

# Employment Generation in the EU in the Information Age<sup>1</sup>

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## 1. Introduction

In recent years there has been considerable debate on the impact of information technology in raising productivity growth in the US and whether similar patterns are being established in the EU. Recent analysis points to accelerating labour productivity growth in the US from the mid 1990s but a deceleration in the EU (see O'Mahony and van Ark, 2003 for a discussion). While there is no doubt that labour productivity growth is important to raise standards of living in the long run, it is also important that the employment rate is high. In the past the EU has fallen behind the US in terms of the percent of the population in employment, with recent estimates suggesting that employment rates in the EU are at only 85% of US levels (European Commission, 2003). Thus whereas labour productivity levels in the EU are now close to those in the US, there is a much wider gap in levels of GDP per capita. Indeed raising the employment rate is an important goal of the Lisbon Agenda. But raising the employment rate may in the short run have a negative effect on labour productivity growth. This can be due to lags in adjustment and to substitution of labour for capital. Also if increased employment is mainly achieved through policies to bring relatively unskilled workers from unemployment or inactivity back into the workforce, then this may lower average labour productivity growth.

To put trends in employment growth in context, Table 1 shows growth in persons engaged, across three time periods, 1979-1990, 1990-1995 and 1995-2001, contrasting the EU-15 with the US. In the first period, the EU-15 saw growth in employment of 0.64%, less than half the rate of US growth. In the early 1990s employment in the EU-15 fell by -0.4%, hardly surprising since this period was dominated by a recession. At the same time growth in employment slowed in the US, but remained positive at 1.1 %. From the mid-1990s, however, there are signs that the EU has begun a process of catching up with the US in terms of employment growth. Thus annual percent growth in employment in the EU-15 rose to an average rate of 1.35%, compared with 1.6% for the US, a much smaller gap than in previous periods. While this result is affected by the inclusion of 2001, a recession year in the US, a substantial narrowing of the gap is still apparent if the calculations end in 2000. Similar trends emerge if we consider total hours growth, rather than employment growth as a measure of labour input.

Table 1 also presents employment growth for individual EU member states. In the first period all countries experienced positive employment growth, although there was significant variation across countries, ranging from more than 1% per annum growth in Luxembourg, the Netherlands and Greece to less than 0.2% in Belgium, Portugal and Denmark. In the second period, most countries experienced a slower rate of employment growth, with ten of the fifteen countries experiencing negative employment growth. The exceptions to this trend were Ireland and Luxembourg, which both witnessed an increase in employment growth, and the Netherlands, where growth remained at its previous rate of 1.3%. In 1995-2001, employment growth accelerated relative to that achieved in the 1980s in most member states, with proportionally very high growth in Ireland, Belgium and Portugal. Only Greece and Germany showed a deceleration in the rate of employment growth, although the absolute growth rate was also relatively low in Austria. If employment growth over

the total period, 1979-2001, is calculated, we find that employment growth has been lowest in the Scandinavian countries.

**Table 1: Employment growth (persons based)**

	1979-1990	1990-1995	1995-2001
US	1.70	1.11	1.60
EU	0.64	-0.40	1.35
Austria	0.23	0.17	0.62
Belgium	0.08	-0.16	1.09
Germany	0.98	-0.04	0.67
Denmark	0.19	-0.52	0.91
Spain	0.50	-0.46	2.75
Finland	0.71	-3.86	2.10
France	0.29	-0.15	1.43
Greece	1.13	0.51	0.44
Ireland	0.25	2.21	5.08
Italy	0.64	-0.55	1.11
Luxembourg	1.65	2.61	4.28
Netherlands	1.30	1.30	2.44
Portugal	0.13	-0.44	1.73
Sweden	0.77	-2.17	1.29
UK	0.59	-1.14	1.32

In order to gain a greater understanding of these aggregate economy trends, this paper considers the industrial pattern of labour input growth in the EU compared to the US in the period 1979 to 2001. In particular it looks at the implications, if any, of changes in information technology on employment generation, by considering the industry location of employment trends. This analysis uses the 56 industry dataset underlying O'Mahony and van Ark (2003), the main features of which are explained in the data sources chapter of that book by Inklaar et al. (2003).

Given the considerable diversity of experience across industries it is necessary to group these in some way to gain additional insights. The next section considers employment trends at the broad sector level. We then look at linking employment generation to information technology by the use of industry taxonomies; these results are given in section 3. Both sections 2 and 3 consider persons employed. The tables in Appendix C show results when total hours worked is the measure of labour input; these show very similar trends to those for persons<sup>2</sup>. Finally section 4 attempts to draw some general conclusions in the context of changes in labour productivity growth.

<sup>2</sup> Some exceptions to this are highlighted in the relevant sections.

## 2. Employment growth at the broad sector level

The trends in employment growth across countries in Table 1 might reflect diverse experience at lower levels of aggregation. Therefore, in order to explore these patterns further, we next consider growth at the broad sector level, shown in table 2. In both the EU and the US, the business services sector has experienced the highest employment growth across all three time periods<sup>3</sup>. As for the majority of industries, and in line with the trends at the country level, employment growth slowed in 1990-1995, before rising in the final period. In fact, in 1995-2001, business services employment growth in the EU, at 5.7%, was greater than the rate of 4.4% observed in the US. This was a reversal of previous trends, as in the first two periods employment growth in business services was higher in the US.

**Table 2: Employment growth of broad sectors in the EU and the US (persons based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
Agriculture, Forestry and Fishing	-3.1	-0.4	-4.6	1.8	-1.8	-0.1
Mining and quarrying	-3.7	-2.5	-9.9	-4.1	-4.1	-0.3
Manufacturing	-1.1	-0.8	-2.8	-0.6	0.0	-0.9
Electricity, gas and water supply	0.3	1.4	-2.5	-0.8	-3.0	-1.0
Construction	-0.2	1.3	-1.1	0.1	0.5	3.7
Distributive trades	1.4	2.1	0.4	1.2	1.7	1.5
Transport	0.4	1.4	-0.7	2.3	1.8	2.3
Communications	0.8	0.5	-1.7	0.3	1.0	1.4
Financial Services	2.3	2.8	0.0	0.1	0.9	1.9
Real Estate	4.1	2.0	2.7	0.6	2.7	1.7
Business Services	4.5	6.2	3.0	3.4	5.7	4.4
Other Community, Social and Personal Services	3.2	1.3	2.3	1.7	2.5	0.7
Public Administration, Education and Health	1.9	2.3	0.8	1.5	1.1	1.7

In the EU, in all three time periods, those sectors experiencing the greatest growth in employment (after business services) were real estate and other community, social and personal services. However, in the US, there has been more variation, with (after business services) financial services and public administration showing the highest growth in 1979-1990, transport and agriculture in 1990-1995 and transport and construction in the final period<sup>4</sup>. In the 1980s falling employment was the norm in agriculture, mining and quarrying, and manufacturing and this decline continues throughout the entire two decades. From 1995 the utilities joins these three sectors in seeing negative employment growth.

In the 1980s, employment growth in the EU was lower than the US in ten of the 13 sectors shown, the exceptions being communications, personal services and real

<sup>3</sup> This is also true for growth in hours worked, with the exception of the US in 1990-95, when the transport sector saw a marginally greater increase.

<sup>4</sup> However, if hours worked growth is considered instead, real estate takes over from public administration in the first period and replaces transport in the final period, while other community, social and personal services takes the place of agriculture in the second period.

estate. This higher US growth generally persists throughout, although by the 1995-2001 period five sectors experienced higher employment growth in the EU, namely manufacturing, distribution, real estate, business services and personal services. In addition agriculture and transport show some convergence of employment growth in the two regions.

In order to gain a fuller picture of employment growth at the industry level, it is necessary to consider the importance of each sector. Hence employment shares for the broad sectors in the US and EU-15 are shown in table 3, for three years, 1979, 1990 and 2000. In the US, in all three years, the sector with the highest employment share has been public administration, education and health, with a share of 26.0% in 2000. This is closely followed by the distributive trades, and together, these two sectors account for just over half of US employment. The manufacturing sector is the third largest, but from table 3, we can observe how its importance has declined over time, falling from a share of 20.2% in 1979 to 12.6% in 2000. In contrast, business services has seen its employment share more than double over the same period, accounting for roughly 11% of US employment by 2000.

**Table 3: Employment shares of broad sectors in the EU and the US (persons based)**

	EU-15			US		
	1979	1990	2000	1979	1990	2000
Agriculture, Forestry and Fishing	9.6	6.4	4.4	3.2	2.6	2.4
Mining and quarrying	0.8	0.5	0.2	0.9	0.6	0.4
Manufacturing	26.3	21.8	18.0	20.2	15.3	12.6
Electricity, gas and water supply	0.9	0.9	0.6	0.8	0.7	0.6
Construction	8.2	7.5	7.0	5.5	5.3	5.7
Distributive trades	17.3	18.9	20.1	23.7	24.8	24.5
Transport	4.3	4.2	4.2	3.1	3.0	3.3
Communications	1.7	1.7	1.5	1.8	1.6	1.6
Financial Services	2.7	3.2	3.2	4.0	4.5	4.3
Real Estate	0.5	0.8	1.0	1.3	1.4	1.3
Business Services	4.6	7.0	10.3	5.3	8.7	11.6
Other Community, Social and Personal Services	4.3	5.8	7.1	5.7	5.5	5.6
Public Administration, Education and Health	18.7	21.4	22.4	24.4	26.1	26.0

Agriculture, mining and utilities, which accounted for relatively small shares in 1979, at 3.2%, 0.9% and 0.8% respectively, have all seen their shares decline further, to 2.4%, 0.4% and 0.6% respectively. Employment shares in the remaining sectors have remained broadly stable over time.

In the EU-15, public administration, education and health also accounted for the greatest share of employment in 2000. Indeed, this sector has seen a greater increase in its employment share in the EU compared to the US since 1979 (although the US employment share remains slightly larger). However, in both 1979 and 1990, although this sector was still large, manufacturing accounted for a slightly greater share of employment. As in the US, the manufacturing sector has seen a fall in its employment share over time, although it still accounts for a greater proportion of employment in

the EU-15 (18% in 2000) than in the US (12.6%). Therefore, although trends are comparable, the employment share accounted for by manufacturing in the EU is appreciably larger than that in the US. Manufacturing is therefore one example of a sizeable difference between the US and the EU.

The distributive trades are the third largest sector in terms of employment, increasing slightly over time, but still account for a smaller proportion of employment in the EU than in the US.

Again, as in the US, the business services sector has more than doubled its share to 10.3% in 2000. Other community, social and personal services also increased from 4.3% to 7.1% over the period, so that this sector now accounts for a greater proportion of employment in the EU than in the US. Real estate, although a small sector, has doubled its employment share from 0.5% to 1.0%. Agriculture has seen its employment share fall by more than half, and mining, utilities and construction have also seen declines.

Employment structure in the EU is naturally influenced by individual country developments, and sometimes strong trends in a few countries can dominate the picture observed at the EU level. It is therefore important that these patterns are recognised. For example, the higher employment share of the EU in agriculture, forestry and fishing is mainly the result of high employment shares in some southern European countries (Greece, Portugal, Spain) and also Austria.

Putting together the shares in table 3 with the growth rates in table 2, a picture emerges of convergence of employment growth rates in the EU relative to the US driven largely by three sectors, manufacturing, distribution and business services. This is partly counterbalanced by poor relative employment growth in the EU in recent years in financial services, non-market services (public administration, education and health) and construction. These traditional industry groupings may however not be the best way to describe movements in employment through time, in particular given that technological changes will have different impacts on industry within these broad aggregates. The next section considers alternative description methods. Before this however, it is useful to first consider a simple division between producing and services industries. Producing industries are classified as those with ISIC Revision 3 codes 01-45 and services are those with codes 50-99 (see Appendix A for a list of which codes correspond to which industries). Table 4 shows employment growth rates for producing and service industries in the US and EU-15.

There has been a clear difference in employment growth trends between producing and services industries. In 1979-1990, both the US and all EU-15 countries, with the exception of Luxembourg, experienced negative employment growth, ranging from -0.3% in the US and Germany to -2.1% in Belgium. Therefore the majority of EU countries saw a greater decline in employment in this group than the US. Luxembourg witnessed positive employment growth of 0.9%. The EU position deteriorated in 1990-1995, with the rate of employment growth falling to -2.8% for the EU-15 as a whole, while in the US this remained unchanged at -0.3%. Most EU countries saw a further fall in the rate of employment growth, apart from Belgium, where there was a slight improvement in the growth rate from -2.1% to -1.6%, and Ireland, where employment growth in this sector increased to 0.3%. In the final period, all countries

saw an improvement in their rate of employment growth, although this remained negative for the EU-15 at -0.3% compared with 0.3% in the US, although considering their respective growth rates in the previous period, the EU saw a greater improvement of 2.5 percentage points compared to 0.6 percentage points in the US. Those countries with the highest employment growth in producing industries in 1995-2001 were Ireland at 3.7% and Spain at 2.6%.

If we consider growth in persons engaged over the whole period 1979-2001 (figures not shown), Ireland and Luxembourg are the only countries that have positive growth rates over this period in the producing sector, at rates of 0.4% and 0.6% respectively. Ireland's growth in the producing industries is mainly caused by high growth in manufacturing and construction, while in Luxembourg manufacturing remains at about the same level and construction doubles its employment. It is interesting to note that these two countries also saw strong employment growth in the services industries, and in 1995-2001 actually experienced the highest growth rates in this sector at 5.9% and 5.6% respectively.

In fact, employment growth in services has been much more favourable in all countries. Across the three time periods, all countries have experienced positive growth in this group, with the exception of Denmark, Finland and Sweden in 1990-1995. Again, most countries experience a slowdown in employment growth in this middle period, before increasing in 1995-2001. Greece is the only country to have seen the rate of employment growth all across time, although this remains positive and it is worth noting that in the first period, Greece experienced the highest growth in the services industries at 3.0%.

**Table 4: Employment growth of producing and services sectors in the EU and the US (persons based)**

	Producing Industries			Services Industries		
	1979-1990	1990-1995	1995-2001	1979-1990	1990-1995	1995-2001
US	-0.3	-0.3	0.3	2.5	1.5	1.9
EU	-1.3	-2.8	-0.3	2.0	0.9	2.1
Austria	-1.2	-1.4	-1.2	1.7	1.4	1.8
Belgium	-2.1	-1.6	-0.4	1.2	0.4	1.6
Germany	-0.3	-3.0	-1.7	2.1	1.8	1.8
Denmark	-1.4	-1.6	-0.7	1.0	-0.1	1.5
Spain	-2.0	-2.9	2.6	2.8	1.1	2.8
Finland	-1.1	-5.8	1.3	2.1	-2.7	2.5
France	-1.9	-2.8	-0.2	1.6	1.0	2.1
Greece	-0.4	-2.0	-0.9	3.0	2.8	1.4
Ireland	-1.3	0.3	3.7	1.6	3.5	5.9
Italy	-1.8	-2.0	-0.2	2.7	0.4	1.8
Luxembourg	0.9	-0.1	0.8	2.1	3.8	5.6
Netherlands	-0.7	-0.7	0.6	2.2	2.1	3.0
Portugal	-1.4	-2.9	0.6	2.0	1.7	2.6
Sweden	-0.8	-3.9	0.6	1.6	-1.5	1.5
UK	-1.7	-4.2	-0.9	1.7	0.0	2.0

If we consider employment shares (Table 5), we observe that the US has seen the highest share in services at all three points in time, and therefore the lowest share in the producing industries. The higher employment share of producing industries in the EU is largely a result of higher shares in Greece, Portugal, Spain and Austria (high agricultural shares) and Ireland (high manufacturing and construction shares). Those EU countries with the highest shares in services are the UK, the Netherlands and Luxembourg. Overall, we can see evidence of convergence between the EU and the US, with a narrowing of the difference between the employment shares in each sector.

**Table 5: Employment shares of producing and services sectors in the EU and the US (persons based)**

	Producing Industries			Services Industries		
	1979	1990	2000	1979	1990	2000
US	30.7	24.5	21.7	69.3	75.5	78.3
EU	45.8	37.0	30.3	54.2	63.0	69.7
Austria	53.8	45.8	38.5	46.2	54.2	61.5
Belgium	37.4	29.5	25.4	62.6	70.5	74.6
Germany	48.0	41.4	31.6	52.0	58.6	68.4
Denmark	36.1	30.5	26.7	63.9	69.5	73.3
Spain	53.8	40.7	36.1	46.2	59.3	63.9
Finland	47.3	38.9	34.1	52.7	61.1	65.9
France	42.4	33.3	26.5	57.6	66.7	73.5
Greece	59.2	50.1	41.2	40.8	49.9	58.8
Ireland	50.9	42.8	36.4	49.1	57.2	63.6
Italy	51.9	39.8	34.4	48.1	60.2	65.6
Luxembourg	36.8	33.8	24.7	63.2	66.2	75.3
Netherlands	35.6	28.6	23.6	64.4	71.4	76.4
Portugal	58.4	49.1	41.6	41.6	50.9	58.4
Sweden	35.9	30.1	26.8	64.1	69.9	73.2
UK	38.1	29.8	23.2	61.9	70.2	76.8

### 3. Industry Taxonomies

Underneath the trends at the broad sector level lies considerable variation at the individual industry level. Employment growth rates in the EU and the US for the three time periods are shown in Appendix table A. In 1995-2001, in the EU, these ranged from growth of 9.5% for computer and related activities and 6.2% for other business activities, to negative growth of -4.1% in both the clothing industry and mining and quarrying. In the same period, the US also experienced the highest growth in computer and related activities, with a rate of 11.1%, followed by 7.1% growth in sale, maintenance and repair of motor vehicles and motor cycles. Clothing and leather and footwear witnessed the greatest declines in employment, with growth rates of -9.7% and -8.6% respectively. The industries that have seen the greatest improvement in their employment growth rate between 1979-1990 and 1995-2001 are railroad equipment in the US and building and repairing of ships and boats in the EU. It should be noted however that both these industries had growth rates of almost -5% in

the first period. In all three time periods, the greatest employment growth has occurred in computer and related activities in both the EU and the US.

A useful indicator of the diversity of employment growth experience across countries is to calculate the cross country correlation between employment growth at the detailed (56) industry level, as shown in table 6.

**Table 6: Correlations<sup>1</sup> between US and EU-15 employment growth (persons based)**

	1979-90	1990-95	1995-01	acceleration <sup>2</sup>
<b>EU-15</b>	0.69	0.57	0.70	0.31
Belgium	0.58	0.28	0.29	0.01
Denmark	0.39	-0.17	0.62	-0.06
Germany	0.66	0.51	0.63	-0.10
Greece	0.47	0.09	0.37	0.11
Spain	0.69	0.15	0.37	-0.23
France	0.74	0.45	0.67	0.15
Ireland	0.38	0.18	0.74	0.54
Italy	0.53	0.34	0.45	0.21
Luxembourg	0.30	-0.13	0.60	-0.09
Netherlands	0.53	0.25	0.73	0.14
Austria	0.70	0.45	0.62	0.21
Portugal	0.50	0.08	0.45	-0.22
Finland	0.65	-0.09	0.47	-0.03
Sweden	0.70	0.19	0.26	-0.15
United Kingdom	0.72	0.53	0.45	0.37

Notes: 1. cross section correlation between industry employment growth in the US and each region/country; 2. growth 1995-2001 minus growth 1990-1995.

The correlation between the industry employment growth rates comparing the US and the EU-15 has varied over time, falling from 0.69 in 1979-1990, to 0.57 in 1990-1995, before rising again to 0.70 in 1995-2001. The correlation in the acceleration in employment growth in the 1990s is much lower, at 0.31.

With the exception of the UK, all other EU countries experienced declines in their correlation in 1990-1995, before increasing again in the final period. The UK correlation has fallen continuously over time, from 0.72 in the first period to 0.45 in 1995-2001. If the acceleration in employment growth in the 1990s is considered, we observe that this is generally much lower, and even negative for seven of the EU-15 countries. Even the highest correlation with the US acceleration in employment growth is only 0.54, occurring in Ireland, followed by the UK at 0.37.

Appendix table A also shows employment growth for all the EU-15 countries at both the broad sector and individual industry levels. From this, the diversity of employment growth trends across the EU is apparent. For example, employment growth in manufacturing in the EU-15 as a whole remained unchanged in 1995-2001, but at the individual country level, this varied from negative growth of -1.1% in the UK to positive growth of 3.3% in Ireland. Most EU countries experienced the greatest employment growth in computer and related activities, particularly in the final period, although this varied in its extent across countries, from 5.7% in Denmark to almost 20% in Ireland. This is reflected at the broad sector level, with strong growth in business services in most countries – however, within this sector, the various

industries performed differently in different countries, for example in Denmark, both research and development and other business activities experienced greater employment growth than computer and related activities in the final period.

Given the variation that exists at the industry level, and in order to gain further insight into employment growth and trends, industries can be grouped according to common features. Industry taxonomies are created based on common structural features of industries, such as their intensity of use of information technology inputs or skilled workers and on the channels through which innovations occur.

This paper employs four such taxonomies, as developed in Robinson et al. (2003). Firstly, the ICT-3 taxonomy divides industries into ICT producing, ICT using and non-ICT, with the latter two dependent on intensity of use of ICT equipment. All three groups then further distinguish between manufacturing and service industries with the final non-ICT group also showing a separate 'other' category, largely agriculture and non-manufacturing production industries (ICT-7 taxonomy). The IT occupational and skills taxonomies group industries according to their intensities of use of skilled labour, with the former based on ICT specific skills and the latter based on general skills. Finally, the innovation taxonomy (combined Pavitt-SIID taxonomy) considers the source of innovations. It distinguishes industries where innovations are largely embodied in equipment (in particular ICT) supplied outside the industry, those where innovation is based on internal R&D activity (scale intensive industries), specialised suppliers, science based industries, organisational innovators in services and service industries where innovations are largely driven by the demands of clients. The list of industries included in each taxonomy, with ISIC revision 3 codes are shown in Appendix B.

Table 7 shows employment growth according to the ICT taxonomy. ICT producing industries displayed positive employment growth in 1979-1990 in both the EU and the US, and again followed the pattern of slowing employment growth in the second time period, indeed, negative growth in the EU, before increasing in 1995-2001, to rates of 3.2% and 3.8% in the EU and US respectively. This positive growth has been driven by relatively high employment growth in ICT producing services. Of all the groups in the ICT-7 taxonomy, ICT producing services experienced the greatest employment growth in the final period for both the EU and the US. Indeed, this group has consistently seen the highest growth in persons engaged in all three periods for the US. Employment in ICT producing manufacturing industries is lower than the services part of the larger group and the EU marginally outperforms the US in the final period.

**Table 7: Employment growth of ICT-producing, ICT-using and non-ICT industries in the EU and the US (persons based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
ICT Producing Industries	1.1	1.4	-1.2	0.7	3.2	3.8
<i>ICT Producing Manufacturing</i>	-0.2	0.2	-3.7	-1.8	0.6	0.2
<i>ICT Producing Services</i>	1.9	2.6	0.1	2.5	4.3	5.7
ICT Using Industries	1.0	1.7	-0.4	0.3	1.4	0.8
<i>ICT Using Manufacturing</i>	-0.7	-0.5	-3.3	-1.6	-0.4	-1.4
<i>ICT Using Services</i>	1.8	2.3	0.6	0.7	1.9	1.2
Non-ICT Industries	0.5	1.7	-0.4	1.5	1.2	1.8
<i>Non-ICT Manufacturing</i>	-1.3	-1.3	-2.5	0.3	0.1	-0.8
<i>Non-ICT Services</i>	2.1	2.6	1.1	1.9	2.0	2.1
<i>Non-ICT Other</i>	-1.6	0.6	-2.8	0.3	-0.6	2.1

ICT intensive using industries have witnessed lower employment growth in the final period than ICT producing industries in both the EU and the US. In the first two periods, the US experienced higher employment growth than the EU in ICT using industries, but this pattern is reversed in the final period, with EU employment growth at 1.4%, compared to 0.8% in the US. The split between ICT using manufacturing and ICT using services reveals that while growth in ICT using services has been positive across the three time periods, this has been offset by negative employment growth in ICT using manufacturing. ICT intensive using services are an important sector in the explanation of productivity growth differentials across the two regions (see below).

Non-ICT industries have consistently demonstrated higher employment and hours worked growth in the US than in the EU. In fact, in the EU in 1990-95, non-ICT industries experienced negative employment growth of -0.4% compared to 1.5% in the US. In 1979-1990, both the EU and the US witnessed negative employment growth in non-ICT manufacturing. Following this, in the EU the growth rate fell further to -2.5%, while in the US, it rose to 0.3%. In the final period, however, employment growth fell in the US by -0.8%, while increasing in the EU by 0.1%. Employment growth in non-ICT services has been positive for both countries in all three time periods, with slightly higher growth in the US, although the difference in the final period is very small, with growth rates of 2.0% and 2.1% in the EU and US respectively. In other non-ICT industries, employment growth has been negative in all three periods in the EU, but positive in the US. Both however experienced declines in 1990-1995, before rising in the final period.

Although very useful insights are obtained from observing the pattern of employment growth within this and the remaining taxonomies, in order to put these trends into perspective, the employment shares of the various groups within each taxonomy also need to be considered. For each taxonomy, employment shares for 1979, 1990 and 2000 are therefore shown in Appendix D.

From Table D.1, it can be seen that non-ICT industries account for the majority of employment in both countries, with a share of 69.2% in the EU and 65.8% in the US in 2000. In both countries, this proportion has remained fairly stable over time. Within

this group, non-ICT services account for the most employment, and in both countries these industries have been increasing their share over time, rising from 35% to 46% in the EU, and from 43% to 50% in the US over the period 1979-2000. In contrast, non-ICT manufacturing has witnessed a decline in its employment share over time, to levels of 10.9% in the EU and 6.8% in the US by 2000. The same applies for other non-ICT industries. While non-ICT service industries account for a slightly greater share of employment in the US in 2000, the EU has a greater proportion of non-ICT manufacturing and other non-ICT industries.

ICT producing industries account for a much smaller proportion of employment, although this is slightly greater in the US (4.6%), than in the EU (3.9%) in 2000. Within this group, ICT producing manufacturing accounts for a declining employment share across time in both countries, so that by 2000, the shares stood at 1.1% and 1.4% in the EU and US respectively. In the US, this group actually increased its employment share slightly up to 1984, but has been falling since this point. In contrast, ICT producing services have seen an increase in their employment share, this has risen by 0.8 percentage points in the EU and 1.1 percentage points in the US between 1979 and 2000.

In 2000, ICT using industries accounted for 27% of employment in the EU and 29.7% in the US. The US has experienced a small decline in this sector's share from 1990 to 2000. ICT using services account for most of this group. ICT using manufacturing has witnessed a fall in its employment share over time, although this remains higher at 6% in the EU, compared to 4.4% in the US.

Table 8 shows employment growth in persons engaged according to the skills taxonomy. In 1995-2001, employment growth in both the EU and US was greatest in the high-skilled group, with rates of 2.3% and 2.4% respectively. While the high-skilled group has consistently experienced the highest employment growth rates in the EU, in the US it was the high-intermediate group that saw the greatest rise in employment in the two earlier periods. In line perhaps with expectations, the low-skilled group experienced the lowest employment growth in the final period in both countries. In 1979-1990 and 1990-1995, the EU saw negative growth in this group. In 1990-1995, employment growth in the low-intermediate skilled industries was also negative, although slightly smaller.

**Table 8: Employment growth in the EU and the US, skills taxonomy (persons based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
<b>Skill taxonomy</b>						
High skilled (HS):	2.1	2.6	0.8	1.2	2.3	2.4
High-intermediate skilled (HIS):	1.6	3.1	0.4	1.7	1.6	1.7
Low-intermediate skilled (LIS):	0.3	1.1	-0.9	0.7	0.9	1.4
Low skilled (LS):	-0.6	0.6	-1.4	1.2	0.7	0.5

In the EU, the rate of employment growth in 1990-1995 falls for all groups in the skills taxonomy, before increasing in the final period. In the US, however, the low-skilled group actually experiences an increase in employment growth in 1990-1995, after which growth rates decline, but remain positive, in 1995-2001. Thus in terms of convergence of employment growth rates, this is mainly driven by lower US growth

across time in industries that intensively use higher intermediate skills and better relative performance in the EU in the low skilled category.

In terms of employment shares, in the EU, at all three points in time, the low-intermediate skilled group has accounted for the greatest share of employment, although this has been declining slightly over time. This was also true for the US in 1979, but over time, the high-skilled industries have grown in importance, and in 2000 accounted for 34.2% of US employment, compared with 30.1% for the low-intermediate skill group. In both countries, high-skilled industries have increased their employment share across time, as have, although to a lesser extent, those industries classified as high-intermediate skilled. In comparison the low-skilled group has seen a consistent decline. Low-skilled industries still accounted for 25% of EU employment in 2000, higher than the share of approximately 20% in the US. The high-intermediate skilled group accounts for the smallest proportion of employment in both countries.

It is also interesting to consider the proportions of employment accounted for by the different skill groups within the EU. If we rank the individual countries based on their employment shares in the different skill categories, it can be seen that there is considerable variation in the proportion of different skill groups across the EU (see Appendix E). For example, Belgium ranks very highly in high-skilled labour, and fairly low in both low-intermediate and low-skilled labour. In contrast, Greece, Spain, Portugal and Austria rank very low in high-skilled labour and high in low-skilled labour. Sweden, Denmark, Finland and the UK are the countries that rank most highly in terms of high-intermediate skilled labour, while the employment share for the low-intermediate skill group is greatest in Germany and Luxembourg.

However, in relating this information to employment growth, no clear pattern emerges. Table 9 shows the rankings for employment growth in the three time periods, as well as those for the employment share of the high-skilled group, with 1 indicating the highest employment growth or highest employment share respectively and 15 the lowest.

The US ranks fairly high in both employment growth and the share of high-skilled labour, although it has been falling relative to the other countries over time. However, Belgium and France also rank highly in this skill group, but do not fare so well in terms of employment growth, with these countries at positions 13 and 8 in the final period. Greece ranks the lowest in terms of high-skilled employment, and while this is also true in terms of employment in 1995-2001, this is not the case in the two earlier periods, when it ranked fourth and fifth respectively.

**Table 9: Total economy employment growth and high-skilled employment share**

	Rank employment growth			Rank high-skilled employment share		
	1979-1990	1990-1995	1995-2001	1979	1990	2001
US	1	4	7	1	2	4
EU	9	10	9	9	7	7
AUT	14	6	16	13	15	14
BEL	17	9	13	2	1	2
DEU	5	7	15	7	9	9
DNK	15	13	14	8	8	8
ESP	11	12	3	15	14	16
FIN	7	17	5	12	12	12
FRA	12	8	8	3	3	3
GRE	4	5	17	17	17	17
IRE	13	2	1	14	13	13
ITA	8	14	12	11	10	11
LUX	2	1	2	6	6	1
NLD	3	3	4	4	4	6
PRT	16	11	6	16	16	15
SWE	6	16	11	10	11	10
UK	10	15	10	5	5	5

Considering trends in employment growth by the occupational taxonomy also yields some interesting results, Table 10. In this case the IT producer service group consists of a single industry, computing services, and this has consistently seen the highest growth in employment in both the EU and US, with greater growth in the US throughout. In contrast, and with the exception of the EU in the first period, employment growth has been negative for IT producer manufacturing, which again is a single industry, computing equipment manufacture. The EU also fares better in this group in 1995-2001, since although it experienced slightly negative growth of -0.6%, this compares favourably with -4.1% for the US. The ‘dynamic IT user’ group has seen greater employment growth in the US in all three time periods than in the EU, although both countries experienced a decline in the rate of employment growth in 1990-1995. But employment growth in the ‘IT user other’ group has remained fairly stable in the US throughout the three time periods, while this group has seen an increase in employment and hours worked growth in the final period in the EU, although it remains behind that of the US.

**Table 10: Employment growth in the EU and the US, IT occupational taxonomy (persons based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
<b>Occupational taxonomy</b>						
IT Producer service (IOPS)	5.9	10.0	4.8	6.7	8.3	11.1
IT Producer manufacturing (IOPM)	2.0	-1.3	-5.3	-4.0	-0.6	-4.1
Dynamic IT user (IOU)	1.2	2.1	0.5	0.7	1.1	1.9
IT user other (NIO)	0.0	1.4	0.1	1.3	0.7	1.3

The group with by far the greatest employment share is the IT user other group, although in both the EU and US, this proportion has fallen over time. The dynamic IT

user group, accounting for roughly one-third of employment in both countries, has experienced an increase in its employment share across time in the EU, while the US witnessed a slight fall in 2000 compared to 1990, despite also rising between 1979 and 1990. IT producer manufacturing has seen a declining employment share in both countries, and accounted for only 0.1% of employment in both the EU and US in 2000. The IT producer service accounts for a greater, but still relatively small employment share in both countries. However, in the EU, this industry has trebled its share from 0.4% in 1979 to 1.2% in 2000, and the US has seen an even greater rise, from 0.3% to 1.6% over the same period.

Finally, we consider employment growth according to the innovation taxonomy, Table 11. This somewhat finer division of industries shows the EU growth rates converging on the US in five of the nine groups. Chief of these is the group with the highest employment growth in both regions, i.e. the ‘specialised suppliers services’ group. In 1979-1990, this group experienced higher growth in the US, while in the following two periods the EU outperformed the US. Employment growth in ‘supplier dominated manufacturing’ remained constant in the US in the first two periods at a rate of 0.3%, before increasing to 0.9% in 1995-2001. However, in the EU, employment growth has been negative in all three time periods, but with a big reduction in the rate of decline in the final period. In the EU, scale intensive industries saw a reversal from negative growth rates in the first two periods to positive growth in the final period, whereas US growth was negative throughout. The final two groups where EU convergence occurred were supplier dominated services and client led services. In both there was a small increase in EU growth rates comparing the 1980s with the late 1990s and a larger decrease in the US.

**Table 11: Employment growth in the EU and US, combined Pavitt-SIID taxonomy (persons based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
<b>Pavitt / SIID Taxonomy</b>						
Supplier dominated manufacturing	-1.6	0.3	-2.7	0.3	-0.7	0.9
Supplier dominated services	0.9	1.5	0.0	0.8	1.2	0.9
Scale intensive industry	-1.2	-1.1	-2.6	-0.8	0.2	-0.3
Specialised suppliers manufacturing	-0.4	-0.8	-3.8	-1.0	0.4	-0.1
Specialised suppliers services	4.5	5.5	2.9	2.3	5.3	4.2
Science based and organizational innov manufacturing	-0.5	-0.9	-3.5	-1.1	-0.4	-0.8
Science based and organizational innov services	1.5	2.1	-0.3	0.8	1.3	2.5
Client led services	2.6	2.9	1.6	2.1	3.2	2.1
Non-market services	1.9	2.3	0.8	1.5	1.1	1.7

‘Specialised suppliers manufacturing’ experienced negative employment growth in both the EU and the US in the first two periods, with greater declines in 1990-1995. In the final period the rate of employment growth improved for both, but remained negative at -0.1% in the US, while increasing to 0.4% in the EU<sup>5</sup>. Nevertheless, in percentage points, comparing the 1979-90 and 1995-2001 periods, the employment

<sup>5</sup> In contrast, growth in hours worked in the US remained within the range -0.6 to -0.8% in all periods.

growth acceleration was about the same in the two regions. Employment growth in ‘science based and organisational innovators in manufacturing’ remained negative in all time periods in both the EU and US, with both countries experiencing their greatest decline in 1990-1995<sup>6</sup>. However, employment growth in the science based services group has largely been positive, despite a decline in the middle period in the US. Growth in the EU turned negative in 1990-1995, but rose again in the final period, to roughly the same rate as in 1979-1990.

In line with the superior growth performance of the ‘specialised suppliers services’ group, this sector has gained in terms of employment share in both the EU and US, rising from 2.5% to 5.5% in the EU and from 3.0% to 5.7% in the US. This sector accounts for a slightly greater share of employment in the US, but the difference between the EU and the US has narrowed over time.

Supplier dominated manufacturing accounts for a greater share of employment in the EU, but again, there is convergence between the two countries over time, as the EU employment share fell considerably from 26% to 16%, while in the US, there was a decline of only 3 percentage points to 12% in 2000. The employment shares accounted for by scale intensive industries and specialised suppliers manufacturing have also fallen over time for both countries.

The share of employment of supplier dominated services remained fairly constant over time, with a marginal rise in the EU and a slight fall in the US, so that the gap between the two countries in this respect narrowed by 2000.

Client led services have grown in their share of employment from 15% and 20% in 1979 to 23% and 25% in 2000 in the EU and US respectively. In 2000, in the EU, these industries account for a greater employment share than any other groups in the innovation taxonomy. In the US, only non-market services account for a (fractionally) larger share, at 26% of employment. Indeed, non-market services also accounted for the greatest share of employment in 1990 and 1979, followed by client led services. However, in 1990 in the EU, while non-market services was also the largest, this was followed by supplier dominated manufacturing, which in 1979 did account for the greatest share of EU employment.

Science based and organisational innovators in manufacturing account for the smallest employment share in 2000, at 1.9% in the EU and 1.1% in the US. Both countries have seen a decline in this group’s share over time. In contrast, the science based and organisational innovators in services group has gained slightly in employment share, accounting for 8.5% of employment in both the EU and US in 2000.

#### **4. Productivity and Employment growth**

The discussion of productivity growth in O’Mahony and van Ark (2003) suggests that performance in high technology sectors can account for much of the failure of the EU to enjoy a US style productivity acceleration from the mid 1990s. This may however reflect a lag in EU adoption of new technology, and adjustments to a new technological regime. However these sectors are those that have also seen some of the

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<sup>6</sup> Growth in hours worked follows a slightly different trend in the US, with growth of -0.8% and -0.7% in the first and second periods respectively, before a further deterioration to a rate of -1.4% in 1995-2001.

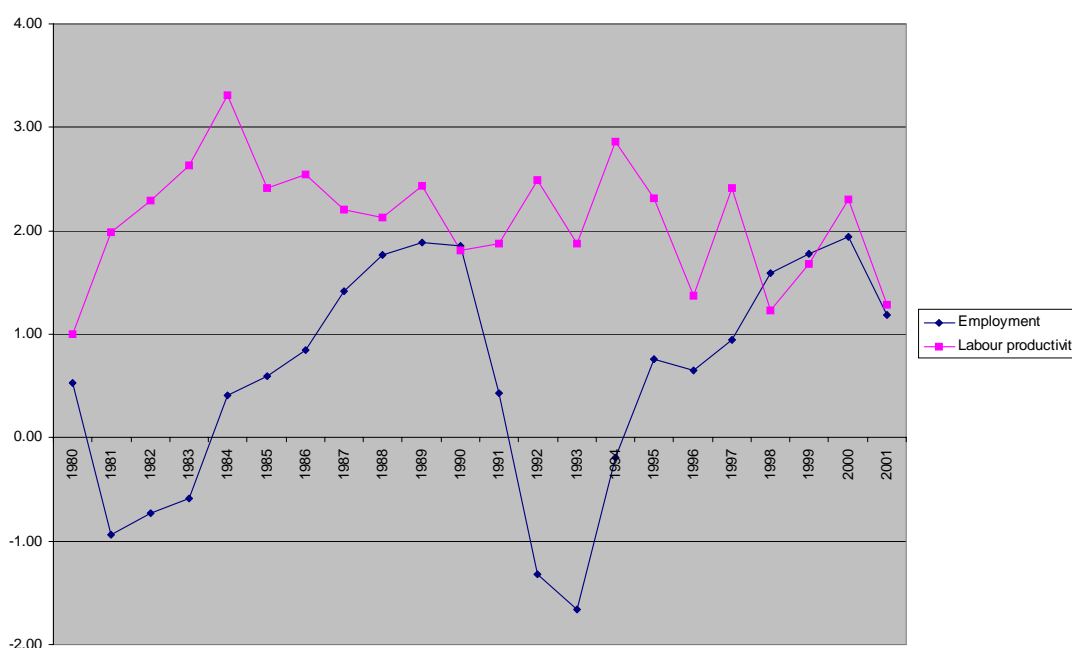
highest growth in employment generation in the EU suggesting a negative relationship between employment and labour productivity growth, at least in the short run.

Figures 1 and 2 plot total economy employment and labour productivity growth for the US and EU-15. In the US, labour productivity and employment growth have followed a very similar trend over time, and appear to be much more closely related than is the case for the EU. This may reflect greater flexibility in the US labour market. It is also worth noting that while both employment and labour productivity growth are of roughly the same magnitude in the US, in the EU, labour productivity growth has remained within a narrower range than employment growth. Labour productivity growth has also tended to remain above employment growth for most of the time period in the EU, although from the late 1990's, the two growth rates have moved much closer together.

**Figure 1: Employment (persons based) and labour productivity growth in the US**



**Figure 2: Employment (persons based) and labour productivity growth in the EU-15**



Further analysis of the link between the growth in employment and labour productivity is contained in a paper published in the *National Institute Economic Review* Special Issue by Bart van Ark, Robert Inklaar, Robert McGuckin and Marcel Timmer (Groningen/The Conference Board), entitled, 'The employment effects of the 'new economy'. A comparison of the European Union and the United States'. This concentrates on the ICT taxonomy. The authors find the inverse relationship between productivity and employment is generally stronger in manufacturing than in services. Secondly, during the 1990s, this relationship has turned positive in many industries, in particular in ICT-producing industries and in ICT-using industries in the service sector. Therefore as a result of increased use of ICT, high labour productivity growth is less associated with low employment growth during the second half of the 1990s, in particular in ICT-using services. But the negative association between productivity and employment growth has remained much more persistent in Europe than in the US.

## 5. Conclusions

The purpose of this paper was to examine the rate of growth of employment comparing the EU-15 and individual member states with the US. Looking at the location of employment growth by sector there is a similarity in both the US and the EU in the sectors which show increasing employment and those where declining employment was the norm. Thus business services showed the greatest expansion in all time periods, with EU growth greater than in the US in the period 1995-2001, but most service sectors showed increased growth. Employment growth in production industries and in particular manufacturing was negative in most periods, although the decline was greater in the US than in the EU in the late 1990s.

Employment generation by detailed industry was described in terms of industry taxonomies. In summary the results show high technology industries (ICT producing, ICT using services, high skilled groups and those where product innovations are dominant) show convergence of employment growth in the EU to rates in the US in the late 1990s. This is a reversal of the position in the decade of the 1980s when employment expansion was considerably greater in high technology industries in the US than in the EU.

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based)**

Industry		US			EU-15		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-0.4	1.8	-0.1	-3.1	-4.6	-1.8
Agriculture	01	-0.7	2.0	0.1	-3.3	-4.6	-1.8
Forestry	02	-0.6	2.2	1.7	-1.5	-4.6	-2.1
Fishing	05	4.1	-1.2	-5.6	-2.0	-2.0	-0.2
<b>Mining and quarrying</b>	10-14	-2.5	-4.1	-0.3	-3.7	-9.9	-4.1
<b>Manufacturing</b>		-0.8	-0.6	-0.9	-1.1	-2.8	0.0
Food, drink & tobacco	15-16	-0.5	0.1	0.1	-0.8	-1.1	0.2
Textiles	17	-1.4	-0.4	-5.5	-3.3	-4.5	-2.1
Clothing	18	-2.6	-2.9	-9.7	-2.1	-5.7	-4.1
Leather and footwear	19	-5.5	-4.6	-8.6	-2.9	-5.2	-2.6
Wood & products of wood and cork	20	-0.5	1.2	-0.1	-1.2	-1.4	-0.3
Pulp, paper & paper products	21	-0.1	-0.1	-1.6	-1.0	-1.7	-0.4
Printing & publishing	22	2.3	-0.2	-1.0	0.7	-1.4	-0.4
Mineral oil refining, coke & nuclear fuel	23	-2.3	-1.9	-2.2	-1.7	-4.2	-0.7
Chemicals	24	-0.2	-0.9	-0.3	-0.7	-3.4	-0.5
Rubber & plastics	25	1.1	1.9	-0.5	0.9	-0.6	1.0
Non-metallic mineral products	26	-2.2	-0.6	0.8	-1.7	-2.4	0.3
Basic metals	27	-4.6	-1.4	-1.5	-2.9	-5.8	-1.2
Fabricated metal products	28	-1.7	0.3	0.2	-1.1	-1.8	0.6
Mechanical engineering	29	-1.8	0.2	-0.4	-0.4	-4.0	0.3
Office machinery	30	-1.3	-4.0	-4.1	1.7	-5.5	-0.7
<i>Insulated wire</i>	313	-1.7	-0.8	-1.0	-0.9	-2.9	0.4
<i>Other electrical machinery and apparatus nec</i>	31-313	-1.7	-1.6	-1.5	-0.2	-2.7	0.1
<i>Electronic valves and tubes</i>	321	2.0	0.5	2.3	-1.0	-1.2	2.7
<i>Telecommunication equipment</i>	322	0.9	-0.9	1.2	-1.1	-4.1	0.8
<i>Radio and television receivers</i>	323	-3.9	1.0	-4.0	-0.4	-7.4	-1.7
<i>Scientific instruments</i>	331	0.3	-2.9	0.2	0.1	-2.4	1.0
<i>Other instruments</i>	33-331	-4.1	-5.3	-2.0	-1.7	-3.8	-0.4
Motor vehicles	34	-1.7	3.2	-0.4	-1.2	-3.1	2.1
<i>Building and repairing of ships and boats</i>	351	-1.4	-3.5	0.4	-4.7	-3.9	-0.3
<i>Aircraft and spacecraft</i>	353	2.2	-10.0	-1.3	0.1	-5.9	2.5
<i>Railroad equipment and transport equipment nec</i>	352+359	-4.8	4.3	4.3	-1.8	-4.2	-0.9
Furniture, miscellaneous manufacturing; recycling	36-37	-0.2	0.1	0.0	-0.8	-1.3	0.0
<b>Electricity, gas and water supply</b>	40-41	1.4	-0.8	-1.0	0.3	-2.5	-3.0
<b>Construction</b>	45	1.3	0.1	3.7	-0.2	-1.1	0.5
<b>Distributive trades</b>		2.1	1.2	1.5	1.4	0.4	1.7
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	3.7	2.1	7.1	1.2	-0.7	1.9

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		US			EU-15		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	1.6	0.6	0.6	1.2	-0.1	1.7
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	1.7	0.9	0.9	1.0	0.4	1.3
Hotels & catering	55	3.2	1.9	2.2	2.8	1.3	2.6
<b>Transport</b>		1.4	2.3	2.3	0.4	-0.7	1.8
Inland transport	60	-0.5	2.4	2.1	0.5	-1.1	0.6
Water transport	61	-1.3	0.2	1.8	-3.2	-3.5	-0.3
Air transport	62	7.1	1.9	3.1	1.2	-1.5	4.3
Supporting and auxiliary transport activities; activities of travel agencies	63	5.5	3.6	1.8	0.5	0.3	3.5
<b>Communications</b>	64	0.5	0.3	1.4	0.8	-1.7	1.0
<b>Financial Services</b>		2.8	0.1	1.9	2.3	0.0	0.9
Financial intermediation, except insurance and pension funding	65	2.5	-0.9	1.6	2.3	-0.3	0.1
Insurance and pension funding, except compulsory social security	66	1.6	-0.1	0.9	1.8	-0.2	0.7
Activities auxiliary to financial intermediation	67	4.9	2.2	3.4	3.2	1.1	3.3
<b>Real estate activities</b>	70	2.0	0.6	1.7	4.1	2.7	2.7
<b>Business Services</b>		6.2	3.4	4.4	4.5	3.0	5.7
Renting of machinery and equipment	71	5.7	-0.6	2.8	3.6	0.5	5.3
Computer and related activities	72	10.0	6.7	11.1	5.9	4.3	9.5
Research and development	73	4.2	0.9	1.5	2.0	0.7	2.0
<i>Legal, technical and advertising</i>	741-3	5.0	1.4	2.2	4.6	2.9	4.5
<i>Other business activities, nec</i>	749	7.1	4.9	4.7	4.5	3.2	6.2
<b>Public Administration, Education and Health</b>		2.3	1.5	1.7	1.9	0.8	1.1
Public administration and defence; compulsory social security	75	1.1	-0.4	0.9	1.2	0.0	0.0
Education	80	1.9	1.4	2.1	1.8	0.7	1.3
Health and social work	85	3.9	3.1	1.9	2.7	1.7	1.7
<b>Other Community, Social and Personal Services</b>		1.3	1.7	0.7	3.2	2.3	2.5
Other community, social and personal services	90-93	2.5	2.2	1.2	2.8	2.0	2.5
Private households with employed persons	95	-2.5	-0.8	-2.2	5.5	3.7	2.4
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Belgium			Denmark		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-2.1	-1.5	-2.0	-3.2	-4.2	-3.4
Agriculture	01	-2.2	-1.3	-2.0	-3.4	-4.5	-3.4
Forestry	02	-2.2	-4.7	-3.3	-1.0	1.8	-2.4
Fishing	05	-0.8	-5.4	-1.1	-1.6	-4.3	-3.2
<b>Mining and quarrying</b>	10-14	-11.5	-14.5	-0.7	-0.1	-1.9	1.1
<b>Manufacturing</b>		-1.8	-2.4	-0.5	-0.5	-1.3	-0.8
Food, drink & tobacco	15-16	-1.1	-0.7	-0.1	-0.5	-2.0	-1.6
Textiles	17	-2.4	-1.6	-1.8	-1.5	-3.7	-6.1
Clothing	18	-3.6	-14.8	-7.4	-4.6	-8.8	-8.7
Leather and footwear	19	-4.7	-4.5	-5.9	-6.9	-6.0	-10.5
Wood & products of wood and cork	20	-0.8	2.1	-0.7	-0.3	2.5	-0.5
Pulp, paper & paper products	21	-1.0	-3.8	-0.6	0.8	-3.6	-0.9
Printing & publishing	22	0.0	-2.3	0.0	-0.7	-2.2	-0.5
Mineral oil refining, coke & nuclear fuel	23	-5.5	-1.4	-2.0	4.6	-4.6	-2.5
Chemicals	24	0.5	-1.5	0.1	1.2	2.0	0.2
Rubber & plastics	25	0.3	-1.3	1.2	0.9	0.3	0.6
Non-metallic mineral products	26	-3.5	-1.3	-0.5	-4.6	-0.6	0.0
Basic metals	27	-4.2	-3.9	-2.4	-0.6	-2.7	1.2
Fabricated metal products	28	-1.6	-0.3	1.2	0.8	-0.2	-0.5
Mechanical engineering	29	-1.6	-2.9	-0.4	0.1	-0.6	-0.4
Office machinery	30	7.8	-11.0	-2.9	1.7	-7.0	-1.9
<i>Insulated wire</i>	313	-3.4	-2.8	-6.2	1.6	-7.8	-0.7
<i>Other electrical machinery and apparatus nec</i>	313	-3.4	-2.8	-0.3	1.6	-4.7	0.6
<i>Electronic valves and tubes</i>	321	-3.4	-4.0	5.9	-1.0	-7.9	0.1
<i>Telecommunication equipment</i>	322	-3.4	-4.0	-2.3	-1.0	4.5	2.2
<i>Radio and television receivers</i>	323	-3.4	-4.0	1.5	-1.0	0.3	1.1
<i>Scientific instruments</i>	331	-1.6	5.5	1.3	2.9	-2.2	-0.9
<i>Other instruments</i>	33-						
	331	-1.5	5.7	-1.7	2.9	2.3	6.6
Motor vehicles	34	0.3	-4.1	-0.4	-4.2	3.1	1.2
<i>Building and repairing of ships and boats</i>	351	-3.9	-3.9	0.1	-2.4	0.2	-3.2
<i>Aircraft and spacecraft</i>	353	-3.9	-4.0	9.3	5.6	21.1	4.8
<i>Railroad equipment and transport equipment nec</i>	352+3						
	59	-3.8	-4.0	-7.7	5.9	-2.5	-1.5
Furniture, miscellaneous manufacturing; recycling	36-37	-2.9	-1.7	-1.9	0.0	-0.8	-1.3
<b>Electricity, gas and water supply</b>	40-41	-0.6	-2.3	-0.7	1.4	-0.3	-3.5
<b>Construction</b>	45	-2.4	1.7	0.6	-2.3	-0.4	1.7
<b>Distributive trades</b>		0.2	-0.5	0.4	-0.3	0.1	1.1
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	0.8	-2.0	3.2	-2.6	-0.2	0.2

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Belgium			Denmark		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	1.6	-0.7	-0.4	1.2	-0.3	1.3
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	-1.3	-0.9	0.4	-1.1	-0.1	1.0
Hotels & catering	55	1.4	1.9	-0.1	1.2	1.7	1.6
<b>Transport</b>		-0.8	-0.2	1.8	0.6	-0.6	0.0
Inland transport	60	-1.3	-0.4	1.0	0.0	-1.2	0.0
Water transport	61	-2.3	-7.5	-10.9	0.2	2.1	-3.4
Air transport	62	0.6	-1.9	7.4	1.1	-3.7	3.3
Supporting and auxiliary transport activities; activities of travel agencies	63	0.9	1.6	3.4	2.2	0.1	1.2
<b>Communications</b>	64	-0.7	0.8	0.3	0.8	-2.5	1.4
<b>Financial Services</b>		2.4	-0.6	0.7	1.4	-2.8	-0.5
Financial intermediation, except insurance and pension funding	65	2.2	-0.7	2.0	1.6	-2.5	-0.9
Insurance and pension funding, except compulsory social security	66	2.9	-1.7	-0.4	0.8	-3.3	-0.1
Activities auxiliary to financial intermediation	67	2.2	9.7	-15.6	1.2	-5.9	2.8
<b>Real estate activities</b>	70	3.6	7.7	-0.3	2.9	-1.5	1.6
<b>Business Services</b>		3.2	3.3	3.0	2.6	0.7	6.5
Renting of machinery and equipment	71	0.2	8.4	-6.0	3.8	-0.8	2.2
Computer and related activities	72	3.5	2.1	8.8	6.1	0.3	5.7
Research and development	73	2.1	-16.0	1.0	0.4	-8.7	7.0
<i>Legal, technical and advertising</i>	741-3	3.3	3.7	1.0	1.9	-0.6	5.0
<i>Other business activities, nec</i>	749	3.3	3.7	4.0	2.6	4.0	8.7
<b>Public Administration, Education and Health</b>		1.4	0.2	1.8	1.4	0.0	1.0
Public administration and defence; compulsory social security	75	1.4	0.7	1.7	0.6	1.7	-0.9
Education	80	1.0	0.1	0.8	0.9	-0.2	1.1
Health and social work	85	1.9	-0.3	2.8	2.1	-0.7	2.0
<b>Other Community, Social and Personal Services</b>		1.9	-0.3	2.4	1.2	1.6	0.9
Other community, social and personal services	90-93	1.9	-0.3	1.5	2.0	1.7	0.9
Private households with employed persons	95	1.9	-0.3	3.8	-4.0	1.1	0.8
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Germany			Greece		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-2.7	-7.1	-2.5	-1.2	-2.4	-2.2
Agriculture	01	-3.1	-8.0	-2.6	-1.2	-2.8	-2.2
Forestry	02	0.7	-2.1	-2.0	-6.9	-5.8	2.8
Fishing	05	-1.7	-2.7	-5.7	6.7	9.0	-2.7
<b>Mining and quarrying</b>	10-14	-1.9	-10.8	-8.5	1.2	-8.8	-1.0
<b>Manufacturing</b>		0.1	-4.2	-0.6	0.8	-2.4	-0.7
Food, drink & tobacco	15-16	-0.8	-0.7	0.4	0.8	-1.0	-0.1
Textiles	17	-3.4	-10.9	-3.4	0.8	-3.8	-2.1
Clothing	18	-3.6	-12.5	-7.6	0.8	-4.7	-1.7
Leather and footwear	19	-5.7	-13.8	-5.0	0.8	-3.6	-3.9
Wood & products of wood and cork	20	-0.6	0.3	-2.6	0.8	-4.0	-0.7
Pulp, paper & paper products	21	0.7	-1.7	-0.3	0.8	0.5	-2.6
Printing & publishing	22	1.0	-2.2	-3.1	0.8	-0.1	-0.1
Mineral oil refining, coke & nuclear fuel	23	-2.0	-10.5	-1.3	0.8	-1.3	-3.1
Chemicals	24	0.2	-4.8	-1.9	0.8	-2.0	-1.9
Rubber & plastics	25	2.9	-1.1	0.2	0.8	0.3	0.7
Non-metallic mineral products	26	-1.5	-2.1	-1.9	0.8	-2.5	-0.2
Basic metals	27	-0.9	-8.7	-2.3	0.8	-1.4	-1.1
Fabricated metal products	28	0.8	-1.4	-0.2	0.8	-1.8	0.8
Mechanical engineering	29	0.8	-6.3	-0.5	0.8	-0.8	1.1
Office machinery	30	2.5	-11.5	-5.6	1.0	6.3	9.9
<i>Insulated wire</i>	313	-1.9	-2.5	1.4	0.8	-0.9	-1.5
<i>Other electrical machinery and apparatus nec</i>	313	1.6	-4.7	-1.1	0.8	-1.7	0.9
<i>Electronic valves and tubes</i>	321	1.0	-0.2	6.6	0.8	1.1	-3.0
<i>Telecommunication equipment</i>	322	1.0	-11.6	-2.9	0.8	-0.9	-0.1
<i>Radio and television receivers</i>	323	1.0	-13.1	-4.2	0.8	-8.1	-4.8
<i>Scientific instruments</i>	331	0.5	-4.2	-0.1	0.8	-0.1	4.9
<i>Other instruments</i>	33-331	-1.5	-6.2	-1.4	0.6	12.5	16.2
Motor vehicles	34	1.3	-3.7	3.5	0.8	-2.6	-2.6
<i>Building and repairing of ships and boats</i>	351	-2.8	-5.8	-3.1	0.8	-1.3	-3.5
<i>Aircraft and spacecraft</i>	353	4.0	-3.4	4.4	0.8	-1.9	-0.8
<i>Railroad equipment and transport equipment nec</i>	352+359	-1.2	-5.5	-3.6	0.8	-1.6	1.0
Furniture, miscellaneous manufacturing; recycling	36-37	-0.4	-2.8	-2.0	0.8	-3.1	0.0
<b>Electricity, gas and water supply</b>	40-41	0.8	-2.4	-4.2	2.3	2.5	-1.0
<b>Construction</b>	45	-0.4	3.1	-3.7	-1.1	0.0	2.0
<b>Distributive trades</b>		1.6	1.6	1.4	3.1	3.0	1.1
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	1.2	0.4	2.2	3.1	2.8	1.1

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Germany			Greece		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	0.8	0.6	0.1	3.1	2.8	1.8
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	1.5	1.9	1.0	3.1	2.8	0.5
Hotels & catering	55	3.2	3.0	3.5	3.1	3.5	1.7
<b>Transport</b>		1.1	-1.1	0.8	-0.6	-0.1	-0.3
Inland transport	60	1.2	-1.8	0.1	-0.6	-0.1	-0.2
Water transport	61	-3.0	-5.5	-0.6	-0.6	-0.1	-0.3
Air transport	62	3.0	-1.9	1.7	-0.6	-0.1	-1.6
Supporting and auxiliary transport activities; activities of travel agencies	63	1.2	0.9	2.3	-0.6	-0.1	-0.3
<b>Communications</b>	64	0.9	-2.3	-3.1	-0.6	-0.1	2.8
<b>Financial Services</b>		1.9	1.5	0.3	4.4	6.1	2.6
Financial intermediation, except insurance and pension funding	65	2.1	1.6	-0.2	4.4	6.1	1.8
Insurance and pension funding, except compulsory social security	66	0.5	1.3	-0.3	4.4	6.1	-0.1
Activities auxiliary to financial intermediation	67	3.2	1.4	2.4	4.4	6.1	5.7
<b>Real estate activities</b>	70	3.3	6.8	4.8	4.4	5.0	3.8
<b>Business Services</b>		4.6	5.9	6.5	4.4	5.0	4.5
Renting of machinery and equipment	71	3.2	2.8	4.9	4.4	4.9	-3.3
Computer and related activities	72	5.4	5.5	9.2	4.5	5.0	16.5
Research and development	73	2.9	2.9	3.0	4.5	4.9	4.0
<i>Legal, technical and advertising</i>	741-3	4.6	6.1	6.4	4.4	5.0	4.3
<i>Other business activities, nec</i>	749	4.6	6.1	6.4	4.4	5.0	4.3
<b>Public Administration, Education and Health</b>		1.8	1.3	0.7	4.1	2.5	1.2
Public administration and defence; compulsory social security	75	0.8	-1.1	-1.5	4.1	1.9	0.1
Education	80	1.4	1.3	0.2	4.1	3.3	2.2
Health and social work	85	3.6	3.8	2.8	4.1	2.5	1.3
<b>Other Community, Social and Personal Services</b>		3.5	2.8	2.4	4.1	4.0	1.3
Other community, social and personal services	90-93	3.0	2.5	2.4	4.1	3.0	-0.2
Private households with employed persons	95	5.9	4.5	2.4	4.1	8.7	6.3
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Spain			France		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-4.1	-6.4	-0.3	-3.6	-3.9	-1.7
Agriculture	01	-4.2	-6.6	-0.4	-3.8	-4.2	-1.9
Forestry	02	-3.3	-7.7	0.9	-0.3	3.5	1.0
Fishing	05	-4.2	-1.4	0.2	-0.9	-0.8	1.2
<b>Mining and quarrying</b>	10-14	-1.6	-7.5	-4.0	-3.0	-5.5	-4.8
<b>Manufacturing</b>		-2.0	-1.6	3.1	-1.7	-2.5	-0.1
Food, drink & tobacco	15-16	-0.7	-0.9	0.7	-0.1	-0.5	1.1
Textiles	17	-4.6	-3.9	1.8	-4.1	-5.0	-2.7
Clothing	18	-1.7	-4.5	1.6	-4.5	-6.5	-7.5
Leather and footwear	19	-4.8	-5.5	1.6	-3.9	-5.8	-4.4
Wood & products of wood and cork	20	-1.3	-2.4	4.4	-2.0	-2.6	-1.6
Pulp, paper & paper products	21	-2.1	-1.2	5.0	-2.0	-2.2	-0.8
Printing & publishing	22	1.3	-1.2	4.6	1.3	-1.9	-0.1
Mineral oil refining, coke & nuclear fuel	23	-2.2	-1.8	2.1	-3.9	-3.1	-3.4
Chemicals	24	-0.3	-2.3	2.7	-0.8	-2.3	-0.9
Rubber & plastics	25	0.8	-0.5	4.7	-0.3	-1.1	1.7
Non-metallic mineral products	26	-2.5	-1.4	3.7	-2.4	-2.5	-1.1
Basic metals	27	-4.5	-3.4	0.6	-3.3	-4.5	-0.6
Fabricated metal products	28	-2.4	0.7	4.9	-1.8	-2.4	0.8
Mechanical engineering	29	-2.0	-1.5	5.6	-1.8	-2.4	0.0
Office machinery	30	0.6	0.6	0.2	1.7	0.2	2.5
<i>Insulated wire</i>	313	-2.4	-3.8	0.8	-0.7	-2.6	-1.0
<i>Other electrical machinery and apparatus nec</i>	313	-4.1	-1.3	3.5	-0.7	-1.1	0.3
<i>Electronic valves and tubes</i>	321	-2.3	4.0	1.8	-1.0	4.0	2.7
<i>Telecommunication equipment</i>	322	-4.5	-9.4	-0.1	-1.0	-6.2	-0.5
<i>Radio and television receivers</i>	323	-4.5	0.1	3.1	-1.0	-7.5	-1.5
<i>Scientific instruments</i>	331	-1.8	-2.6	3.9	-0.7	-1.8	1.5
<i>Other instruments</i>	33-						
	331	-2.3	3.9	1.3	-0.7	-5.4	-5.3
Motor vehicles	34	-0.1	-0.6	4.0	-2.8	-3.2	0.6
<i>Building and repairing of ships and boats</i>	351	-3.5	-1.7	2.1	-6.2	1.8	0.9
<i>Aircraft and spacecraft</i>	353	1.8	7.8	3.4	1.2	-6.0	0.6
<i>Railroad equipment and transport equipment nec</i>	352+3						
	59	-2.7	-5.2	3.3	-6.3	-2.5	1.7
Furniture, miscellaneous manufacturing; recycling	36-37	-3.1	-0.8	3.2	-1.6	-2.9	0.1
<b>Electricity, gas and water supply</b>	40-41	0.7	-0.5	-0.7	1.0	-0.1	0.2
<b>Construction</b>	45	0.8	-1.9	4.2	-1.3	-3.0	0.5
<b>Distributive trades</b>		1.8	0.5	2.9	0.9	-0.5	1.8
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	2.1	-1.9	3.8	0.0	0.0	2.3

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Spain			France		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	2.9	-0.7	3.0	0.8	-1.1	2.2
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	0.7	1.0	2.5	0.5	-0.7	1.3
Hotels & catering	55	3.0	1.6	3.0	2.4	0.5	1.7
<b>Transport</b>		0.2	0.3	2.6	0.6	0.0	2.6
Inland transport	60	0.5	-1.0	2.6	0.3	0.1	1.8
Water transport	61	-5.5	-0.4	-3.0	-5.3	-7.3	0.8
Air transport	62	-0.3	4.7	-1.5	3.2	-1.7	1.9
Supporting and auxiliary transport activities; activities of travel agencies	63	0.3	6.3	4.4	1.9	0.9	4.9
<b>Communications</b>	64	3.0	0.7	2.3	0.3	0.3	1.9
<b>Financial Services</b>		0.4	-1.2	0.4	1.2	-0.6	0.6
Financial intermediation, except insurance and pension funding	65	0.3	-2.7	-0.7	0.8	-1.3	-0.4
Insurance and pension funding, except compulsory social security	66	2.0	4.9	-0.4	1.8	-0.2	0.1
Activities auxiliary to financial intermediation	67	0.1	1.2	6.0	1.8	0.9	2.8
<b>Real estate activities</b>	70	2.9	-3.3	7.9	3.3	-0.8	-0.3
<b>Business Services</b>		5.4	3.2	5.9	2.7	1.9	5.4
Renting of machinery and equipment	71	9.8	-1.6	3.9	4.1	2.3	6.2
Computer and related activities	72	4.9	10.1	10.6	3.8	3.8	7.8
Research and development	73	4.0	-6.5	6.9	2.7	0.7	0.9
<i>Legal, technical and advertising</i>	741-3	5.3	3.0	4.0	2.6	1.2	3.6
<i>Other business activities, nec</i>	749	5.3	3.0	7.5	2.6	2.6	7.4
<b>Public Administration, Education and Health</b>		3.9	1.4	2.1	1.9	1.4	0.6
Public administration and defence; compulsory social security	75	5.1	0.9	1.6	1.5	1.4	0.1
Education	80	2.5	2.1	2.1	1.9	1.4	0.9
Health and social work	85	3.7	1.4	2.9	2.3	1.4	1.0
<b>Other Community, Social and Personal Services</b>		4.1	2.1	2.8	2.6	5.1	4.1
Other community, social and personal services	90-93	4.1	2.1	2.8	2.6	4.7	3.9
Private households with employed persons	95	-	-	-	2.6	6.1	4.9
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Ireland			Italy		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-2.1	-3.2	-1.7	-5.1	-4.8	-2.6
Agriculture	01	-2.1	-3.2	-1.8	-5.2	-4.9	-2.5
Forestry	02	-2.1	-3.3	-1.9	-5.2	-3.0	-5.4
Fishing	05	-2.1	-3.2	2.9	-1.0	-3.6	-0.9
<b>Mining and quarrying</b>	10-14	-6.3	-0.9	2.1	-0.5	-5.1	-1.0
<b>Manufacturing</b>		-0.4	1.7	3.3	-0.9	-1.6	0.0
Food, drink & tobacco	15-16	-1.6	-0.2	2.6	0.4	0.0	-0.9
Textiles	17	-2.8	-5.1	-5.2	-1.9	-0.8	-0.4
Clothing	18	-1.2	-3.9	-18.0	-0.6	-3.8	-2.7
Leather and footwear	19	-11.3	-3.0	-9.8	-1.6	-2.7	-1.8
Wood & products of wood and cork	20	-1.0	0.8	5.7	-2.0	-1.0	-0.3
Pulp, paper & paper products	21	-2.5	0.0	3.2	-0.3	0.2	1.1
Printing & publishing	22	0.8	4.7	5.6	0.1	-0.4	0.3
Mineral oil refining, coke & nuclear fuel	23	2.1	1.8	3.1	-0.7	-2.5	0.3
Chemicals	24	2.0	4.4	5.3	-1.8	-2.8	0.8
Rubber & plastics	25	2.6	2.7	0.7	1.4	0.1	1.7
Non-metallic mineral products	26	-2.1	-2.1	3.3	-0.3	-1.7	2.4
Basic metals	27	-2.4	-3.1	2.0	-2.5	-3.0	1.5
Fabricated metal products	28	-1.7	0.1	5.3	-0.8	-1.9	0.3
Mechanical engineering	29	1.4	2.1	0.6	-0.7	-1.5	1.3
Office machinery	30	5.2	12.7	6.0	1.3	-2.8	-0.7
<i>Insulated wire</i>	313	5.4	8.7	2.0	-0.9	-6.4	-0.7
<i>Other electrical machinery and apparatus nec</i>	313	5.4	2.5	1.9	-0.9	-0.9	1.5
<i>Electronic valves and tubes</i>	321	5.4	11.6	15.5	-2.5	0.0	1.1
<i>Telecommunication equipment</i>	322	5.4	3.8	10.6	-2.5	0.4	-1.8
<i>Radio and television receivers</i>	323	5.3	11.9	-0.1	-2.5	-0.7	-4.0
<i>Scientific instruments</i>	331	3.2	7.1	11.8	0.6	-1.6	2.2
<i>Other instruments</i>	33-331	3.2	2.5	3.9	0.6	-3.4	1.6
Motor vehicles	34	-5.9	2.4	1.1	-4.0	-4.3	-0.9
<i>Building and repairing of ships and boats</i>	351	-11.1	-4.4	2.9	-0.1	-5.9	-0.1
<i>Aircraft and spacecraft</i>	353	-	-	-	5.4	-3.4	-1.7
<i>Railroad equipment and transport equipment nec</i>	352+359	2.1	-0.2	1.8	0.6	-0.4	-0.2
Furniture, miscellaneous manufacturing; recycling	36-37	-0.7	1.5	2.8	0.7	-0.1	-1.5
<b>Electricity, gas and water supply</b>	40-41	-0.2	-2.8	-4.8	1.5	-1.7	-2.5
<b>Construction</b>	45	-1.8	3.1	10.8	-0.8	-0.7	1.2
<b>Distributive trades</b>		1.1	4.0	6.2	1.9	-0.1	1.6
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	1.1	0.5	6.2	1.7	-2.5	1.9

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Ireland			Italy		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	0.0	2.9	2.4	1.7	0.7	3.5
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	1.3	3.8	6.2	1.7	-0.6	0.4
Hotels & catering	55	1.4	5.9	7.8	2.8	2.1	3.2
<b>Transport</b>		-0.8	0.8	5.1	0.3	-2.2	1.9
Inland transport	60	0.2	-1.6	5.2	0.7	-1.9	-0.5
Water transport	61	-3.5	-5.9	5.3	0.5	-1.1	4.0
Air transport	62	0.2	4.4	3.0	-1.7	-12.0	7.4
Supporting and auxiliary transport activities; activities of travel agencies	63	-0.4	4.2	6.3	-0.8	-0.6	9.9
<b>Communications</b>	64	1.0	-8.8	11.5	0.7	-2.9	-0.9
<b>Financial Services</b>		4.7	4.8	6.7	3.1	1.0	0.4
Financial intermediation, except insurance and pension funding	65	4.7	5.6	7.3	3.1	1.3	0.1
Insurance and pension funding, except compulsory social security	66	4.5	1.4	5.2	3.1	0.8	-1.3
Activities auxiliary to financial intermediation	67	5.7	9.3	6.2	3.1	0.3	1.5
<b>Real estate activities</b>	70	5.9	3.1	6.6	8.2	0.7	0.3
<b>Business Services</b>		4.6	5.0	11.5	8.2	2.0	6.5
Renting of machinery and equipment	71	-0.8	7.9	12.0	8.2	1.6	13.6
Computer and related activities	72	5.9	10.7	19.9	8.2	2.9	6.2
Research and development	73	2.9	-4.0	0.6	8.2	2.2	-2.3
<i>Legal, technical and advertising</i>	741-3	5.1	4.3	9.5	8.2	1.8	5.8
<i>Other business activities, nec</i>	749	5.1	4.3	11.7	8.2	1.8	8.0
<b>Public Administration, Education and Health</b>		1.5	4.4	3.2	1.6	-0.1	0.2
Public administration and defence; compulsory social security	75	1.5	4.4	2.1	1.0	-0.7	-0.6
Education	80	1.5	4.4	2.5	2.1	-0.8	0.1
Health and social work	85	1.5	4.4	4.5	1.8	1.5	1.2
<b>Other Community, Social and Personal Services</b>		1.5	4.4	4.5	6.2	2.8	2.3
Other community, social and personal services	90-93	1.5	4.4	5.5	3.9	2.0	3.0
Private households with employed persons	95	1.5	4.4	-4.4	9.3	3.6	1.6
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Luxembourg			Netherlands		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-1.0	-6.8	-2.6	0.7	-0.2	-0.9
Agriculture	01	-1.0	-6.6	-2.5	0.7	-0.1	-0.9
Forestry	02	-0.8	-9.9	-4.0	4.0	-18.8	-4.0
Fishing	05	0.0	-10.2	-6.8	0.5	3.6	-1.9
<b>Mining and quarrying</b>	10-14	-2.4	0.0	0.0	3.1	0.0	-3.7
<b>Manufacturing</b>		0.1	-1.7	0.3	-0.5	-1.3	0.2
Food, drink & tobacco	15-16	0.5	1.6	1.2	-0.8	-0.8	-0.4
Textiles	17	-7.2	9.3	8.1	-2.1	-3.2	-2.8
Clothing	18	12.4	-8.6	-25.7	-5.8	-5.4	-7.0
Leather and footwear	19	-	-	-	-4.0	-8.2	-6.4
Wood & products of wood and cork	20	1.0	8.5	10.7	-2.6	-1.1	0.0
Pulp, paper & paper products	21	2.0	-4.5	0.0	0.1	-2.8	-0.6
Printing & publishing	22	0.2	1.1	4.9	0.9	0.1	-0.9
Mineral oil refining, coke & nuclear fuel	23	-	-	-	-0.3	0.0	-2.2
Chemicals	24	1.5	9.7	2.4	0.4	-3.4	-0.8
Rubber & plastics	25	-0.6	-2.1	0.4	2.8	0.0	1.0
Non-metallic mineral products	26	2.7	-1.8	-0.5	-1.4	0.3	-0.6
Basic metals	27	-1.5	-7.3	-4.4	-1.6	-3.3	-1.2
Fabricated metal products	28	1.7	0.0	2.6	-0.6	-0.8	1.4
Mechanical engineering	29	-0.3	-2.0	0.0	0.0	-0.7	2.3
Office machinery	30	-10.9	26.0	4.0	0.7	-3.1	2.7
<i>Insulated wire</i>	313	12.6	-19.6	0.9	0.7	-0.7	2.0
<i>Other electrical machinery and apparatus nec</i>	313	12.6	-19.6	0.9	0.7	-10.4	5.4
<i>Electronic valves and tubes</i>	321	-	-	0.0	0.7	-3.6	0.2
<i>Telecommunication equipment</i>	322	-	-	0.0	0.7	-3.6	0.2
<i>Radio and television receivers</i>	323	-	-	0.0	0.7	-3.6	0.2
<i>Scientific instruments</i>	331	-4.3	23.3	2.9	0.7	-6.1	2.5
<i>Other instruments</i>	33-						
	331	-4.3	23.3	2.9	0.7	-0.8	0.1
Motor vehicles	34	2.3	-8.1	-5.7	2.0	-0.2	0.6
<i>Building and repairing of ships and boats</i>	351	-	13.9	11.6	-7.6	0.5	-0.7
<i>Aircraft and spacecraft</i>	353	-	13.9	11.6	-0.7	-3.9	0.4
<i>Railroad equipment and transport equipment nec</i>	352+3	-					
	59		13.9	11.6	2.0	-14.2	1.2
Furniture, miscellaneous manufacturing; recycling	36-37	2.0	6.6	3.0	-0.7	1.1	1.4
<b>Electricity, gas and water supply</b>	40-41	1.5	0.0	0.0	0.0	-1.3	-3.0
<b>Construction</b>	45	3.2	4.1	1.9	-2.2	0.4	2.9
<b>Distributive trades</b>		1.0	2.6	2.4	1.4	2.8	2.7
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	1.6	1.6	3.1	0.6	1.6	2.5

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Luxembourg			Netherlands		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	1.7	2.3	2.9	1.5	2.0	3.1
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	0.9	1.6	2.1	1.4	2.3	2.4
Hotels & catering	55	0.1	5.3	2.0	1.9	6.1	2.6
<b>Transport</b>		2.2	2.0	6.9	0.7	1.9	1.8
Inland transport	60	2.2	2.1	6.9	1.1	2.2	2.1
Water transport	61	2.0	1.9	7.3	-0.8	-4.9	-2.0
Air transport	62	-	-	-	0.3	1.5	2.3
Supporting and auxiliary transport activities; activities of travel agencies	63	2.2	2.0	7.0	0.3	3.2	1.9
<b>Communications</b>	64	2.2	2.1	5.4	0.4	-1.0	5.9
<b>Financial Services</b>		4.6	3.9	6.7	3.4	0.7	4.3
Financial intermediation, except insurance and pension funding	65	4.4	3.3	4.9	3.3	-0.7	4.7
Insurance and pension funding, except compulsory social security	66	2.0	1.7	12.2	3.5	1.9	2.7
Activities auxiliary to financial intermediation	67	10.2	10.2	14.0	3.6	3.4	4.7
<b>Real estate activities</b>	70	3.5	6.5	5.5	3.9	4.0	2.8
<b>Business Services</b>		4.4	10.0	11.7	4.8	4.5	5.5
Renting of machinery and equipment	71	2.9	4.5	5.6	4.4	9.6	4.8
Computer and related activities	72	9.2	17.3	15.4	5.7	7.6	14.1
Research and development	73	4.2	9.5	8.2	3.3	4.3	2.4
<i>Legal, technical and advertising</i>	741-3	4.2	9.6	11.9	4.4	4.2	4.1
<i>Other business activities, nec</i>	749	4.2	9.6	11.5	5.2	4.2	5.3
<b>Public Administration, Education and Health</b>		1.3	3.5	4.0	1.9	0.7	2.2
Public administration and defence; compulsory social security	75	0.0	2.1	3.6	1.3	-1.4	0.7
Education	80	0.8	3.4	4.5	1.3	-0.1	1.9
Health and social work	85	3.4	4.8	3.8	2.8	2.4	3.2
<b>Other Community, Social and Personal Services</b>		1.9	2.6	4.3	2.8	1.9	1.6
Other community, social and personal services	90-93	3.1	2.4	3.8	3.0	2.6	2.5
Private households with employed persons	95	0.0	2.8	5.2	2.7	1.1	0.5
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Austria			Portugal		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-1.4	-2.5	-2.0	-3.4	-5.5	0.2
Agriculture	01	-1.4	-2.1	-1.8	-4.0	-4.1	1.1
Forestry	02	-1.4	-3.3	-2.4	-1.2	-10.1	-3.8
Fishing	05	-0.4	-3.6	-0.2	-2.0	-6.8	-1.5
<b>Mining and quarrying</b>	10-14	-5.8	-4.1	-1.9	-0.8	-0.5	-0.4
<b>Manufacturing</b>		-1.2	-2.0	-0.5	-0.3	-2.0	-1.0
Food, drink & tobacco	15-16	-1.5	-1.1	-2.0	-1.0	-1.9	-0.8
Textiles	17	-2.7	-6.2	-3.6	-2.0	-5.6	-3.3
Clothing	18	-4.2	-8.7	-7.5	1.7	-1.0	-2.6
Leather and footwear	19	-4.0	-7.8	-3.9	3.1	-2.5	-3.1
Wood & products of wood and cork	20	0.0	-0.8	-0.8	-1.5	-0.6	-0.2
Pulp, paper & paper products	21	-1.3	-1.5	-1.3	-0.1	-4.2	-2.7
Printing & publishing	22	-0.9	-1.2	-1.4	1.4	1.3	-0.9
Mineral oil refining, coke & nuclear fuel	23	-0.4	-3.4	-7.1	-0.7	-0.5	-8.1
Chemicals	24	-1.1	-2.8	0.1	-0.8	-6.1	-1.2
Rubber & plastics	25	-1.1	0.0	0.6	0.0	-2.0	2.4
Non-metallic mineral products	26	-0.5	-0.2	-1.9	-0.8	-0.5	-0.1
Basic metals	27	-3.5	-5.9	-0.3	-1.6	-1.7	-2.7
Fabricated metal products	28	-1.8	0.1	0.7	-0.6	-2.0	2.0
Mechanical engineering	29	0.1	-1.9	1.1	-0.7	-3.5	1.6
Office machinery	30	-2.2	4.9	-3.3	0.5	-4.7	-12.7
<i>Insulated wire</i>	313	2.6	11.9	-7.1	2.5	0.6	6.1
<i>Other electrical machinery and apparatus nec</i>	313	2.6	-1.8	-1.5	2.5	0.6	2.4
<i>Electronic valves and tubes</i>	321	-0.8	-3.2	10.3	-2.7	-2.8	-2.1
<i>Telecommunication equipment</i>	322	-0.8	-2.3	-2.4	-2.7	-2.7	22.7
<i>Radio and television receivers</i>	323	-0.8	-7.3	-1.3	-2.7	-2.8	-3.0
<i>Scientific instruments</i>	331	0.3	3.4	-0.4	-0.5	2.0	-0.5
<i>Other instruments</i>	33-331	0.3	-20.7	2.0	-0.5	2.0	-3.1
Motor vehicles	34	2.2	-1.5	7.1	2.9	-2.4	0.8
<i>Building and repairing of ships and boats</i>	351	-1.0	-32.1	1.0	-8.4	-5.9	-9.0
<i>Aircraft and spacecraft</i>	353	-5.4	-8.8	3.0	-3.6	15.4	-1.5
<i>Railroad equipment and transport equipment nec</i>	352+359	-5.4	-9.1	2.0	-3.6	15.5	-4.9
Furniture, miscellaneous manufacturing; recycling	36-37	-0.7	0.6	-1.7	1.1	0.2	0.7
<b>Electricity, gas and water supply</b>	40-41	0.2	0.2	-1.2	1.8	-4.8	-9.4
<b>Construction</b>	45	-0.8	2.5	-1.1	-0.8	-1.0	4.7
<b>Distributive trades</b>		1.1	1.0	1.1	1.3	0.2	2.8
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	0.8	0.8	-0.1	0.8	0.3	2.2

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Austria			Portugal		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	1.3	0.9	1.5	0.8	0.3	2.4
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	0.7	0.8	1.2	0.8	0.3	4.1
Hotels & catering	55	1.5	1.5	1.1	2.8	-0.2	1.2
<b>Transport</b>		0.8	1.6	0.6	0.1	-3.0	3.7
Inland transport	60	0.6	1.7	0.1	0.1	-3.0	3.2
Water transport	61	0.0	0.7	1.1	0.1	-3.0	-0.4
Air transport	62	2.4	1.2	5.0	0.1	-3.0	4.5
Supporting and auxiliary transport activities; activities of travel agencies	63	1.7	1.2	1.6	0.1	-3.0	5.3
<b>Communications</b>	64	0.3	-1.2	-1.2	-0.3	-3.2	1.9
<b>Financial Services</b>		2.0	0.3	0.4	1.2	0.0	1.0
Financial intermediation, except insurance and pension funding	65	2.0	0.0	0.1	1.6	0.1	1.2
Insurance and pension funding, except compulsory social security	66	1.5	0.5	-1.7	-0.5	-0.4	0.3
Activities auxiliary to financial intermediation	67	8.2	4.0	12.5	-	-	-
<b>Real estate activities</b>	70	0.8	2.4	1.9	6.6	10.1	3.9
<b>Business Services</b>		4.4	3.0	7.4	6.6	10.1	5.3
Renting of machinery and equipment	71	1.6	3.7	3.8	6.6	10.1	0.0
Computer and related activities	72	8.2	6.6	15.4	6.6	10.1	10.0
Research and development	73	3.6	1.8	6.1	6.3	9.7	8.0
<i>Legal, technical and advertising</i>	741-3	4.4	2.6	5.7	6.6	10.1	4.4
<i>Other business activities, nec</i>	749	4.4	2.6	7.7	6.6	10.1	5.8
<b>Public Administration, Education and Health</b>		2.1	1.7	1.5	3.2	2.0	2.2
Public administration and defence; compulsory social security	75	0.7	1.4	0.6	2.5	0.7	1.9
Education	80	2.2	1.7	1.4	4.0	4.5	1.7
Health and social work	85	3.6	1.9	2.4	3.7	1.4	3.3
<b>Other Community, Social and Personal Services</b>		2.1	1.9	2.3	0.6	2.7	0.8
Other community, social and personal services	90-93	2.6	2.0	2.2	0.6	2.7	0.8
Private households with employed persons	95	-3.9	0.5	4.8	-	-	-
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Finland			Sweden		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		-3.3	-5.8	-3.3	-2.9	-2.9	-2.9
Agriculture	01	-3.4	-5.5	-3.5	-3.2	-1.4	-2.3
Forestry	02	-2.8	-7.6	-2.9	-2.0	-8.0	-5.3
Fishing	05	-3.1	-1.9	-0.9	-1.9	2.5	-4.2
<b>Mining and quarrying</b>	10-14	-3.2	-3.3	0.3	-4.2	-3.5	-3.8
<b>Manufacturing</b>		-0.9	-3.9	1.8	-0.8	-3.5	1.0
Food, drink & tobacco	15-16	-0.8	-4.5	-1.5	-0.4	-3.6	-0.5
Textiles	17	-5.9	-9.7	0.4	-4.4	-7.2	-5.8
Clothing	18	-5.9	-15.2	-2.7	-4.4	-14.8	5.4
Leather and footwear	19	-3.9	-10.5	-4.4	-8.1	-6.8	-5.8
Wood & products of wood and cork	20	-3.0	-5.3	0.8	-1.0	-5.3	2.7
Pulp, paper & paper products	21	-1.6	-3.2	-0.7	-1.1	-3.4	-0.8
Printing & publishing	22	1.4	-5.6	0.4	-0.1	-3.9	-2.8
Mineral oil refining, coke & nuclear fuel	23	0.0	-0.6	1.9	0.9	-3.5	-1.4
Chemicals	24	1.4	-2.0	0.3	-0.7	-1.7	1.2
Rubber & plastics	25	-1.2	-2.4	4.1	-0.4	-1.9	-1.6
Non-metallic mineral products	26	0.4	-9.8	3.0	-1.5	-7.0	-0.1
Basic metals	27	-1.3	-2.0	0.5	-3.7	-5.7	1.6
Fabricated metal products	28	1.7	-4.3	6.8	-0.1	-5.6	2.6
Mechanical engineering	29	0.5	-3.3	2.3	0.1	-3.2	-1.1
Office machinery	30	4.4	5.9	-26.8	-1.5	-14.0	-5.0
<i>Insulated wire</i>	313	-4.9	-10.3	3.3	-1.5	-3.0	0.8
<i>Other electrical machinery and apparatus nec</i>	313	0.7	-1.5	1.1	-1.5	-2.9	-1.1
<i>Electronic valves and tubes</i>	321	5.3	9.7	4.7	-1.5	-0.9	6.8
<i>Telecommunication equipment</i>	322	3.3	15.5	10.7	-1.5	7.6	2.4
<i>Radio and television receivers</i>	323	1.8	-16.5	-5.8	-1.5	-25.8	11.2
<i>Scientific instruments</i>	331	5.2	4.8	7.4	-1.5	3.4	3.7
<i>Other instruments</i>	33-331	-0.2	1.0	5.9	-1.5	-1.6	11.0
Motor vehicles	34	1.3	-6.9	2.3	2.0	-3.0	4.9
<i>Building and repairing of ships and boats</i>	351	-4.2	-0.5	0.7	-3.6	-5.3	6.7
<i>Aircraft and spacecraft</i>	353	3.5	-1.7	1.2	-3.6	-4.1	1.6
<i>Railroad equipment and transport equipment nec</i>	352+359	-2.3	-5.3	-7.4	-3.6	-4.4	-2.4
Furniture, miscellaneous manufacturing; recycling	36-37	-1.3	-5.5	2.2	-0.7	-2.2	1.3
<b>Electricity, gas and water supply</b>	40-41	0.0	-5.1	-2.7	0.5	-2.6	1.0
<b>Construction</b>	45	1.6	-11.5	5.1	0.5	-6.2	1.5
<b>Distributive trades</b>		1.2	-5.6	2.8	0.9	-1.8	1.5
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	3.5	-7.1	3.7	0.3	-1.7	2.1

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		Finland			Sweden		
		1979-90	1990-95	1995-01	1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	0.0	-3.4	2.2	0.3	-1.7	3.0
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	1.1	-6.5	2.5	0.3	-1.7	-0.2
Hotels & catering	55	1.6	-5.2	3.9	3.9	-2.4	2.5
<b>Transport</b>		0.8	-3.0	1.5	1.0	-0.6	1.7
Inland transport	60	0.9	-4.0	1.8	1.0	-1.4	1.0
Water transport	61	-2.3	0.7	0.0	1.0	-0.1	1.7
Air transport	62	4.3	-1.5	3.5	1.0	-0.8	2.4
Supporting and auxiliary transport activities; activities of travel agencies	63	1.6	-1.6	0.5	1.0	1.7	3.3
<b>Communications</b>	64	1.2	-3.1	0.5	1.0	-5.8	1.0
<b>Financial Services</b>		2.1	-6.3	-3.1	2.5	-1.6	2.3
Financial intermediation, except insurance and pension funding	65	2.1	-8.0	-4.3	2.2	-1.1	1.4
Insurance and pension funding, except compulsory social security	66	1.1	0.0	-2.4	3.3	-3.4	2.5
Activities auxiliary to financial intermediation	67	16.1	-1.4	12.1	2.5	0.3	7.7
<b>Real estate activities</b>	70	1.6	-3.8	2.9	5.0	-1.1	-3.5
<b>Business Services</b>		7.0	-2.1	8.3	5.0	1.2	7.0
Renting of machinery and equipment	71	2.1	-5.9	6.2	5.0	0.4	4.4
Computer and related activities	72	9.1	-0.8	15.7	5.0	1.8	11.6
Research and development	73	4.0	-0.6	5.0	5.0	2.5	5.2
<i>Legal, technical and advertising</i>	741-3	7.6	-2.0	2.9	5.0	1.0	6.2
<i>Other business activities, nec</i>	749	7.0	-2.8	11.0	5.0	1.0	6.2
<b>Public Administration, Education and Health</b>		2.1	-1.0	1.6	1.4	-1.6	0.9
Public administration and defence; compulsory social security	75	1.4	-0.4	0.2	1.4	-1.6	1.6
Education	80	1.8	-0.2	2.2	1.4	-1.6	2.7
Health and social work	85	2.7	-1.8	2.1	1.4	-1.6	0.0
<b>Other Community, Social and Personal Services</b>		2.5	-0.6	3.5	1.4	-1.4	-1.7
Other community, social and personal services	90-93	3.0	-1.1	2.9	1.4	-1.4	-1.8
Private households with employed persons	95	-4.9	8.7	10.2	1.6	6.5	17.4
Extra-territorial organizations and bodies	99	-	-	-	-	-	-

**Appendix A. Employment growth at the broad sector and detailed industry level  
(persons based) continued...**

Industry		UK		
		1979-90	1990-95	1995-01
<b>Agriculture, Forestry and Fishing</b>		0.1	-2.8	-3.2
Agriculture	01	0.3	-2.4	-3.7
Forestry	02	0.3	-8.2	1.4
Fishing	05	-3.3	-9.3	6.5
<b>Mining and quarrying</b>	10-14	-7.9	-18.0	0.5
<b>Manufacturing</b>		-2.8	-3.4	-1.1
Food, drink & tobacco	15-16	-2.2	-2.6	0.7
Textiles	17	-5.3	-4.4	-5.5
Clothing	18	-3.3	-5.5	-10.4
Leather and footwear	19	-3.8	-9.2	-10.6
Wood & products of wood and cork	20	-0.2	-2.4	-1.1
Pulp, paper & paper products	21	-2.3	-0.9	-3.5
Printing & publishing	22	0.5	-0.8	0.5
Mineral oil refining, coke & nuclear fuel	23	-0.2	-4.2	2.5
Chemicals	24	-2.5	-3.8	-1.2
Rubber & plastics	25	-1.1	0.4	-0.5
Non-metallic mineral products	26	-2.7	-6.2	-1.3
Basic metals	27	-6.1	-6.3	-4.2
Fabricated metal products	28	-3.4	-3.0	-1.6
Mechanical engineering	29	-2.5	-4.6	-1.7
Office machinery	30	0.8	-4.6	1.5
<i>Insulated wire</i>	313	-0.4	-4.3	0.7
<i>Other electrical machinery and apparatus nec</i>	31-313	-3.9	0.0	-0.1
<i>Electronic valves and tubes</i>	321	-1.3	-7.6	-4.8
<i>Telecommunication equipment</i>	322	-2.6	-4.2	4.5
<i>Radio and television receivers</i>	323	-2.3	-4.5	-3.1
<i>Scientific instruments</i>	331	-1.8	1.6	-3.8
<i>Other instruments</i>	33-331	-2.9	-2.8	-0.6
Motor vehicles	34	-5.4	-2.1	-1.2
<i>Building and repairing of ships and boats</i>	351	-7.4	-9.6	0.1
<i>Aircraft and spacecraft</i>	353	-2.1	-9.7	4.2
<i>Railroad equipment and transport equipment nec</i>	352+359	-2.2	-7.3	1.3
Furniture, miscellaneous manufacturing; recycling	36-37	-1.2	-1.1	1.5
<b>Electricity, gas and water supply</b>	40-41	-1.9	-7.3	-7.6
<b>Construction</b>	45	2.0	-5.6	0.7
<b>Distributive trades</b>		1.4	-0.5	1.3
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	50	1.3	-1.1	-0.9

**Appendix A. Employment growth at the broad sector and detailed industry level (persons based) continued...**

Industry		UK		
		1979-90	1990-95	1995-01
Wholesale trade and commission trade, except of motor vehicles and motorcycles	51	1.3	-1.1	1.7
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	52	0.7	-0.1	1.2
Hotels & catering	55	2.9	-0.8	1.9
<b>Transport</b>		-0.6	-1.3	2.0
Inland transport	60	-2.9	-2.5	-20.5
Water transport	61	-7.0	-8.5	-5.2
Air transport	62	3.0	0.5	9.9
Supporting and auxiliary transport activities; activities of travel agencies	63	0.0	-0.9	3.2
<b>Communications</b>	64	0.9	-2.0	3.2
<b>Financial Services</b>		3.6	-1.4	0.9
Financial intermediation, except insurance and pension funding	65	3.6	-1.5	-0.8
Insurance and pension funding, except compulsory social security	66	2.4	-2.5	2.3
Activities auxiliary to financial intermediation	67	5.0	0.2	4.2
<b>Real estate activities</b>	70	5.1	5.8	4.1
<b>Business Services</b>		3.9	1.1	4.5
Renting of machinery and equipment	71	2.8	-3.5	6.0
Computer and related activities	72	6.7	3.9	10.9
Research and development	73	-1.9	-0.9	2.6
<i>Legal, technical and advertising</i>	741-3	4.1	1.2	2.0
<i>Other business activities, nec</i>	749	4.1	1.2	4.7
<b>Public Administration, Education and Health</b>		1.2	0.5	1.3
Public administration and defence; compulsory social security	75	-1.2	-0.6	0.5
Education	80	1.3	-0.2	3.1
Health and social work	85	2.8	1.5	0.5
<b>Other Community, Social and Personal Services</b>		2.1	0.2	2.4
Other community, social and personal services	90-93	2.1	0.2	2.4
Private households with employed persons	95	-	-	-
Extra-territorial organizations and bodies	99	-	-	-

## Appendix B. Industry taxonomies

### ICT Taxonomy

1. *ICT Producing - Manufacturing* (ICTPM): Office machinery (30); Insulated wire (313); Electronic valves and tubes (321); Telecommunication equipment (322); Radio and television receivers (323); Scientific instruments (331).
2. *ICT Producing – Services* (ICTPS): Communications (64); Computer & related activities (72).
3. *ICT Using – Manufacturing* (ICTUM): Clothing (18); Printing & publishing (22); Mechanical engineering (29); Other electrical machinery & apparatus (31-313); Other instruments (33-331); Building and repairing of ships and boats (351); Aircraft and spacecraft (353); Railroad equipment and transport equipment nec (352+359); Furniture, miscellaneous manufacturing; recycling (36-37).
4. *ICT Using – Services* (ICTUS): Wholesale trade and commission trade, except of motor vehicles and motorcycles (51); Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods (52); Financial intermediation, except insurance and pension funding (65); Insurance and pension funding, except compulsory social security (66); Activities auxiliary to financial intermediation (67); Renting of machinery & equipment (71); Research & development (73); Legal, technical & advertising (741-3).
5. *Non-ICT Manufacturing* (NICTM): Food, drink & tobacco (15-16); Textiles (17); Leather and footwear (19); Wood & products of wood and cork (20); Pulp, paper & paper products (21); Mineral oil refining, coke & nuclear fuel (23); Chemicals (24); Rubber & plastics (25); Non-metallic mineral products (26); Basic metals (27); Fabricated metal products (28); Motor vehicles (34).
6. *Non-ICT Services* (NICTS): Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel (50); Hotels & catering (55); Inland transport (60); Water transport (61); Air transport (62); Supporting and auxiliary transport activities; activities of travel agencies (63); Real estate activities (70); Other business activities, nec (749); Public administration and defence; compulsory social security (75); Education (80); Health and social work (85); Other community, social and personal services (90-93); Private households with employed persons (95); Extra-territorial organizations and bodies (99).
7. *Non-ICT Other* (NICTO): Agriculture (01); Forestry (02); Fishing (05); Mining and quarrying (10-14); Electricity, gas and water supply (40-41); Construction (45)

## Skill Taxonomy

1. *High skilled (HS)*: Mineral oil refining, coke and nuclear fuel (23); Chemicals (24); Office machinery (30); Radio, television and communications equipment (32); Electronic valves and tubes (321); Telecommunication equipment (322); Radio and television receivers (323); Financial intermediation, except insurance and pension funding (65); Insurance and pension funding, except compulsory social security (66); Activities auxiliary to financial intermediation (67); Real estate activities (70); Computer and related activities (72); Research & development (73); Other business services (74); Public administration and defence; compulsory social security (75); Education (80).
2. *High-intermediate skilled (HIS)*: Medical, precision & optical instruments (33); Scientific instruments (331); Other instruments (33-331); Other transport equipment (35); Building and repairing of ships and boats (351); Aircraft and spacecraft (353); Railroad equipment and transport equipment nec (352+359); Electricity, gas and water supply (40-41); Air transport (62); Supporting and auxiliary transport activities; activities of travel agencies (63); Communications (64); Renting of machinery & equipment (71); Health and social work (85).
3. *Low-intermediate skilled (LIS)*: Wood & products of wood and cork (20); Pulp, paper & paper products (21); Printing & publishing (22); Fabricated metal products (28); Mechanical engineering (29); Electrical machinery and apparatus (31); Insulated wire (313); Other electrical machinery & apparatus (31-313); Construction (45); Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel (50); Wholesale trade and commission trade, except of motor vehicles and motorcycles (51); Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods (52); Inland transport (60); Water transport (61).
4. *Low skilled (LS)*: Agriculture (01); Forestry (02); Fishing (05); Mining and quarrying (10-14); Food, drink & tobacco (15-16); Textiles (17); Clothing (18); Leather and footwear (19); Rubber & plastics (25); Non-metallic mineral products (26); Basic metals (27); Motor vehicles (34); Furniture, miscellaneous manufacturing; recycling (36-37); Hotels & catering (55); Other community, social and personal services (90-93).

## IT Occupational Taxonomy

1. *IT producer – services (IOPS)*: Computer and related activities (72).
2. *IT producer – manufacturing (IOPM)*: Computers and office machinery (30).
3. *Dynamic IT user with a high and growing IT-labour intensity (IOU)*: Mining and quarrying (10-14); Mineral oil refining, coke and nuclear fuel (23); Chemicals (24); Electrical machinery and apparatus (31); Radio, television and communication (32); Instrument engineering (33); Motor vehicles (34), Other transport equipment (35), Electricity, gas and water supply (40-41), Air transport (62); Telecommunications (642); Financial intermediation (65, 67), Insurance and pension funding (66), Research and development (73); Other business services (71, 74), Public administration and defence, incl. compulsory social security (75); Education (80).
4. *Other IT user industries (NIO)*: Agriculture, forestry and fishing (01-05), Food, drink and tobacco (15-16), Textiles, leather, footwear and clothing (17-19), Wood, products of wood and cork; Pulp, paper and paper products, printing and publishing (20-22), Rubber and plastics (25), Non-metallic mineral products, furniture, miscellaneous manufacturing (26, 36-37), Basic metals and fabricated metal products (27-28), Mechanical engineering (29), Construction (45), Sale, maintenance and repair of motor vehicles and motor cycles (50), Wholesale trade (51), Retail trade (52), Hotels and catering (55), Railways (601), Other inland transport, Water transport (602-603, 61), Supporting and auxiliary transport activities, activities of travel agencies (63), Post and courier activities (641), Real estate (70), Health and social work (85), Other community, social and personal services (90-93).

## Innovation Taxonomy

1. *Supplier Dominated Goods (SDG)*: Agriculture (01) Forestry (02) Fishing (05) Textiles (17); Clothing (18); Leather and footwear (19); Wood & products of wood and cork (20); Pulp, paper & paper products (21); Printing & publishing (22); Furniture, miscellaneous manufacturing; recycling (36-37); Construction (45).
2. *Scale Intensive industry (SII)*: Mining and quarrying (10-14); Food, drink & tobacco (15-16); Mineral oil refining, coke & nuclear fuel (23); Rubber & plastics (25); Non-metallic mineral products (26); Basic metals (27); Fabricated metal products (28); Motor vehicles (34); Building and repairing of ships and boats (351); Aircraft and spacecraft (353); Railroad equipment and transport equipment nec (352+359); Electricity, gas and water supply (40-41).
3. *Specialised Goods Suppliers (SGS)*: Mechanical engineering (29); Office machinery (30); Insulated wire (313); Electronic valves and tubes (321); Telecommunication equipment (322); Scientific instruments (331); Other instruments (33-331).
4. *Science Based Innovator (SBI)*: Chemicals (24); Other electrical machinery & apparatus (31-313); Radio and television receivers (323).
5. *Supplier Dominated Services (SDS)*: Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods (52); Water transport (61); Communications (64).
6. *Specialised Services Suppliers (SSS)*: Computer and related activities (72); Research & development (73); Legal, technical and advertising (741-3).
7. *Organisational Service Innovators (OSI)*: Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel (50); Inland transport (60); Air transport (62); Financial intermediation, except insurance and pension funding (65); Insurance and pension funding, except compulsory social security (66) Real estate activities (70); Renting of machinery & equipment (71).
8. *Client-Led Services (CLS)* Wholesale trade and commission trade, except of motor vehicles and motorcycles (51); Hotels and catering (55); Supporting and auxiliary transport activities; activities of travel agencies (63); Activities auxiliary to financial intermediation (67); Other business services nec. (749); Other Community, social and personal services (90-93); Private households with employed persons (95);
9. *Non-Market Services (NMS)* Public administration (75); Education (80); Health (85).

## Appendix C. Trends in total hours worked

**Table C.1: Labour input growth (hours based)<sup>7</sup>**

	1979-1990	1990-1995	1995-2001
US	1.55	1.05	1.56
EU	0.08	-0.79	1.01
Austria	-0.23	-1.35	0.13
Belgium	-0.64	-0.84	0.33
Germany	0.28	-0.29	0.02
Denmark	-0.39	-0.49	0.76
Spain	-0.02	-0.57	2.76
Finland	0.16	-3.83	1.92
France	-0.54	-0.68	0.88
Greece	0.66	0.62	0.50
Ireland	-0.40	1.28	3.63
Italy	0.40	-1.03	1.08
Luxembourg	1.06	1.72	4.20
Netherlands	0.11	0.50	2.07
Portugal	-0.15	-1.09	0.71
Sweden	0.86	-1.42	1.21
UK	0.20	-1.52	1.06

**Table C.2: Labour input growth, broad sectors in the EU and the US (hours based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
Agriculture, Forestry and Fishing	-3.6	-1.1	-4.7	0.6	-2.3	-0.4
Mining and quarrying	-4.2	-2.0	-10.1	-3.8	-4.1	-0.8
Manufacturing	-1.6	-0.7	-2.8	-0.3	-0.3	-1.1
Electricity, gas and water supply	-0.1	1.5	-2.7	-0.1	-3.5	-1.2
Construction	-0.4	1.5	-1.3	0.2	0.5	3.9
Distributive trades	0.9	1.7	-0.3	1.2	1.5	1.2
Transport	-0.1	1.2	-1.2	3.2	1.4	1.4
Communications	0.3	0.3	-2.1	0.7	0.7	1.1
Financial Services	1.6	2.5	-0.3	0.4	0.7	1.9
Real Estate	3.8	2.5	2.1	0.6	2.3	2.1
Business Services	3.9	6.4	2.7	3.1	5.4	4.8
Other Community, Social and Personal Services	3.0	1.6	1.6	1.4	2.3	1.3
Public Administration, Education and Health	1.4	2.3	0.6	1.3	0.7	1.9

<sup>7</sup> Note that in 1979-1990, growth in hours worked was negative for seven of the EU countries, in contrast to growth in the number of persons engaged, which was positive for all countries in this period.

**Table C.3: Labour input growth of ICT-producing, ICT-using and non-ICT industries in the EU and the US (hours based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
ICT Producing Industries	0.6	1.4	-1.2	0.9	3.0	3.5
<i>ICT Producing Manufacturing</i>	-0.8	0.3	-3.1	-1.5	0.5	-0.5
<i>ICT Producing Services</i>	1.4	2.4	-0.3	2.8	4.1	5.8
ICT Using Industries	0.4	1.5	-0.8	0.4	1.1	0.7
<i>ICT Using Manufacturing</i>	-1.2	-0.4	-3.3	-1.2	-0.6	-1.7
<i>ICT Using Services</i>	1.2	2.0	0.1	0.8	1.7	1.2
Non-ICT Industries	-0.1	1.6	-0.8	1.4	0.9	1.8
<i>Non-ICT Manufacturing</i>	-1.8	-1.1	-2.5	0.6	-0.3	-0.9
<i>Non-ICT Services</i>	1.6	2.6	0.6	1.8	1.7	2.2
<i>Non-ICT Other</i>	-2.0	0.4	-3.0	0.0	-0.9	2.1

**Table C.4: Labour input growth in the EU and the US, skills taxonomy (hours based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
<b>Skill taxonomy</b>						
High skilled (HS):	1.6	2.6	0.5	1.1	2.0	2.6
High-intermediate skilled (HIS):	1.0	3.1	0.0	1.7	1.3	1.7
Low-intermediate skilled (LIS):	-0.2	0.7	-1.3	0.8	0.7	1.2
Low skilled (LS):	-1.2	0.5	-1.9	0.9	0.2	0.3

**Table C.5: Labour input growth in the EU and the US, IT occupational taxonomy (hours based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
<b>Occupational taxonomy</b>						
IT Producer service (IOPS)	5.3	11.0	4.3	6.9	8.2	11.6
IT Producer manufacturing (IOPM)	1.6	-1.3	-4.6	-3.7	-0.2	-5.0
Dynamic IT user (IOU)	0.7	2.0	0.1	0.7	1.0	1.9
IT user other (NIO)	-0.6	1.2	-0.5	1.2	0.4	1.2

**Table C.6: Labour input growth in the EU and US, combined Pavitt-SIID taxonomy (hours based)**

	1979-1990		1990-1995		1995-2001	
	EU	US	EU	US	EU	US
<b>Pavitt / SIID Taxonomy</b>						
Supplier dominated manufacturing	-2.0	0.2	-2.9	0.1	-0.9	0.9
Supplier dominated services	0.4	0.9	-0.7	0.9	1.0	0.6
Scale intensive industry	-1.7	-0.9	-2.7	-0.5	-0.2	-0.3
Specialized suppliers manufacturing	-1.0	-0.7	-3.3	-0.6	0.2	-0.8
Specialized suppliers services	3.9	5.7	2.6	2.1	5.0	4.6
Science based and organizational innov manufacturing	-1.0	-0.8	-3.2	-0.7	-0.6	-1.4
Science based and organizational innov services	1.0	1.9	-0.8	1.2	1.0	2.1
Client led services	2.1	2.9	1.0	2.0	2.9	2.1
Non-market services	1.4	2.3	0.6	1.3	0.7	1.9

## Appendix D. Employment shares by industry taxonomies

**Table D.1: Employment shares of ICT-producing, ICT-using and non-ICT industries in the EU and the US (persons based)**

	1979		1990		2000	
	EU	US	EU	US	EU	US
ICT Producing Industries	3.5	4.1	3.7	4.0	3.9	4.6
<i>ICT Producing Manufacturing</i>	1.5	2.1	1.3	1.8	1.1	1.4
<i>ICT Producing Services</i>	2.0	2.1	2.3	2.3	2.8	3.2
ICT Using Industries	25.9	31.4	27.0	31.6	27.0	29.7
<i>ICT Using Manufacturing</i>	8.9	7.3	7.6	5.7	6.0	4.4
<i>ICT Using Services</i>	17.1	24.2	19.4	25.9	20.9	25.3
Non-ICT Industries	70.6	64.4	69.4	64.4	69.2	65.8
<i>Non-ICT Manufacturing</i>	16.0	10.9	12.8	7.8	10.9	6.8
<i>Non-ICT Services</i>	35.0	43.1	41.3	47.4	46.0	49.9
<i>Non-ICT Other</i>	19.6	10.4	15.3	9.2	12.3	9.1

**Table D.2: Employment shares in the EU and the US, skills taxonomy (persons based)**

	1979		1990		2000	
	EU	US	EU	US	EU	US
<b>Skill taxonomy</b>						
High skilled (HS):	22.5	29.8	26.4	32.8	29.3	34.2
High-intermediate skilled (HIS):	12.2	12.8	13.6	14.9	14.2	15.2
Low-intermediate skilled (LIS):	34.1	33.2	32.9	30.9	31.5	30.1
Low skilled (LS):	31.2	24.2	27.1	21.4	25.0	20.4

**Table D.3: Employment shares in the EU and the US, IT occupational taxonomy (persons based)**

	1979		1990		2000	
	EU	US	EU	US	EU	US
<b>Occupational taxonomy</b>						
IT Producer service (IOPS)	0.4	0.3	0.6	0.7	1.2	1.6
IT Producer manufacturing (IOPM)	0.2	0.4	0.2	0.3	0.1	0.1
Dynamic IT user (IOU)	29.4	35.4	31.7	37.0	32.7	36.8
IT user other (NIO)	70.1	64.0	67.5	62.1	65.9	61.5

**Table D.4: Employment shares in the EU and US, combined Pavitt-SIID taxonomy (persons based)**

	1979		1990		2000	
	EU	US	EU	US	EU	US
<b>Pavitt / SIID Taxonomy</b>						
Supplier dominated manufacturing	25.7	14.8	20.1	12.7	16.2	11.8
Supplier dominated services	10.2	14.0	10.5	13.7	10.6	13.2
Scale intensive industry	13.3	9.8	10.8	7.2	9.2	6.0
Specialized suppliers manufacturing	4.2	4.3	3.7	3.3	3.0	2.8
Specialized suppliers services	2.5	3.0	3.9	4.5	5.5	5.7
Science based and organizational innov manufacturing	2.8	1.8	2.5	1.3	1.9	1.1
Science based and organizational innov services	7.8	8.2	8.6	8.5	8.5	8.5
Client led services	15.0	19.8	18.6	22.6	22.6	24.8
Non-market services	18.7	24.4	21.4	26.1	22.4	26.0

**Appendix E. Ranked employment shares, skill taxonomy, 1979, 1990 and 2001**

	<b>RANK 1979</b>	<b>RANK 1990</b>	<b>RANK 2001</b>
<b>High</b>			
US	1	2	4
EU	9	7	7
Austria	13	15	14
Belgium	2	1	2
Germany	7	9	9
Denmark	8	8	8
Spain	15	14	16
Finland	12	12	12
France	3	3	3
Greece	17	17	17
Ireland	14	13	13
Italy	11	10	11
Luxembourg	6	6	1
Netherlands	4	4	6
Portugal	16	16	15
Sweden	10	11	10
UK	5	5	5
<b>High-intermediate</b>			
US	8	7	8
EU	9	10	11
Austria	13	12	12
Belgium	7	8	6
Germany	11	11	9
Denmark	2	2	2
Spain	16	15	15
Finland	4	3	3
France	10	9	10
Greece	15	16	16
Ireland	6	5	7
Italy	12	13	14
Luxembourg	14	14	13
Netherlands	5	6	5
Portugal	17	17	17
Sweden	1	1	1
UK	3	4	4

**Appendix E. Ranked employment shares, skill taxonomy, 1979, 1990 and 2001 continued...**

	<b>RANK 1979</b>	<b>RANK 1990</b>	<b>RANK 2001</b>
<b>Low-intermediate</b>			
US	14	15	13
EU	8	7	7
Austria	4	3	3
Belgium	12	13	14
Germany	11	9	9
Denmark	16	16	16
Spain	3	4	4
Finland	9	10	12
France	10	11	8
Greece	1	1	1
Ireland	5	5	6
Italy	6	6	5
Luxembourg	7	8	15
Netherlands	15	12	10
Portugal	2	2	2
Sweden	17	17	17
UK	13	14	11
<b>Low</b>			
US	9	11	12
EU	7	6	9
Austria	14	8	7
Belgium	11	15	17
Germany	1	2	3
Denmark	3	7	8
Spain	8	4	1
Finland	4	3	6
France	12	13	16
Greece	16	16	13
Ireland	17	17	10
Italy	6	5	5
Luxembourg	2	1	2
Netherlands	5	10	11
Portugal	15	14	4
Sweden	10	12	14
UK	13	9	15

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