixed investment in automated assembly, tooling and testing equipment. In Japan, for instance, vertically integrated consumer electronic manufactures still have to sell part of their components on the open market to reach the minimum efficient scale. Since components make up a large part of the production costs, international sourcing of components and globalisation of assembly are prominent in the consumer electronics industry (cf. Table 13). Labour cost is quite important at the low end of the market in the assembly stage but it is becoming increasing less so due to automation. Noteworthy is the trend towards reducing the number of parts and components, thanks to the greater integration of functions into single components and to miniaturisation, thus increasing productivity in the assembly phase. This could be a motive to keep the assembly phase within high-income countries. Firm level evidence from Europe suggests that international sourcing is not a one-way street towards low-income countries (Jungnickel 1990). Whereas there was a clear trend in the 1970s and early 1980s to shift the production of components and even the assembling to East Asia, anecdotal evidence suggests that this trend has slowed down in the 1990s (Beviglia Zampetti 1996). Political developments have contributed to this development: EU protectionism against imports from Asia, leading to 'defensive investments' of Asian

18 The following builds on Beviglia Zampetti (1996), Bowen (1991) and Cawson/Holmes (1991).

firms, and the opening-up of the former centrally planned economies in Central and Eastern Europe.

Table 13 — Imports of intermediate inputs[a] in the electrical industry, 1995

	France	Germany	Italy	UK	USA	Japan
Electronics (ISIC 3832)	19.9	} 16.6	15.4	29.2	9.6	} 23.7
Other electrical industry	20.8		31.6	33.2	16.1	

[a]Share of imported intermediate inputs in total sectoral intermediate consumption (per cent).

Source: Hatzichronoglu (1999).

A fourth strategy is increased research and development, both in product and in process innovations. The intensity of research and development is usually measured by expenditures for research and development (R&D) as share of value added (R&D intensity). This indicator yields that R&D efforts in the electrical industry have decreased between 1985 and 1993 in the UK, stagnated in Italy, and increased in Germany and France (Table 14). This helps to understand the relatively good performance of the French and German industry and the relatively weak performance of the UK industry. Moreover, some notable differences between EU countries are revealed. For instance, the consumer electronics subsector is significantly less R&D intensive in Italy and the remaining electrical industry is significantly more R&D intensive in the UK, compared to the respective subsector in other EU countries.

In summary, the share of unskilled workers in the electrical industry's labour force has declined significantly during the last two decades at almost the same rate as the average of all manufacturing industries. The direct effect of increased import competition from low-wage countries (i.e., specialisation on other industries) seems to be small, since the weight of the EU electrical industry within the manufacturing sector has remained stable and export ratios have increased in the same order as import penetration ratios, indicating the importance of intra-industry trade. However, other adjustment strategies indirectly induced by globalisation pressures pressures probably

had a large skill bias. Long-run trends in international outsourcing, investment in machinery and R&D activities are broadly in line with the observed trends in employment by skill. By contrast, there is little evidence for a skill bias of changes in the product mix.

Table 14 — R&D intensity[a] in the electrical industry (per cent), 1985 and 1993

	France	Germany	Italy	UK
Radio, TV, telecom. equipment (section 32[b], ISIC Rev. 3)				
1985	22.1	22.8	10.1	20.1
1993	23.5	25.7	9.8	11.1
Other electrical products (section 31[c], ISIC Rev. 3)				
1985	3.0	3.8	2.3	5.8
1993	3.1	3.6	2.0	6.3
Memo: total manufacturing				
1985	2.3	2.5	1.1	2.3
1993	2.9	2.9	1.3	2.3

[a]Expenditures for research and development in per cent of value added (based on data in current prices). — [b]Corresponds to section 3832 of ISIC (Rev. 2) less electro-medical apparatus and recorded media (records, tapes etc.). — [c]Corresponds to section 383 excl. 3832 of ISIC (Rev. 2) less electrical household appliances comprised in section 3833.

Source: EUROSTAT, Industrial Statistics (CD-ROM); own calculations.

5. The case of Germany

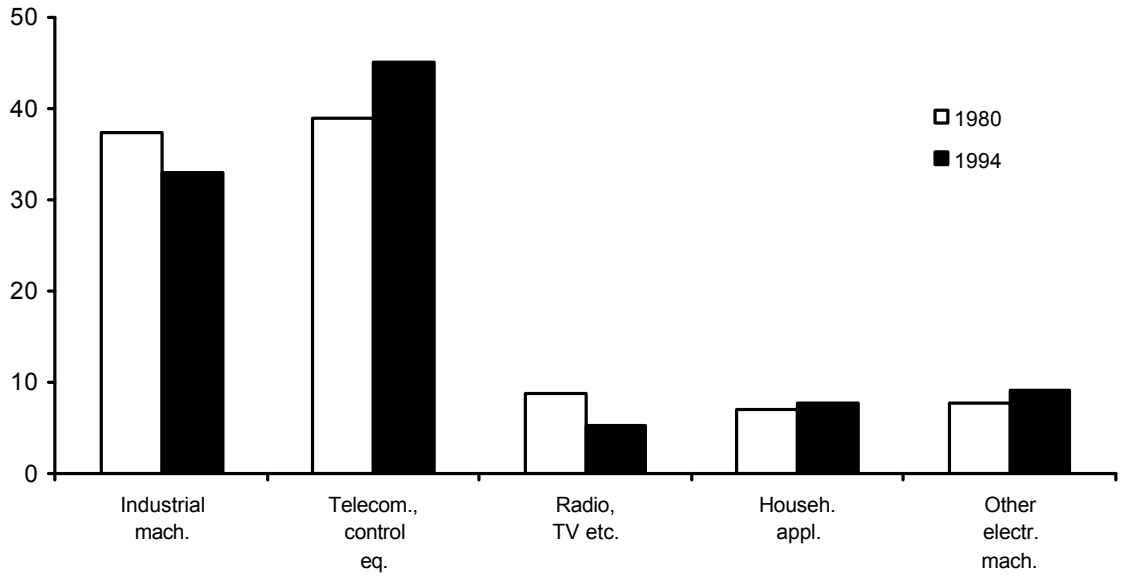
The production of telecommunications equipment[19] and the production of electrical industrial machinery are the two largest subsectors, accounting for about 45 per cent and 35 per cent respectively, of 1994 value added in the electrical industry and about the same shares in total employment. The remaining share is almost equally

19 In German industrial statistics, this subsector includes the manufacturing of electrical measuring and controlling equipment (ex ISIC 3851). Hence, German data are not strictly comparable to data for other countries.

distributed among the production of consumer electronics (radios, TV, etc.), household appliances and other electrical products.

The weight of these subsectors has changed significantly during the period 1980 to 1994. The shares of industrial machinery and consumer electronics in value added (Figure 10) and employment (Figure 11) decreased by about 5 percentage points each, and those of telecommunications and other electronic equipment increased by about 10 percentage points. However, the latter is only due to an employment increase in the production of high-tech products like electro-medical equipment, measuring and control apparatus, and electric equipment for cars.

Figure 10 — Value added share[a] of subsectors of the German electrical industry



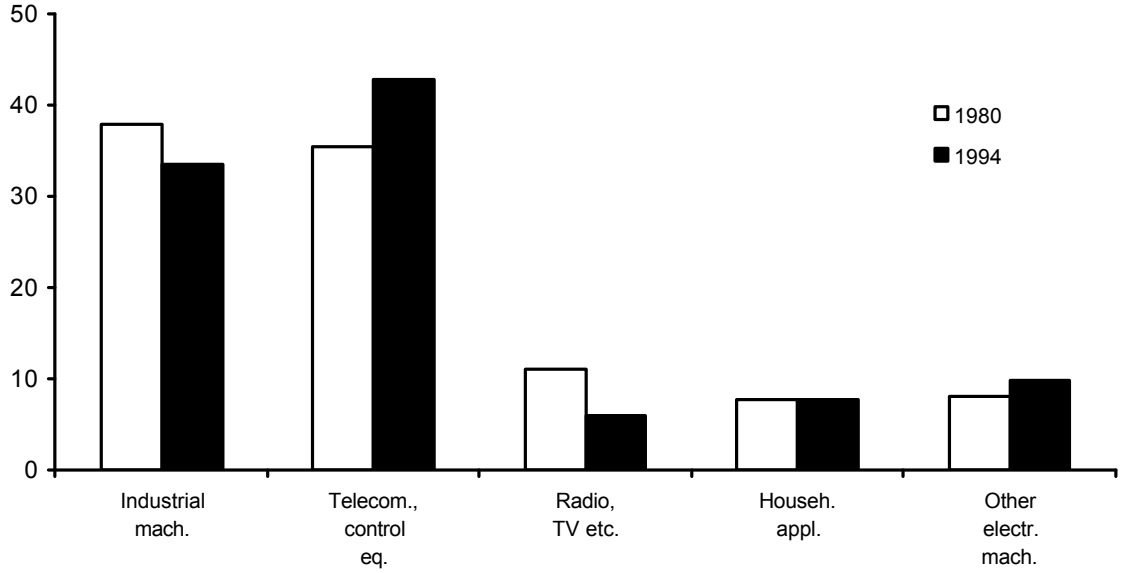
[a]Share in net value added of total electrical industry (per cent).

Source: Statistisches Bundesamt; own calculations.

This structural change can be related to the relative factor intensities of these subsectors. The production of telecommunications and other electronic equipment has always been skill intensive relative to the total electrical industry, and this ratio has even increased during the observation period (Figure 12). The skill intensity of the production of consumer electronics is still below the average even though there was a significant catching-up. This can probably be explained by the relatively low-skilled

labour intensive assembling process in this subsector, which has become increasingly automated. By contrast, the skill intensity of the production of industrial machinery has decreased to below the average level for the total electrical industry.

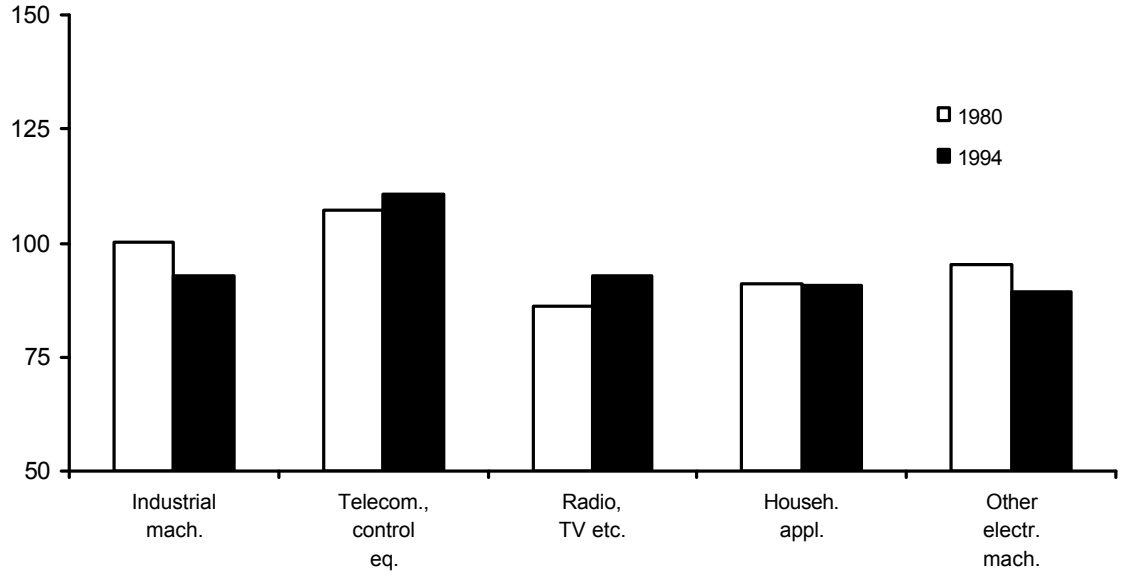
Figure 11 — Employment share[a] of subsectors of the German electrical industry



[a]Share in employment of total electrical industry (per cent).

Source: Statistisches Bundesamt; own calculations.

Figure 12 — Skill intensity[a] of subsectors of the German electrical industry

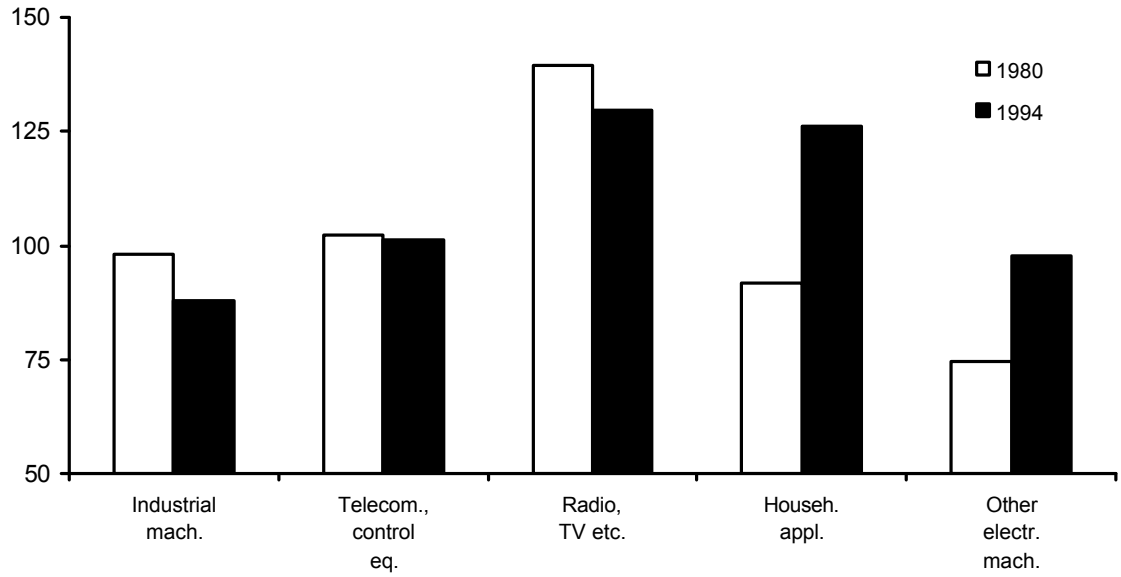


[a]Average labour cost per employee, relative to total electrical industry (per cent).

Source: Statistisches Bundesamt; own calculations.

Still, the variance of skill intensities across sectors is relatively narrow with a range of about +/- 10 per cent around the average for the electrical industry. This range is significantly larger for the physical capital intensity across subsectors (Figure 13). Like for the skill intensity, industrial machinery has fallen back behind the average level of the electrical industry if ranked by investment per worker, and telecommunications and other electronic equipment was always slightly above the average level. The production of consumer electronics, however, is still the most capital intensive subsector, although the gap to the production of household appliances has narrowed since 1980.

Figure 13 — Capital intensity[a] of subsectors of the German electrical industry



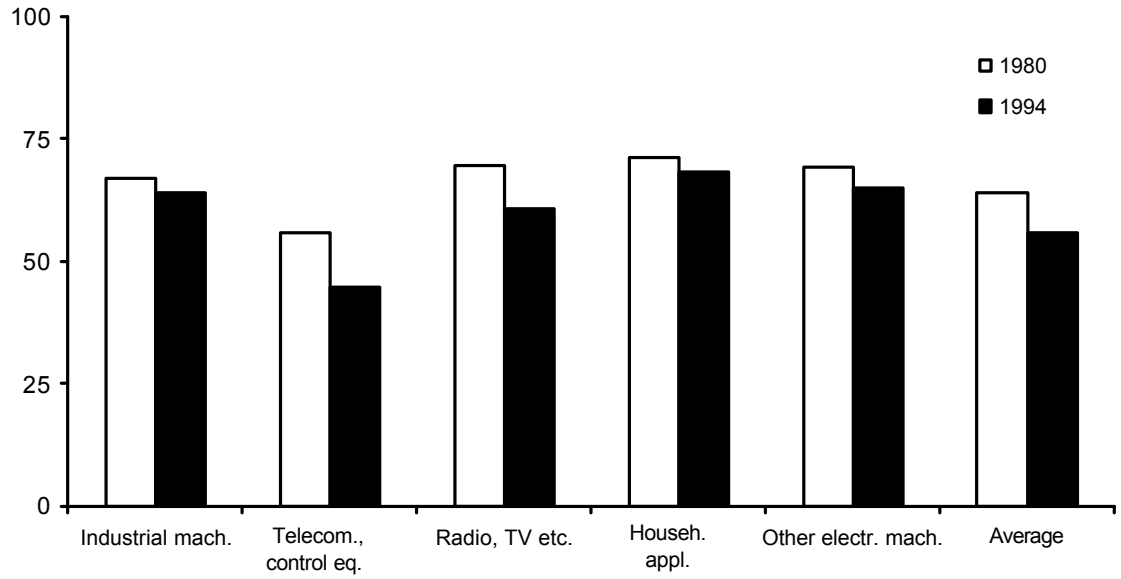
[a]Investment per employee, relative to total electrical industry (per cent).

Source: Statistisches Bundesamt; own calculations.

With respect to skill categories of workers, a clear bias against manual workers prevailed in all subsectors of the electrical industry during the period 1980 to 1994. In terms of employment, this decline was strongest in telecommunications and other electronic equipment and consumer electronics which is already reflected in the indicator for the relative skill intensity whereas it was only moderate in the other subsectors (Figure 14). In terms of relative wages of the two categories, however, a

different picture emerges (Figure 15). The wage of manual workers relative to that of non-manual workers decreased in all subsectors, except for the production of consumer electronics. This supports the hypothesis that process innovations in this subsector have led to relatively higher productivity growth of manual workers.

Figure 14 — Employment structure[a] of subsectors of German electrical industry



[a]Share of manual workers in total employment (per cent).

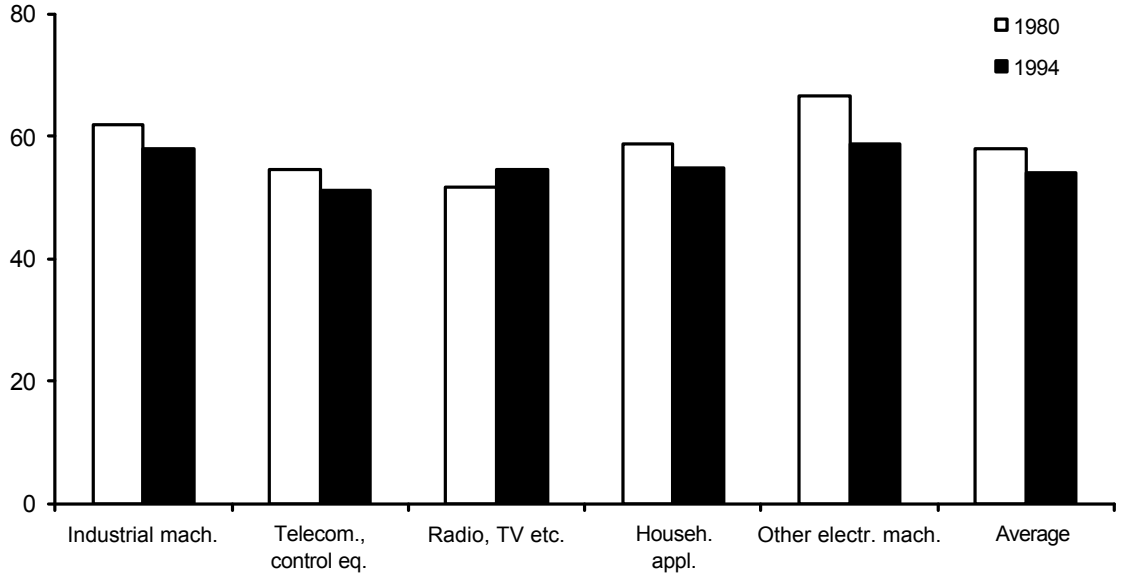
Source: Statistisches Bundesamt; own calculations.

The analysis of price trends by subcategories of electrical products provides a tentative answer to the question whether the relative decline of the economic position of the less-skilled workers can be traced back to an increase of the competitiveness of imports. Aggregate price indices[20] lend support to the previous assumption that export prices may be used as a proxy for domestic producer prices (Figure 16). With respect to the relative price of foreign and domestic goods, the sharp decline of relative import prices in the mid 1980s is surprising at first sight. However, the cyclical movements of the US$ exchange rate between 1980 and 1987 provides an explanation: to the extent that the US$ has appreciated, import prices have increased relative to domestic prices and vice versa, i.e., there was a strong exchange rate pass-

20 Note that Figure 16 shows 'true' price indices, in contrast to unit value indices in other sections.

through. If one disregards this period, there was a steady decrease of import prices relative to domestic prices by an average annual rate of almost 1 per cent in the period 1975 to 1994.

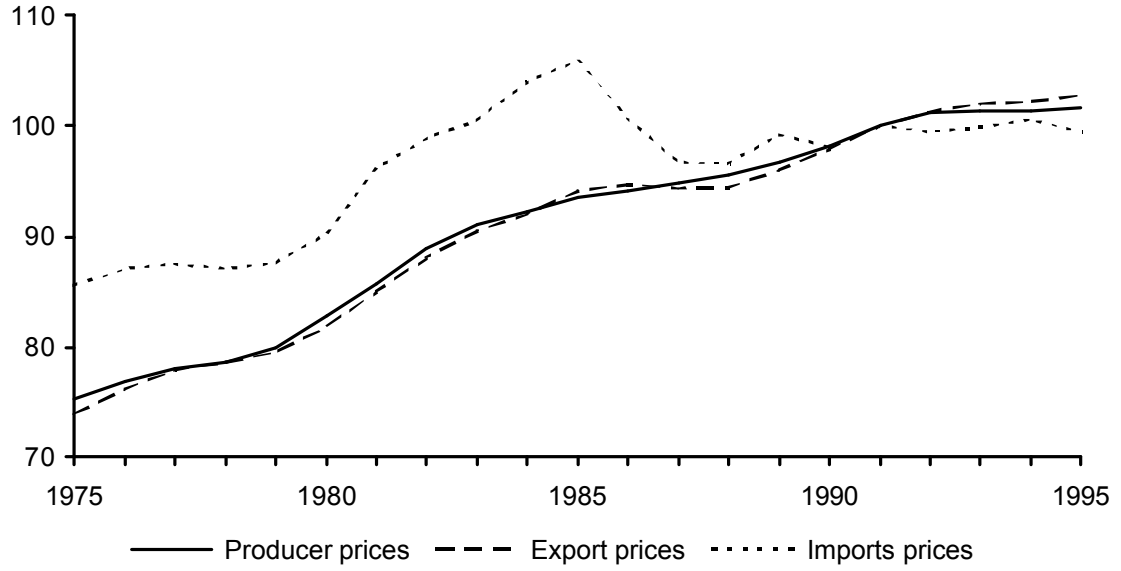
Figure 15 — Relative labour cost of manual workers[a] in the German electrical industry



[a]Average labour cost of manual relative to non-manual workers (per cent).

Source: Statistisches Bundesamt; own calculations.

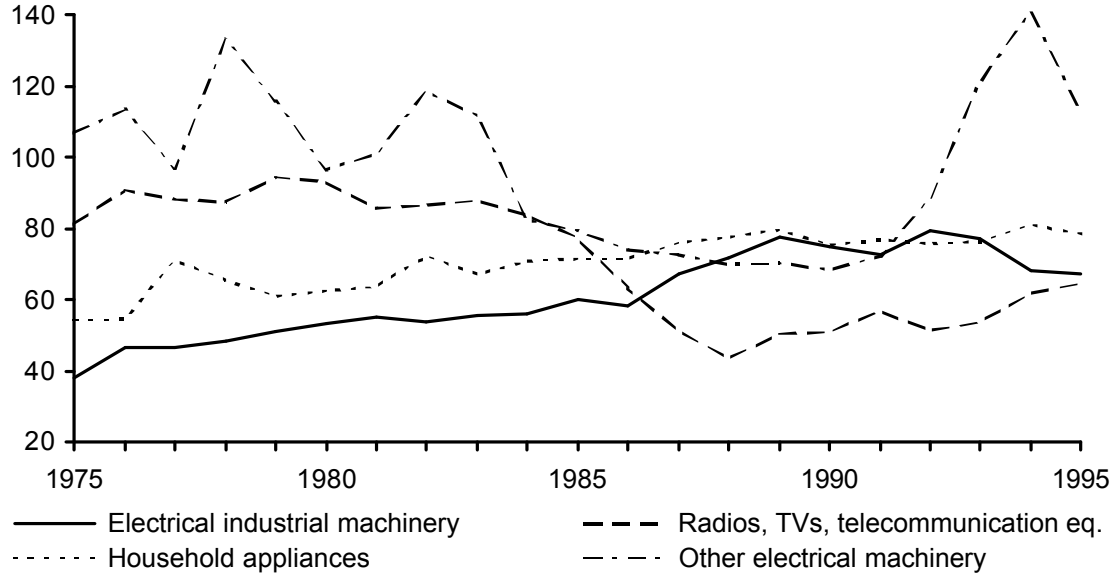
Figure 16 — Price indices[a] for the German electrical industry, 1975–1994



[a]Aggregate price indices (1991 = 100).

Source: Statistisches Bundesamt; own calculations.

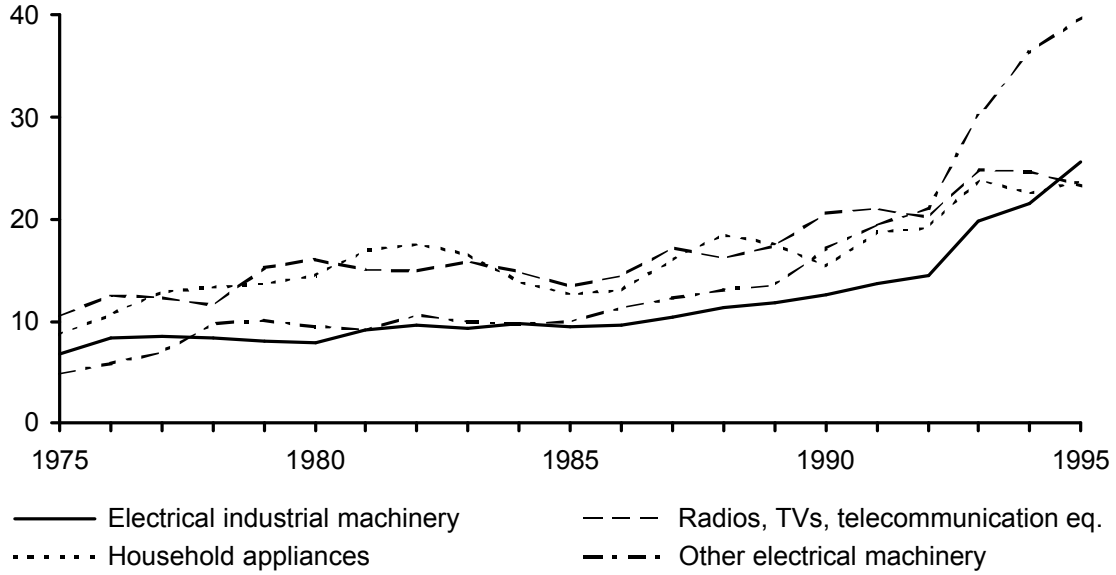
Figure 17 — Relative unit values[a] of German imports of electrical products, 1975–1995



[a]Unit value of imports (by ISIC sections) from non-OECD relative to OECD countries (per cent)

Source: CEPS database, derived from OECD, ITCS; own calculations.

Figure 18 — Non-OECD share[a] in German imports of electrical products, 1975–1995



[a]Share of imports (by ISIC sections) from non-OECD countries in total value of imports (per cent).

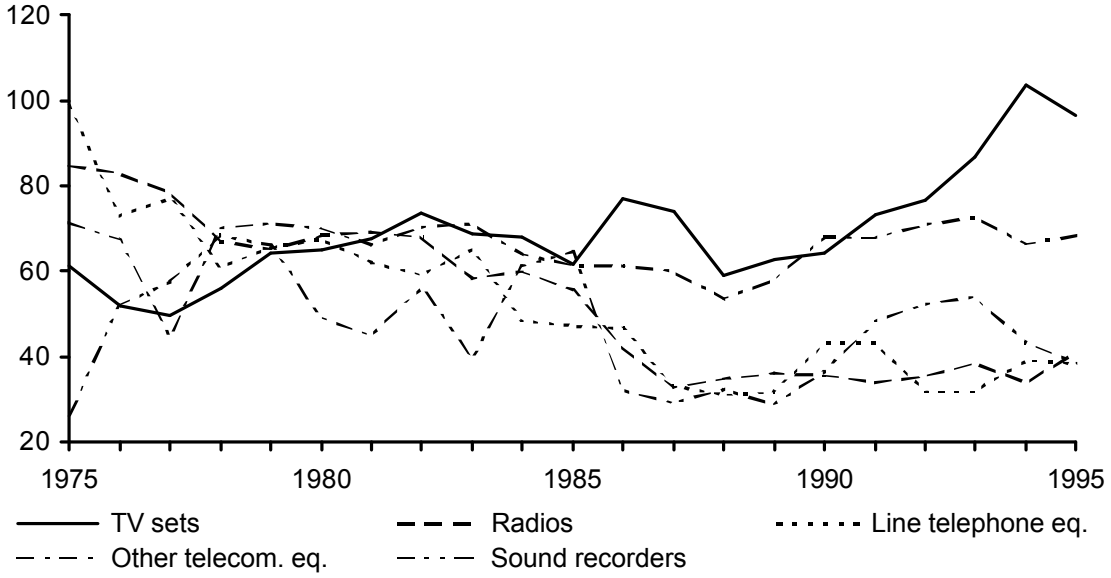
Source: CEPS database, derived from OECD, ITCS; own calculations.

A first look at broad subsectors shows that this relative price decrease took place only in the case of consumer electronics. Unit values of imports from non-OECD countries (taken as a proxy for low-wage countries) slightly increased relative to those of imports from OECD countries (taken as a proxy for countries with factor endowments similar to Germany) in the case of electrical industrial machinery and even in the case of electric household appliances (Figure 17). However, this is not in contrast to the relatively high skilled-labour intensity of consumer electronics since this subsector is a relatively heterogeneous aggregate. By contrast, the value share of imports from non-OECD countries increased for all subsectors (Figure 18).

A closer look at different products manufactured within the consumer electronics industry confirms this presumption (Figure 19). Relative unit values of imports from non-OECD countries declined significantly in the case of radios, sound recorders and line telephone equipment whereas they were stable in the case of other telecommunication equipment and increased in the case of TV sets. However, the share of imports from non-OECD countries in total imports increased in all three segments (Figure 20). A priori, these broad trends may be interpreted as improved price competitiveness of non-OECD countries' exports in the first group, and as quality upgrading of non-OECD producers and/or improved price competitiveness of OECD producers in the third group of products. This presumption is confirmed by the fact that the share of intra-EU trade is relatively high in the third group.

Changes in the product mix is not the only possible adjustment strategy. With respect to relocation of production, anecdotal evidence is provided by the results of a recent sample survey in the German electrical industry, based on about 300 questionnaires (Dichtl and Hardock, 1997). Accordingly, firms which are considering the relocation of parts of their production are mainly oriented towards Central and Eastern Europe. Whereas the main motive for FDI in North America and East Asia is production for local markets, export of final products to Germany was the main motive

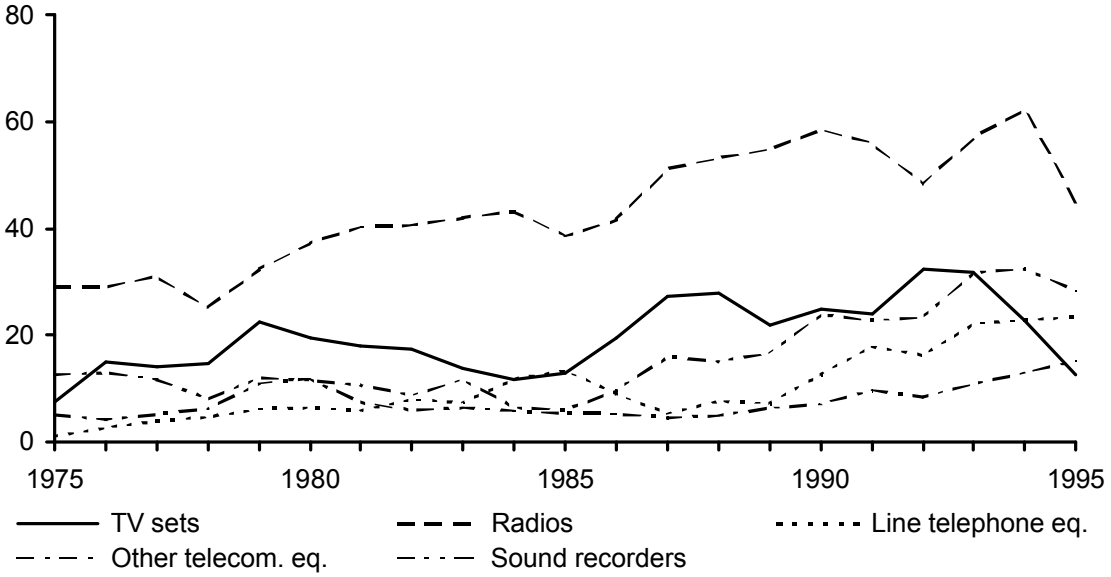
Figure 19 — Relative unit values[a] of German imports of consumer electronics, 1975–1995



[a]Unit value of imports (by SITC sections) from non-OECD relative to OECD countries (per cent).

Source: CEPS database, derived from OECD, ITCS; own calculations.

Figure 20 — Non-OECD share[a] in German imports of consumer electronics, 1975–1995



[a]Share of imports (by SITC sections) from non-OECD countries in total value of imports (per cent).

Source: CEPS database, derived from OECD, ITCS; own calculations.

only for FDI in Central and Eastern Europe. Surprisingly, the most attractive region for engagement are the USA, closely followed by the Czech Republic. When asked whether

they expect a negative effect of their investment abroad on domestic employment, only about half of the interviewed firms answered with "yes". According to the same source, quality improvement and process innovations ranked even higher in the priority list of German producers. This finding confirms the above hypothesis that investment in machinery and R&D has been more important as an explanatory factor for the decline of the share of low-skilled workers than globalisation pressures.

However, differences in globalisation pressures and adjustment strategies which are likely to be significant across subsectors are not described in surveys like the one cited above which provides only summary statistics. Therefore, only stylised facts about adjustment strategies for subsectors of the German electrical industry can be provided[21]:

- Consumer electronics: under pressure

Management problems, especially in mature family-owned firms which have been typical for the German consumer electronics industry, led to significant downsizing and take-overs by foreign conglomerates in the 1970s and 1980s (e.g., Nordmende and Telefunken by Thomson, Grundig by Philips). Outsourcing of parts of the production has been prominent since the 1970s but the scope and the direction of these activities has changed. Recently, facilities have been relocated from Asia to Central and Eastern Europe or even – with automated assembly lines – back to Germany. A large share of the office machinery subsector disappeared due to the failure of the large conglomerate AEG and its subsidiary Olympia, although AEG had once been famous for its important world-wide innovations in the early and mid-20th century.

- Measuring and controlling devices, car electronics: successful specialisation

21 The following builds on Berger (1993).

This subsector providing capital goods and intermediate inputs is closely linked to developments in other manufacturing industries. On the one hand, this has led to strong business cycles in output and employment of the subsector. On the other hand, the subsector was able to gain from close supplier-customer-relationships, e.g., in the form of technological spill-overs. In addition, R&D efforts are relatively high and increasing in the this subsector. In contrast to other sectors, outsourcing has never been a top priority in the subsector.

- Household appliances and telecommunications equipment: mixed evidence

Typical for the first subsector are product innovations, leading to high quality standards (e.g. energy efficiency), especially in large appliances like refrigerators and washing machines[22]. By contrast, world market shares are decreasing in the low-tech segment of smaller household appliances. Until recently, the second subsector gained from a close producer-customer relationship due to the regulation of European telecom service providers which led to a quasi-monopoly status of some suppliers. These relationships disappeared after the deregulation of telecom services, causing adjustment problems for established producers. The major producer of line telephones (Siemens) maintained its competitiveness only through significant changes in its production structure. However, new suppliers with high market potential are emerging, e.g., in the production of cellular phones and internet infrastructure.

In summary, the relatively favourable development of the German electrical industry is due to the large share of relatively high-skill labour intensive subsectors (industrial electrical machinery, telecommunications and other electronic equipment). Other subsectors experienced significant downsizing of their activities. The share of low-skilled workers decreased in all subsectors. However, the direct effect of increased import competition from low-wage countries (i.e., specialisation on other segments) apparently was significant only in the consumer electronics subsector. In

22 In German industrial statistics, electrical and non-electrical household appliances are comprised in the same subsector, in contrast to the ISIC (Rev. 2) classification system (see Table 1).

the other subsectors, investment in machinery and in R&D probably had the largest impact.

6. Conclusions

Globalisation in the electrical industry has led to significant shifts of the locational pattern of production and trade during the last two decades, mostly in favour of East Asian suppliers. However, the aggregate electrical industry still grew relative to other manufacturing industries in terms of output and employment. The decline of the aggregate price index for electrical products relative to the average manufactures price index is not in contrast to this development because it is largely caused by relatively high total factor productivity growth in the electrical industry. Moreover, the increasing inflows of FDI from non-European countries shows that the EU is still an attractive location for the production of electrical industry. Hence, the aggregate electrical industry can be regarded as a case for relative successful adjustment to globalisation pressures which is in line with the high skill-intensity.

In absolute terms, employment decreased significantly only in the UK. In addition, the share of unskilled workers in the electrical industry's labour force has declined significantly during the last two decades at almost the same rate as the average of all manufacturing industries. The direct effect of increased import competition from low-wage countries (i.e., specialisation on other industries) seems to be small, except for the consumer electronics segment. Moreover, export ratios have increased in the same order as import penetration ratios, indicating the importance of intra-industry trade. However, other adjustment strategies which were indirectly induced by globalisation pressures probably had a large skill bias, basically as a result of capital-skill complementarity. Long-run trends in international outsourcing, investment in machinery and R&D activities are broadly in line with the observed trends in employment by skill. By contrast, there is little evidence for a skill bias of changes in the product mix. Although shifts to products with relatively high unit value added occurred in some subsegments, these product innovations have not necessarily led to a decrease of the demand for low-skilled workers.

Statistical sources

Deutsche Bundesbank: Kapitalverflechtung mit dem Ausland (various issues).

EUROSTAT: Earnings in industry and services (various issues).

EUROSTAT: Industrial statistics (CD-ROM).

Hong Kong Census and Statistics Department: Annual review of external trade.

Japan Ministry of Finance: Japan's investment abroad (various issues).

OECD: International direct investment statistics yearbook(various issues).

OECD-DSTI: OECD data on skills: employment by industry and occupation. Working Paper 1998/4. OECD Directorate for Science, Technology and Industry. Paris.

OECD, ISDB: International sectoral database (CD-ROM).

OECD, ISIS: Industrial structure statistics (CD-ROM).

OECD, ITCS: International trade by commodities statistics (CD-ROM).

OECD, STAN: Structural analysis industrial database (CD-ROM).

Statistisches Bundesamt: Fachserie 4, Produzierendes Gewerbe (various issues); Fachserie 17, Preisstatistik (various issues).

Taiwan Statistical Department: The trade of China (Taiwan district) 1980.

UN: International trade statistics yearbook (various issues).

UNCTAD: Handbook of international trade and development statistics 1996/1997.

UNIDO, IYIS: International yearbook of industrial statistics 1997.

UNIDO: Industrial statistics (CD-ROM).

US Department of Commerce: U.S. direct investment abroad (various issues).

References

Baumol, William (1967). Macroeconomics of unbalanced growth - The anatomy of urban crisis. American Economic Review 57 (3), pp. 415–426.

Berger, Manfred (1993). Elektroindustrie – Strukturwandlungen und Entwicklungsperspektiven. Ifo Schriftenreihe "Struktur und Wachstum", 47. Berlin.

Beviglia Zampetti, Americo (1996). Globalization in the consumer electronics industry. In: OECD, Globalization of industry – Overview and sector reports. Paris (pp. 207–250).

Bowen, Harry P. (1991). Consumer electronics. In: Mayes (ed.) (pp. 255–268).

Cawson, Alan, Peter Holmes (1991). The new consumer electronics. In: Freeman et al. (eds.) (pp. 169–182).

Dichtl, Erwin, Petra Hardock (1997). Auslandsfertigung und Produktionsverlagerung von Unternehmen der Elektrotechnik- und Elektronikindustrie - Ergebnisse einer empirischen Studie. Arbeitspapiere des Instituts für Marketing, Nr. 123. Universität Mannheim.

Dicken, Peter (1998). Global shift - Transforming the world economy (third edition). London.

Freeman, Christopher, Margaret Sharp and William Walker (eds.) (1991). Technology and the future of Europe - Global competition and the environment in the 1990s. London, New York.

GATT Secretariat (1993). Trade policy review European Communities 1993, Vol. I. Geneva 1993.

Hatzichronoglu, Thomas (1999). The globalization of industry in the OECD countries. OECD-DSTI Working Paper, 1999/2. Paris.

Heitger, Bernhard, Klaus Schrader and Jürgen Stehn (1999). Handel, Technologie und Beschäftigung. Kieler Studien, 298. Tübingen.

Jungnickel, Rolf (1990). Neue Technologien und Produktionsverlagerung. Hamburg.

International Labour Organisation (ILO) (1998). Impact of flexible labour market arrangements in the machinery, electrical and electronic industries. Geneva.

Line, Richard (1990). The international electronics industry. Economist Intelligence Unit, Special Report No. 2050. London.

Mayes, David G. (ed.) (1991). The European challenge - Industry's response to the 1992 programme. London, New York.

Savary, Juline (1996). Thomson consumer electronics - From national champion to global contender. In: Jan-Evert Nilsson, Peter Dicken and Jamie Peck (eds.), The internationalisation process - European firms in global competition. London.

Schultz, Siegfried (1995). Auslandsinvestitionen ostasiatischer Länder in Europa und in der Bundesrepublik Deutschland. DIW Beiträge zur Strukturforschung, 160. Berlin.

UNCTAD (1996). Sharing Asia's dynamism - Asian direct investment in the European Union. New York and Geneva.

Weiss, Frank Dietmar (1978). Electrical engineering in West Germany - Adjusting to imports from less developed countries. Kieler Studien, 155. Tübingen.

World Trade Organisation (WTO) (1997). Trade policy review European Union 1997, Vol. I. Geneva.

Appendix: Statistical tables

Table 1 — Major indicators of the EU electrical industry[a]

	Employment 1990 (1,000)	Value added 1990 (bill. US$)	Exports[b] 1991 (bill. US$)	Imports[b] 1991 (bill. US$)
EU				
Office machinery	0.3 mill.	20.8	45.6 (13.3)	62.8 (32.1)
Radio, TV, telecom.	1.3 mill.	67.8	57.8 (24.8)	75.0 (39.8)
Other electr. prod.	1.7 mill.	64.1	75.7 (30.2)	85.9 (32.1)
France				
Office machinery	58.1	6.3	6.2 (2.0)	9.9 (3.7)
Radio, TV, telecom.	197.9	11.9	9.2 (4.3)	12.3 (5.6)
Other electr. prod.	281.9	13.9	10.3 (4.4)	10.6 (3.1)
Germany				
Office machinery	102.0	7.1	8.8 (3.5)	15.5 (9.4)
Radio, TV, telecom.	516.5	33.0	21.8 (9.4)	19.3 (12.2)
Other electr. prod.	729.5	27.3	27.4 (13.4)	15.5 (7.7)
Italy				
Office machinery	29.8	2.4	5.8 (1.2)	5.2 (1.8)
Radio, TV, telecom.	67.9	7.2	4.8 (2.2)	11.3 (4.7)
Other electr. prod.	259.7	10.7	10.4 (3.7)	6.6 (0.6)
Netherlands				
Office machinery	4.8	0.3	5.7 (1.0)	7.2 (3.6)
Radio, TV, telecom.	106.3	5.5	5.2 (1.2)	6.4 (2.9)
Other electr. prod.	7.7	0.4	9.1 (2.1)	11.4 (4.2)
UK				
Office machinery	66.5	4.4	10.4 (4.0)	15.5 (8.1)
Radio, TV, telecom.	288.5	8.8	11.6 (5.5)	16.0 (9.8)
Other electr. prod.	322.6	8.5	7.5 (3.6)	26.2 (11.3)

[a]ISIC 3825 (office machinery), ISIC 3832 (Radio, TV, telecommunication equipment and ISIC 383 excl. 3832 (Other electrical products). — [b]Extra-EU trade in parentheses.

Source: OECD, STAN database; GATT Secretariat (1993) for trade figures.

Table 2 — Employment[a] in the EU electrical industry (ISIC 383), 1970-1994

	1970	1978	1986	1994
Austria	64	74	79	74
Belgium	123	85	71	n.a.
Denmark	33	25	28	26
Finland	22	29	32	28
France	455	528	484	421
Germany	1,095	915	959	942
Greece	13	18	15	12
Ireland	10	12	18	n.a.
Italy	227	336	272	228
Netherlands	128	111	117	85
Portugal	23	29	29	46
Spain	119	171	107	104
Sweden	71	79	71	54
UK	746	658	546	332
EU 15	3,130	3,070	2,830	2,430[b]

[a]In 1,000. — [b]Partially estimated.

Source: OECD, Industrial structure statistics; UNIDO, Industrial statistics (CD-ROM).

Table 3 — Major exporters and importers of consumer electronics (ISIC 3832), 1980

	Exports (bill. US$)			Imports (bill. US$)		
	TV sets, radios, record players	Telecom. equipment and parts	TV tubes, semiconductors etc.	TV sets, radios, record players	Telecom. equipment and parts	TV tubes, semiconductors etc.
SITC Rev.2	761-763	764	776	761-763	764	776
World	17.2	17.8	14.2	17.3	15.9	15.6
USA	2.00	2.75	4.06	3.74	3.21	3.65
Japan	8.45	3.77	2.31	0.12	0.29	0.71
EU 10	3.66	7.52	3.73	6.17	5.05	5.27
- *France*	*0.18*	*1.15*	*0.75*	*1.00*	*0.78*	*0.94*
- *Germany*	*1.64*	*2.22*	*1.22*	*1.71*	*1.20*	*1.81*
- *Italy*	*0.25*	*0.60*	*0.33*	*0.86*	*0.59*	*0.73*
- *NL*	*0.40*	*1.27*	*0.56*	*0.79*	*0.74*	*0.50*
- *UK*	*0.42*	*1.24*	*0.68*	*1.14*	*0.78*	*0.86*
Hong Kong	1.04	0.22	0.58	0.49	0.40	0.70
Singapore	1.00	0.36	1.19	0.46	0.37	1.18
Taiwan	*1.24*	*0.80*	*0.43*	*0.06*	*0.44*	*0.50*
Korea	0.84	0.25	0.52	0.14	0.32	0.53
Thailand					0.10	
Malaysia	0.05	0.05	1.05	0.13	0.18	
China						
Mexico		0.16	0.03	0.26	0.21	0.12
Brazil	0.09	0.04	0.06	0.02	0.08	0.27

Source: UN, International trade statistics yearbook 1982; Taiwan Statistical Department, The trade of China (Taiwan district) 1980.

Table 4 — Major exporters and importers of consumer electronics (ISIC 3832), 1995

	Exports (bill. US$)			Imports (bill. US$)		
	TV sets, radios, record players	Telecom. equipment and parts	TV tubes, semiconductors etc.	TV sets, radios, record players	Telecom. equipment and parts	TV tubes, semiconductors etc.
SITC Rev.2	761-763	764	776	761-763	764	776
World	66.0	118.5	180.0	45.3	119.0	179.4
USA	2.5	17.8	35.7	16.4	18.6	41.0
Japan	10.1	18.2	40.8	3.3	5.8	12.3
EU 15	12.7	41.1	32.5	19.0	32.7	38.0
- *France*	*1.7*	*4.6*	*5.6*	*2.8*	*3.6*	*5.2*
- *Germany*	*2.6*	*8.6*	*8.0*	*5.0*	*7.2*	*9.8*
- *Italy*	*0.8*	*2.1*	*2.7*	*1.6*	*2.7*	*4.4*
- *NL*	*1.1*	*2.0*	*4.0*	*1.9*	*2.3*	*2.9*
- *UK*	*2.6*	*7.4*	*8.0*	*2.7*	*7.2*	*7.9*
Hong Kong	7.7*	9.1*	7.6*	8.6*	10.3*	12.5*
Singapore	6.1	6.9	18.4	3.2	6.0	21.4
Taiwan	*2.4*	*3.7*	*7.4*			
Korea	4.7	4.2	19.4	0.4	2.7	9.8
Thailand	1.5	1.5	2.9	0.4	2.0	5.0
Malaysia	8.5	3.8	13.2	0.3	3.6	15.5
China	4.4	4.0	1.3	0.7	6.9	3.9
Mexico	4.6	3.0	1.1	1.3	1.9	4.5
Brazil	0.3	0.1	0.1	0.4	1.8	1.3

*Including re-exports and imports for re-exports respectively.

Source: UN, International trade statistics yearbook 1996. Figures for Taiwan are average 1994-1995 values, taken from UNCTAD, Handbook of international trade and development statistics 1996/1997.

Table 5 — Major exporters and importers of industrial electrical mach. (ISIC 3831), 1980

	Exports (bill. US$)			Imports (bill. US$)		
	Electrical motors	Electric power mach.	Switches, relays etc.	Electrical motors	Electric power mach.	Switches, relays etc.
SITC Rev.2	716	771	772	716	771	772
World	6.4	3.3	13.1	7.6	3.3	13.2
USA	1.19	0.32	1.78	0.45	0.41	1.16
Japan	0.92	0.59	1.63	0.12	0.11	0.28
EU 10	3.20	1.66	6.99	1.92	1.03	4.66
- *France*	*0.66*	*0.29*	*1.47*	*0.33*	*0.16*	*0.82*
- *Germany*	*1.05*	*0.68*	*3.00*	*0.53*	*0.29*	*1.25*
- *Italy*	*0.30*	*0.14*	*0.59*	*0.30*	*0.11*	*0.60*
- *NL*	*0.11*	*0.12*	*0.41*	*0.21*	*0.15*	*0.56*
- *UK*	*0.68*	*0.22*	*1.02*	*0.24*	*0.14*	*0.71*
Hong Kong	0.03	0.05	0.07	0.04	0.06	0.16
Singapore	0.07	0.03	0.19	0.11	0.10	0.27
Taiwan	*0.09*	*0.08*	*0.11*	*0.51*	*0.05*	*0.24*
Korea	0.02	0.07	0.06	0.09	0.07	0.20
Thailand			0.31		0.08	0.27
Malaysia		0.02	0.07	0.05	0.04	0.10
China						
Mexico	0.01	0.02	0.04	0.22	0.04	0.21
Brazil	0.05		0.06	0.26		0.33

Source: UN, International trade statistics yearbook 1982; Taiwan Statistical Department, The trade of China (Taiwan district) 1980.

Table 6 — Major exporters and importers of industrial electrical mach. (ISIC 3831), 1995

	Exports (bill. US$)			Imports (bill. US$)		
	Electrical motors	Electric power mach.	Switches, relays etc.	Electrical motors	Electric power mach.	Switches, relays etc.
SITC Rev.2	716	771	772	716	771	772
World	25.1	22.0	63.6	26.5	22.9	63.7
USA	3.1	2.2	8.3	3.4	3.7	9.7
Japan	3.7	2.5	11.4	1.2	1.4	1.7
EU 15	10.1	7.6	26.2	7.0	6.5	21.2
- *France*	*1.6*	*1.0*	*4.7*	*0.9*	*1.0*	*2.5*
- *Germany*	*3.2*	*2.3*	*10.8*	*2.0*	*1.6*	*4.9*
- *Italy*	*1.1*	*0.7*	*1.9*	*0.8*	*0.6*	*2.5*
- *NL*	*0.2*	*0.4*	*1.4*	*0.4*	*0.3*	*1.4*
- *UK*	*1.2*	*0.8*	*2.6*	*0.8*	*1.0*	*3.1*
Hong Kong	1.4*	2.5*	2.3*	1.6*	2.2*	2.6*
Singapore	1.1	1.0	2.5	1.6	1.4	3.5
Taiwan	*0.5*	*1.5*	*2.2*			
Korea	0.2	0.6	0.8	0.8	0.5	1.7
Thailand	0.4	0.6	1.0	0.8	0.5	1.8
Malaysia	0.5	0.5	1.2	0.8	0.7	2.7
China	1.1	1.5	1.6	1.7	0.8	1.9
Mexico	0.8	1.0	2.1	0.6	0.7	2.8
Brazil	0.2	0.1	0.2	0.2	0.3	0.6

*Including re-exports and imports for re-exports respectively.

Source: UN, International trade statistics yearbook 1996. Figures for Taiwan are average 1994-1995 values, taken from UNCTAD, Handbook of international trade and development statistics 1996/1997.

Table 7 — Major exporters and importers of electrical products (ISIC 3833, 3839), 1980

	Exports (bill. US$)			Imports (bill. US$)		
	Electro-medical app.	Household equipment	Other electrical goods	Electro-medical app.	Household equipment	Other electrical goods
SITC Rev.2	774	775	773, 778	774	775	773, 778
World	2.7	8.4	19.7	2.3	9.4	20.6
USA	0.83	0.79	2.66	0.32	0.97	1.99
Japan	0.20	1.04	3.19	0.17	0.06	0.38
EU 10	1.40	4.68	9.84	0.94	3.98	7.26
- *France*	*0.15*	*0.71*	*1.70*	*0.15*	*0.92*	*1.42*
- *Germany*	*0.61*	*1.74*	*3.49*	*0.26*	*0.83*	*1.83*
- *Italy*	*0.07*	*1.06*	*1.03*	*0.13*	*0.28*	*0.87*
- *NL*	*0.29*	*0.37*	*0.99*	*0.16*	*0.50*	*1.02*
- *UK*	*0.12*	*0.43*	*1.72*	*0.12*	*0.71*	*0.99*
Hong Kong		0.42	0.17		0.15	0.43
Singapore		0.11	0.22		0.08	0.37
Taiwan		*0.19*	*0.38*	*0.01*	*0.04*	*0.34*
Korea		0.06	0.21		0.04	0.18
Thailand			0.01		0.02	0.12
Malaysia			0.03		0.04	0.43
China						
Mexico		0.01	0.09		0.04	0.43
Brazil		0.03	0.11			0.22

Source: UN, International trade statistics yearbook 1982; Taiwan Statistical Department, The trade of China (Taiwan district) 1980.

Table 8 — Major exporters and importers of electrical products (ISIC 3833, 3839), 1995

	Exports (bill. US$)			Imports (bill. US$)		
	Electro-medical eq.	Household appliances	Other electrical goods	Electro-medical eq.	Household appliances	Other electrical goods
SITC Rev.2	774	775	773, 778	774	775	773, 778
World	12.4	33.0	105.3	11.0	33.9	104.2
USA	3.3	2.5	13.5	2.1	4.6	16.1
Japan	1.8	1.0	16.5	0.8	1.3	4.0
EU 15	6.3	17.6	40.0	3.8	14.9	40.0
- *France*	*0.8*	*2.2*	*5.1*	*0.7*	*2.4*	*5.4*
- *Germany*	*2.7*	*4.8*	*14.0*	*1.0*	*3.7*	*118*
- *Italy*	*0.3*	*5.1*	*3.5*	*0.3*	*0.9*	*3.0*
- *NL*	*1.1*	*0.9*	*2.5*	*0.5*	*1.4*	*2.5*
- *UK*	*0.4*	*1.2*	*5.4*	*0.4*	*1.8*	*6.4*
Hong Kong	0.1*	3.3*	3.8*	0.2*	2.7*	4.4*
Singapore	0.1	0.5	3.0		0.4	3.7
Taiwan	*0.7*	*0.6*	*2.9*			
Korea	0.1	1.7	6.1	0.4	0.3	1.9
Thailand		0.6	1.2	0.1	0.2	2.0
Malaysia		0.2	1.1	0.1	0.2	2.3
China		2.1	2.9	0.3	0.3	2.3
Mexico		0.8	6.7	0.1	0.2	4.7
Brazil		0.1	0.4	0.2	0.2	1.0

*Including re-exports and imports for re-exports respectively.

Source: UN, International trade statistics yearbook 1996. Figures for Taiwan are average 1994-1995 values, taken from UNCTAD, Handbook of international trade and development statistics 1996/1997.