Chapter 7

POTENTIAL OFF-SHORING OF ICT-INTENSIVE OCCUPATIONS

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Abstract. Services are increasingly tradable, mainly as a result of rapid technological advances, in particular in information and communication technologies (ICT), and continuing liberalisation of trade in services. This has led to the relatively new phenomenon of global services sourcing or offshoring. This chapter analyses evidence from both trade and employment data. It finds that many of the countries prominent in the offshoring debate have experienced rapid growth of exports of computer and information services and other business services. However, the bulk of these exports still originates from OECD member countries. Detailed analysis of occupational data for OECD countries to determine the share of total employment that could potentially be affected by international sourcing of information technology and ICT-enabled services has yielded estimates close to 20%. Services sectors such as business services (*e.g.* accounting, consulting), financial services and research and development have a relatively high share of such employment. Both low and high skill white collar occupations are identified by the study as potentially affected by this phenomenon of global services sourcing.

Introduction

This chapter analyses international sourcing and the potential offshoring of ICT-intensive using occupations. There is little hard evidence of the extent of international outsourcing and offshoring, despite widespread media attention. Chapters 2 and 6 of the 2004 *OECD Information Technology Outlook* analyse international sourcing of information technology (IT) and ICT-enabled services (often referred to as "offshoring"). This includes international insourcing, to foreign affiliates, and international outsourcing where activities are contracted out to independent parties in other countries.

The current media focus is on the offshoring of jobs, but in- and out-sourcing can also take place domestically, and domestic outsourcing is still much larger than international outsourcing. Offshoring and outsourcing have existed for many years in the manufacturing sector but are now increasingly taking place in the services sector as a result of increased tradability of services, which has resulted from trade liberalisation and rapid technological developments, particularly in ICTs, and the ability to codify and standardise routine IT and ICT-enabled services tasks. As a result, the production of many services activities has become increasingly location independent. Some firms, sectors and countries will be net exporters of international services sourcing activities, while others will be net importers. The main firm-level drivers are increased competition and the ensuing need to achieve efficiency gains and cut costs, as well as the need to fill skills shortages.

To date, most evidence of offshoring is anecdotal and there are no official statistics measuring the extent of the offshoring phenomenon. This is complicated by important definitional and measurement problems. In the absence of official statistics on offshoring, it is necessary to look at indirect measures, such as trade in services and employment data. However, even the official statistics on these indirect measures are difficult to interpret and in many cases imperfect.

This chapter summarises recent analysis that contributes to clarifying the debate on the offshoring of jobs. The offshoring phenomenon is described and illustrated below. The third section will examine what can be learned from trade data and the penultimate section will look at the results from the ongoing analysis of employment data. The final section draws conclusions.

Offshoring, or international sourcing, of IT and ICT-enabled services

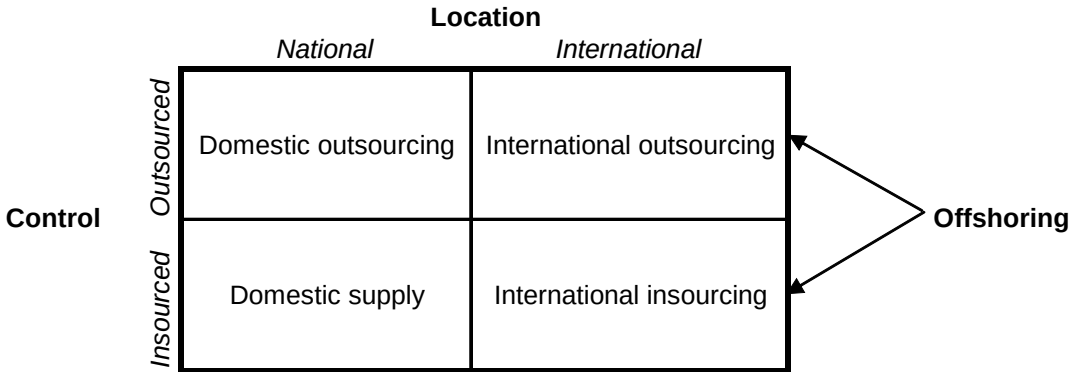
Offshoring — the international sourcing of IT and ICT-enabled business support services such as customer services, back-office services and professional services — is a recent development in the globalisation of services sectors. It has arisen in response to the need to cut costs and fill skills shortages, and competition has created a self-reinforcing dynamic. Once one or two firms shifted to lower-cost locations and moved the cost/quality frontier, others had to follow. How long the dynamic will be maintained will depend on the availability of skills and relative wage and other costs. As activities are being moved off shore, relative wages will adjust and slow the offshoring process. The extent to which activities can be moved off shore will also depend on the supply of skilled labour overseas and the potential for undertaking service activities at a distance.

In a context of globalisation, market deregulation and rapid technological developments, firms increasingly resort to new organisational forms in order to face competitive pressures. Firms can reorganise through mergers and acquisitions, joint ventures and strategic alliances,[1] but also by sourcing activities to foreign affiliates or outsourcing them to external suppliers. By concentrating on their core comparative advantages and outsourcing other activities, firms may increase their competitiveness through cuts in labour and capital investment costs and the exploitation of economies of scale. Global sourcing may also lead to more efficient organisation of firms and allow them to share and spread risk. Furthermore, rapid developments in ICTs provide increasing opportunities for global sourcing. In particular, "knowledge work" such as data entry and information processing services and research and consultancy services can easily be carried out via the Internet and e-mail, as well as tele- and video- conferencing (ICT-enabled services provisions). Increasingly, activities such as call centres have also started to be offshored. For example, when phoning a call centre via a local telephone number in the United Kingdom, the person answering may well be located in Bangalore.

Services offshoring is a recent development in ongoing globalisation as services become increasingly tradable, and involves both international outsourcing (giving rise to unaffiliated trade in services) and international sourcing in foreign affiliates (giving rise to foreign direct investment [FDI] and affiliated trade in services). It is useful to define the nature and scope of offshoring, or international sourcing, in terms of a matrix of location and control (see Figure 7.1). Within such a framework, services can be supplied internally (*i.e.* insourced) or by an external supplier (*i.e.* outsourced), and they can be supplied from within the country (nationally) or from another country (internationally).

1. See Pain and van Welsum (2003), for example.

Figure 7.1. **Offshoring, outsourcing and insourcing – an illustrative matrix**



Manufacturers have sourced components from other countries for many years, but the international sourcing of business support services, and ICT-enabled services more generally, is a relatively recent phenomenon. It has been enabled by rapid developments in IT systems and broadband communications and by the liberalisation of trade in services, which are making services more easily tradable. As a result, service activities are now less constrained in their choice of location than they have been traditionally. As services account for a large share of production costs, there is increasing pressure to seek lower-cost solutions for the provision of business process services. Offshoring is one response to these ongoing cost pressures and to the ICT and related skills shortages experienced in many developed countries during the late 1990s.

Measuring the extent of offshoring: what do the trade data tell us?

There are no official data measuring the extent of the offshoring and outsourcing phenomenon directly as there are many challenges involved in tracking offshoring activities. In addition to there being a number of modes of offshoring, difficulties also result from definitional and data collection complications. For example, if international sourcing implicitly refers to activities that were previously carried out in the home country and within the firm (in the case of outsourcing), this raises the question of "when outsourcing stops being outsourcing", *i.e.* when does it become just another intermediate purchase? Trade in services provides one possible proxy for offshoring, but other possibilities include employment data or Input-Output Tables.

One way to examine the extent of offshoring using trade data would be to look at countries' imports of services (Schultze, 2004; van Welsum, 2004). If a country sources services activities internationally, this should result in a return flow of imports of services. For example, van Welsum (2004) finds a clear effect of production relocation in the services sector on US imports of services. Another way is to look at exports of services, especially of countries that are host to international sourcing activities.

Offshoring of services activities should result in a return flow of exports of services from the country receiving the international sourcing. For example, Indian exports of ICT-enabled services have grown rapidly since the mid-1990s. The extent of international trade in IT and ICT-enabled business process services in international statistics is approximated by summing the International Monetary Fund (IMF) Balance of Payments categories "computer and information services" and "other business services" (see Annex Table 7.A1.1 for details on which services are included in these categories). These data contain information on international outsourcing and international insourcing

combined (see also van Welsum, 2004), although it is not possible to identify the proportion of the trade that results directly from offshoring. Data on computer and information services are not available for all countries. For some, such as India, they are included under "other business services", along with other services.[2] The "other business services" category may have variable shares of IT and ICT-enabled services in different countries. Moreover, the data are reported in current US dollars and will be affected by currency fluctuations.

Most exports of other business services and computer and information services still originate in OECD member countries although their share declined by 2.4 percentage points between 1995 and 2002 (from 79.5% of total reported value shares in 1995 to 77.1% in 2002).[3] Figure 7.2 shows the 15 countries that accounted for the largest value shares in 2002, as well as some other selected countries. OECD countries have the top five shares of these services exports with India in sixth position. Nevertheless, some non-member developing economies are experiencing rapid growth in exports (see Figure 7.3), although most are starting from very low levels. Only India and Ireland are among the ten countries with the largest shares and the fastest growth rates.

Exports of other business services and computer and information services are sensitive to the overall business cycle. The global downturn affected total reported values (in current USD) of exports, with annual growth rates averaging 6.9% over the period 1995-2000, and 3.9% for 2000-2002. For some countries, the difference was more marked. India, for example, experienced very strong average growth of its exports over the period 1995-2000 with a compound annual growth rate (CAGR) of 43.8%, which slowed to 19.6% for 2000-2002.

It remains, however, difficult to interpret these data and link them to different sourcing activities. It is not possible to tell what share of these exports results from international sourcing activities. Offshoring can include unaffiliated trade in services (from international outsourcing), affiliated trade (from international insourcing) and also temporary migration (Mode 4 trade in services under the General Agreement on Trade in Services [GATS]). But temporary migration is not captured by balance of payments trade data.[4] Furthermore, the quality of the data may be variable and very large discrepancies between reported exports and imports may.[5] Some of the problems with data on trade in services can be explained by factors such as reporting difficulties, collection methods (company surveys rather than customs records for goods), varying timelines of implementing Balance of Payments (BPM5) methodology and rules, the treatment of certain services categories, and the complexity of the structures and operations of multinational firms (OECD, 2004a).

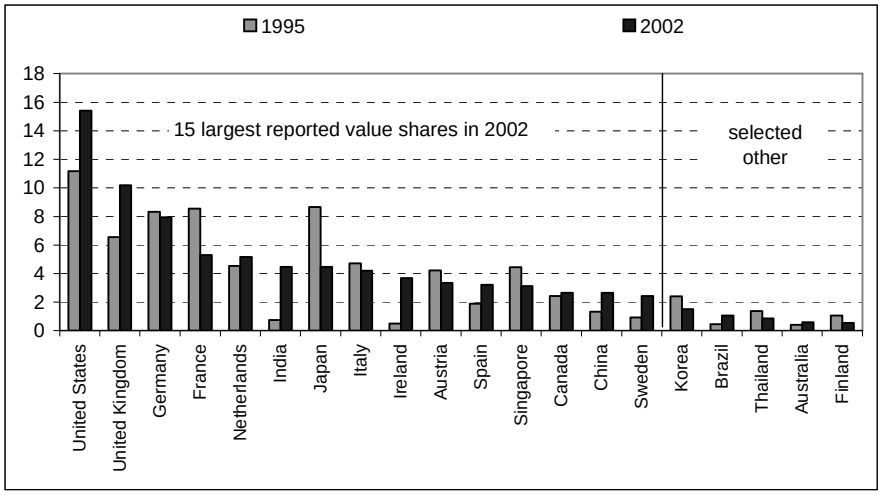
2. For India, the category "other business services" includes all services except travel, transport and government services. However, Indian firms are now extensively exporting ICT-enabled services and business process services and the remaining services included in the category are likely to be small in comparison. Furthermore, data on overseas revenues from annual reports of top Indian export firms show patterns similar to the IMF data.

3. The share of some services exporting countries may be understated as they may not have very good data on trade in services to report to the IMF, which will bias their actual share downwards. Furthermore, other countries that export services may not be members and may not report to the IMF.

4. See van Welsum (2003) for a discussion.

5. See OECD (2004a), Chapter 2, for the Indian example.

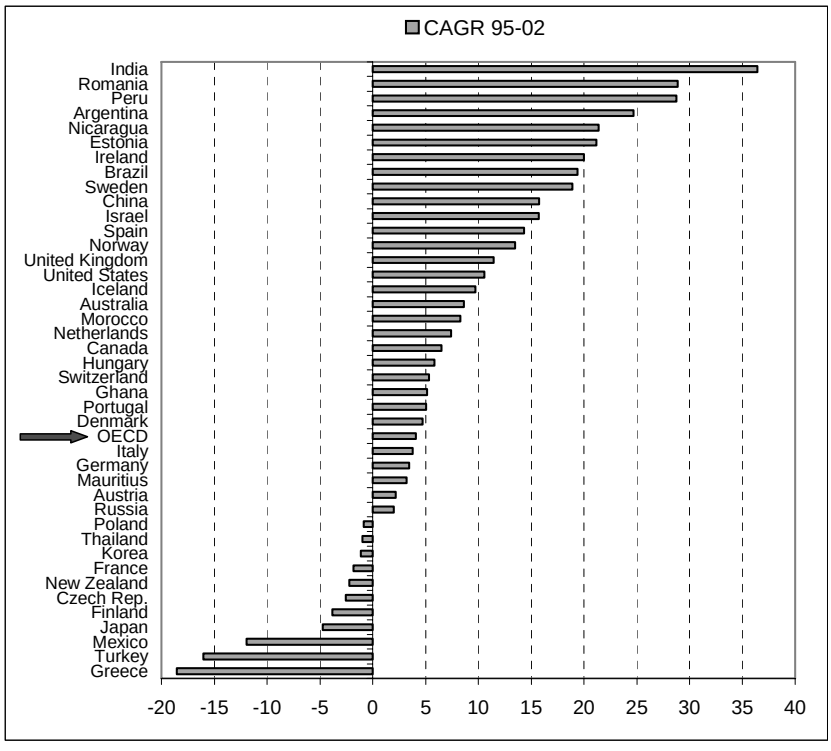
Figure 7.2. **Share of the value of reported total exports[1] of other business services and computer and information services, selected countries, 1995 and 2002**
Decreasing order of the total reported value share in 2002, %



Note: 1. The reported total for all countries does not necessarily correspond to a world total. For some countries, such as India, it is not possible to isolate other business services and computer and information services. As a consequence, for India, the category includes total services, minus travel, transport and government services (*i.e.* including construction, insurance and financial services as well as other business services and computer and information services).

Source: OECD (2004), *OECD Information Technology Outlook*, Chapter 2, OECD, Paris.

Figure 7.3. **Growth of the value of exports of other business services and computer and information services for selected countries, 1995-2002**
Compound annual growth rate, %



Source: OECD (2004), *OECD Information Technology Outlook*, Chapter 2, OECD, Paris.

More recent data for 2003 point to a confirmation of certain countries as offshoring locations, backing up anecdotal evidence of offshoring to Cape Verde, Estonia, Morocco and Russia, for example (see Table 7.1). It should be kept in mind again though that the exports of some of these countries are growing from a low base. Furthermore, as these data are in current US dollars, currency fluctuations affect these growth rates.

Table 7.1. **Growth of exports of other business and computer and information services, top 15 of OECD countries and selected other countries, respectively, 2002-2003**

Rank	OECD	%	Non-OECD	%
1	Luxembourg	53.3	Estonia	71.4
2	Ireland	34.9	China	67.6
3	Turkey	33.6	Morocco	60.4
4	Sweden	29.7	Ethiopia	58.7
5	Poland	29.3	Macedonia, FYR	53.9
6	Finland	28.6	Colombia	53.9
7	Germany	24.5	Cape Verde	53.6
8	Italy	23.3	Bangladesh	51.0
9	Spain	22.4	Russia	46.7
10	Belgium	20.1	Ukraine	44.8
11	Australia	18.0	South Africa	44.1
12	Portugal	17.7	Croatia	42.0
13	Norway	16.0	Argentina	40.5
14	France	15.8	Guinea	39.0
15	Austria	14.7	Romania	32.3

Note: Data for 2003 were not available for all countries, notably for India. Data for Mexico are excluded as they are subject to revision.

Source: Authors' calculations, based on IMF Balance of Payments Database (January 2004).

What can be learned from employment data?

Anecdotal data and projections of jobs lost to offshoring

Labour costs and skills shortages are among the drivers of international sourcing, and the current media focus is on the offshoring of services jobs, so it is important to see what can be learned from employment data, and from occupational employment data in particular. However, most data on changes in employment are anecdotal (illustrated in Table 7.2) or based on model projections, which vary widely across sources and studies, as illustrated by the example for the United States (see Table 7.3).

The large differences in the projection numbers published by different sources illustrate the difficulty of measuring the international sourcing phenomenon as well as its impact. To put these numbers into perspective though, some 15 million jobs disappear in the US economy each year, and slightly more are being created on average. While most other OECD economies experience relatively lower job turnover rates than the United States, it is still the case that even the largest projections of jobs "lost" to offshoring are small in comparison to annual job turnover, and most job terminations are not related to offshoring (OECD, 2004b).

Table 7.2. **Services outsourcing: the case of India (as of September 2003)**

	Latest Manpower	India Manpower	Plans for India Office	Job Cuts Announced / Carried out in the last 12 months
Accenture	65000	3500	8000 Employees by August 2004	1000
Adobe Systems	3250	185	250 People in 6 months	260
Cadence	5000	315	Doubling team in 4 years	500
Cap Gemini	56500	800	2000 People by December 2003	1000
Cisco	34466	2300	NA	Have frozen hiring engineers globally but have continued to increase India outsourcing
Covansys	4556	2000	2800 People in 1 year	200
CSC	92000	1200	4800 People by 2004	607
EDS	138000	300	2400 People by 2005	8200
i2	2800	1000	Recruiting actively	Nearly 1800 people
IBM Global Services	150000	3100	10000 People In 3 years	Nearly 2000 people
Intel	79200	950	3000 People by 2005	4700
Keane	5819	623	2000 People by end 2003	607
Logica-CMG	24000	350	1000 People by end 2004	2650
Lucent	35000	570	NA	13800
Microsoft	55000	200	500 People in 3 years	Increasing workforce
Oracle	40000	3159	6000 People in the next 12 months	200
Sapient	1500	600	Growing the India Center and Global Delivery	863
SunMicro	36000	700	Growing the India Center	5480
Syntel	2700	2000	650	NA
Texas Instruments	34400	900	1500 People by March 2006	800 personnel
Xansa	5583	1200	6000 People in a few years	502

Source: Morgan Stanley (2003), "Outsourcing, Protectionism, and the Global Labor Arbitrage", Morgan Stanley Special Economic Study, prepared by S. Roach, 11 November.

Table 7.3. **US estimated and projected gross job losses in all sectors**

Total number of jobs in the US economy: 140 million		
Estimated jobs lost to date	**Projected job losses**	**Estimated jobs potentially affected**
300 000 – 995 000 Goldman Sachs	3.3 – 6 million Forrester Research	14.1 million UC Berkeley
300 000 – 500 000 Business Week	3.3 million over 15 years[1] Goldman Sachs	14.1 million
400 000 – 500 000 Economy.com	6 million over 10 years	
995 000		

Note: 1. Of these, 473 000 are expected to be in the IT sector.

Source: Centre for American Progress, www.americanprogress.org, accessed September 2004.

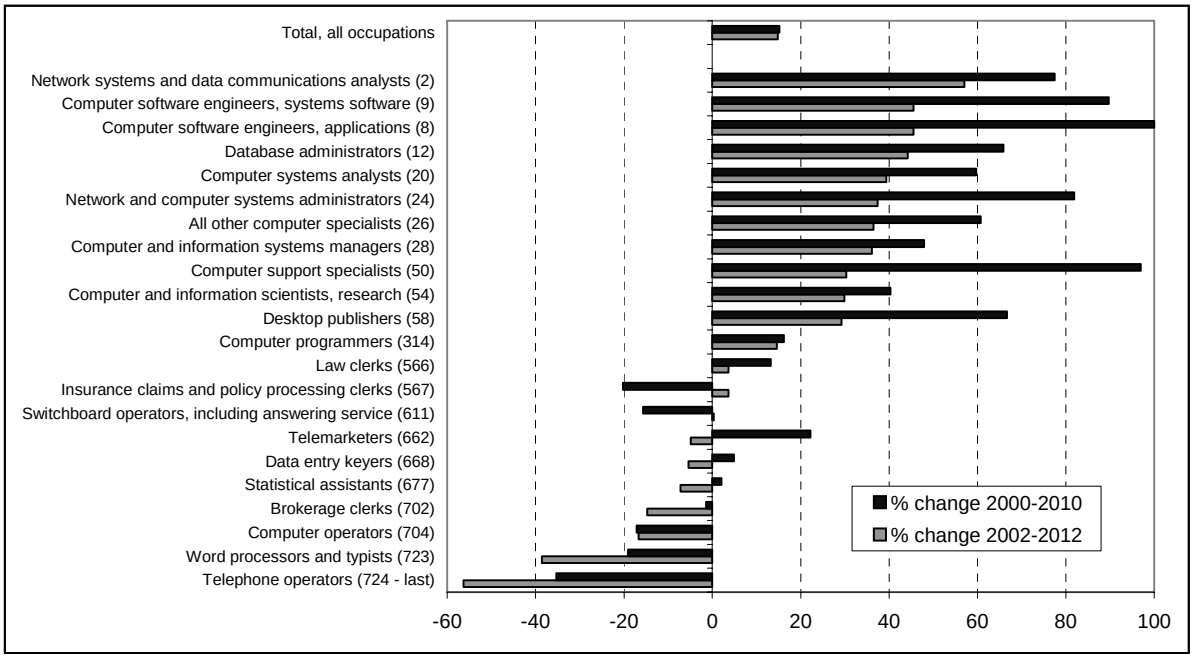
While the current debate focuses on services jobs being affected, this does not mean that services employment would necessarily contract. Many existing services sectors have expanded, new services have emerged, and with ongoing technological developments and services trade liberalisation, it is likely yet more will be created. The offshoring phenomenon itself will also create new jobs in the domestic economy (OECD, 2004b). The efficiency and productivity gains achieved through offshoring are also expected to enhance the overall growth and employment opportunities of both the domestic and host economies and should result in further job creation.[6] In addition, jobs created off shore generate demand for developed country goods and services exports for ICT equipment and communications services immediately and, over time, for a wide range of other goods and services. At the same time, wages and prices in offshore locations are likely to rise, creating wealthier host country consumers and reducing the wage cost differential and arbitrage opportunities.

Even though many ICT specialist jobs are thought to be affected by the offshoring phenomenon, the occupational projections from the US Bureau of Labor Statistics (BLS) show an increase in the

6. See, for example, Global Insight (2004) and Mann (2003).

number of US ICT professionals for the period 2002-2012, although their ten-year estimates have been revised downwards from two years previously (see Figure 7.4).[7] However, some occupations which use ICTs intensively, such as word processors and typists, various types of clerks, and computer and telephone operators, are projected to decline. While part of this decline may be the result of international sourcing, some occupations are likely to disappear anyway as they will increasingly become digitised and/or automated.

Figure 7.4. **Comparison of BLS occupational employment projections for the United States, 2000-2010 and 2002-2012, selected occupations**[1]
%, rank in terms of expected growth shown in brackets



Note: 1. These selected occupations combined accounted for 3.6% of total employment in 2002.

Source: Authors' calculations based on BLS (2004), "Occupational Employment Projections to 2012", *Monthly Labor Review*, February; and BLS (2001), "Occupational Employment Projections to 2010", *Monthly Labor Review*, November.

It is important to bear in mind that the occupations included in Figure 7.4 are mostly growing from a relatively low level (see Figure 7.5). Together they accounted for 3.6% of total employment in 2002.

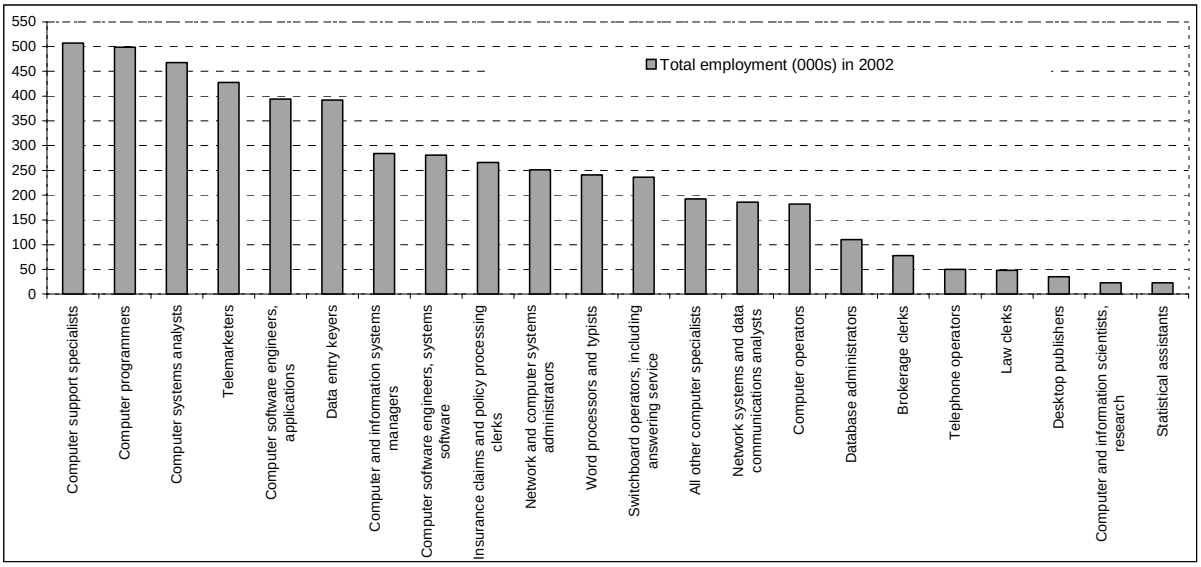
The BLS also collects mass lay-off statistics associated with domestic and overseas relocations.[8] The numbers indicate that in the first quarter of 2004 around one-third of separations of workers

7. Of the 30 occupations that are expected to experience the fastest growth rates, 8 are ICT specialist-type occupations. The others are health- and life–style-related occupations, and a few teaching and environment-related occupations. These 30 occupations accounted for 5.2% of total employment in 2002, and the 8 ICT-related occupations alone accounted for 1.5% of total employment.

8. See the BLS Web site for more information: www.bls.gov/news.release/reloc.toc.htm, accessed September 2004.

resulted from activities moving abroad; the rest was due to domestic relocation[9] (these two combined approximately correspond to the top row in Figure 7.1). It also appears that international insourcing accounts for around two-thirds of total offshoring and international outsourcing for one-third (these two combined correspond to the right column in Figure 7.1), a finding confirmed by various studies and surveys (*e.g.* McKinsey & Company, 2003). Lay-off events associated with the relocation of production activities domestically or abroad accounted for 14% of all lay-off events (and 9% of separations for reasons other than seasonal or vacation). This type of data is not currently available for other countries, but surveys show that in Europe most relocation is accounted for by movements within and between European countries.

Figure 7.5. **Employment in selected occupations in the United States, 2002**



Source: Authors' calculations based on BLS (2004), "Occupational Employment Projections to 2012", *Monthly Labor Review*, February.

The European Foundation for the Improvement of Living and Working Conditions collects information from the newspaper articles on announced plans for restructuring on job loss related to restructuring in large firms in Europe. The quarterly issue of the European Restructuring Monitor (ERM Quarterly, Issue 2, summer 2004) reported announced plans for restructuring by 163 companies (in the EU15 countries and Czech Republic, Poland and Slovakia) for the second quarter of 2004. These involved nearly 60 000 job losses, while some 16 000 new jobs were announced. However, restructuring is a somewhat different and wider concept than outsourcing and/or offshoring alone, and the quality of the data used may limit the scope of interpretation. Indeed, press articles may not always be reliable everywhere, announced plans may not be carried out as stated, and there may be a bias in coverage between countries as smaller restructuring announcements may get relatively less coverage in larger countries.

9. These statistics reflect job losses (associated with domestic and overseas relocation) in companies employing at least 50 workers and where at least 50 people filed for unemployment insurance during a five-week period and where the layoff lasted for more than 30 days (around one-third of these mass lay-off events).

An occupational employment approach

New analysis has been undertaken to investigate occupations which could be potentially affected by offshoring and outsourcing. This approach builds on the work on ICT skills and employment which used data on employment, by occupation, by industry, to identify the share of ICT-intensive users, at various skill levels, in total employment, both at the aggregate and the sectoral level (OECD, 2004a; van Welsum and Vickery, 2005). The idea is that those occupations that use ICTs intensively, combined with other characteristics discussed below, could also potentially be more likely to be affected by offshoring. If people use ICTs intensively in order to produce their own output, it is also likely that this output can be traded enabled by ICTs. As a result, their production activity becomes location independent, *i.e.* the person carrying out the work could be based anywhere in the world and send/trade their output using ICTs. Thus, the aim is to identify those people who are performing the types of functions and activities that could potentially be carried out anywhere.

The choice of occupations was guided by the following criteria:

1. People exercising jobs where they are likely to make intensive use of ICTs in order to produce their output.
2. Their output can be traded/transmitted with the help of ICTs (ICT-enabled trade in services).
3. The work has a high explicit information or "codified knowledge" content (and no or little tacit or implicit knowledge).
4. The work does not necessarily require face-to-face contact.

Additional factors that are potentially important, but that were not explicitly taken into account include: *(i)* a high wage differential with similar occupations in destination countries;[10] *(ii)* low set-up barriers; and *(iii)* low social networking requirements (Bardhan and Kroll, 2003).

The selections of occupations were guided by: the principles mentioned above; the aim to include both high skill and low skill ("white collar") occupations; and making selections for the individual countries comparable to the extent possible, even though data and classifications are not harmonised across countries. The selection of occupations potentially affected by offshoring (or performing the types of functions that could potentially be offshored) for Europe, using the 3-digit ISCO-88 classification, is provided in Table 7.4 below. The lists of selected occupations for the United States, Canada, Australia and Korea are given in Annex Tables 7.A1.2-5.

In 2003, the sum of these occupations identified as potentially affected by offshoring represented 19.2% of total employment in the EU15. The selection of occupations potentially affected by offshoring in Canada represented 18.6% of total employment in 2003, 19.4% in Australia, and 18.1% of total employment in the United States in 2002. In Korea, the share of such employment potentially affected by offshoring represented 13% of total employment in 2002.[11] It should be kept in mind though that these percentages are not directly comparable as the classifications, and therefore the selection of occupations, are not harmonised across countries.

10. Bardhan and Kroll (2003) examine some examples of wage differentials. They find that these vary significantly across occupations, and tend to be greater for the relatively lower skilled occupations with lower wages.

11. Korea is currently revising its occupational classification system. As managerial and business-related occupations will be particularly affected, the share of employment potentially affected by offshoring in Korea is likely to change accordingly.

Table 7.4. **Europe: occupations potentially affected by offshoring**

3-digit ISCO-88
123: Other specialist managers
211: Physicists, chemists, and related professionals
212: Mathematicians, statisticians and related professionals
213: Computing professionals
214: Architects, engineers, and related professionals
241: Business professionals
242: Legal professionals
243: Archivists, librarians, and related information professionals
312: Computer associate professionals
341: Finance and sales associate professionals
342: Business services agents and trade brokers
343: Administrative associate professionals
411: Secretaries and keyboard-operating clerks
412: Numerical clerks
422: Client information clerks

Source: Authors, based on EULFS (2004).

Other studies have also attempted to identify occupations potentially affected by offshoring.[12] For example, Kirkegaard (2004) reports the methodology adopted by Forrester Research which identifies the main US SOC occupational categories given in Annex Table 7.A1.6 as being potentially affected by offshoring. In 2002, these occupations accounted for around 44% of the total sample.[13] Bardhan and Kroll (2003) have a more conservative estimate of 11% of US employment in occupations potentially affected by offshoring (in 2001) – the outer limit of potential direct job loss. Their choice of occupations (see Annex Table 7.A1.7) was guided by a judgement on the "offshorability attributes" (see above), and whether some outsourcing had already taken place in these occupational categories. Like the approach in this chapter, possible dynamic adjustments, or changes in qualifications, skill requirements and task descriptions were not taken into account. Garner (2004) makes a further distinction between occupations likely to be affected (with a further distinction of a high and low probability of being affected), or unlikely to be affected by offshoring. He uses the same possibly affected occupations as Bardhan and Kroll (2003), and also calculates a category unlikely to be affected by offshoring as total employment minus workers in farming, construction and extraction, manufacturing and potentially affected services. In 2000, the potentially affected categories accounted for around 10% of total employment, and the categories unlikely to be affected for around two-thirds. Furthermore, both types of occupations (likely and unlikely to be affected) declined between 2000 and 2002, but the possibly affected occupations declined more rapidly (1.5% job loss, compared to 0.3% for the occupations unlikely to be affected). While this is consistent with the offshoring of services jobs, other explanations are possible, *e.g.* faster rate of technological change, greater cyclical sensitivity.

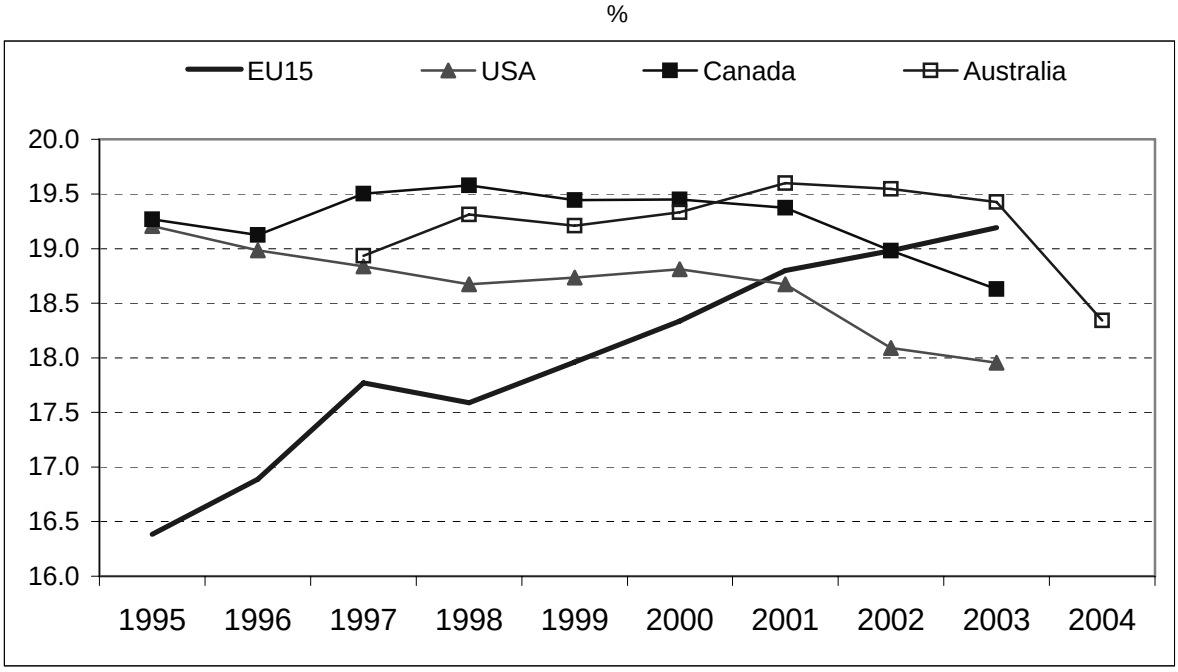
In the present study the share of occupations potentially affected by offshoring in the EU15 increased from 16.4% in 1995 to 19.2% in 2003 (see Figure 7.6). For Canada it was more or less flat

12. Another approach would be to look at the extent of "telework" (*e.g.* Bates and Huws, 2002). If work can be carried out "remotely" through telework it should also be possible to outsource and/or offshore it.

13. Around 80% worked in services sectors, and less than 10% in manufacturing.

around 19.5% until 2001 when it started to decline to reach 18.6% by 2003. For the United States, the share declined by more than 1 percentage point from 19.2% in 1995 to 18.1% in 2002.[14] In Australia, the share increased between 1996 and 2001 (except in 1999). It started to decline in 2001 and in particular between 2003 and 2004. The offshoring phenomenon does not necessarily have to result in a decline in employment though. It could be that certain types of occupations will experience slower growth than they otherwise may have done. As an example, employment in call centres continues to increase even though offshoring of call centres also takes place. As the analysis is conducted in terms of shares, there are several possibilities to explain changes in the trends. For example, a decline in the share could be explained by an absolute decline in the number of people employed in the categories identified as potentially affected by offshoring, or it could be that this selection of occupations is growing at a slower pace than total employment. This relatively slower growth of employment potentially affected by offshoring is in fact what explains most of the declines observed in the trends, except for the United States where the absolute number of people employed in the categories identified as potentially affected by offshoring declines. These findings would therefore tend to support the idea that offshoring may lead to slower growth of employment in occupations potentially affected by offshoring and not necessarily actual declines in employment.

Figure 7.6. **The share of ICT-intensive using occupations potentially affected by offshoring in total employment: EU15, United States, Canada, and Australia, 1995-2003/4**[1]



Note: 1. Includes estimates where a full data set was not available. In particular, because of classification changes, the number for the United States for 2003 is an estimate.

Source: Authors' calculations based on EULFS, US Current Population Survey, Statistics Canada and Australian Bureau of Statistics (2004).

The levels are not directly comparable since the classifications have not been harmonised and, as a result, the occupational selections may not be equivalent, but the trends reveal some divergences.

14. The number for 2003 (just under 18%) is an estimate as both the occupational and industrial classification systems were changed in 2003 in the United States.

While it is difficult to draw inferences from these trends without further analysis as the trends are affected by a multitude of factors, the evolution shown in these trends would be consistent with Canada serving as an offshoring location, mainly from the United States, but less so more recently when other locations, such as India, have started to emerge. Similarly, Australia possibly also experienced competition from India and other emerging locations in the region. Thus, the declining share in the United States, Canada and Australia towards the end of the period would be consistent with the offshoring of IT-related and back-office activities, for example, even though this might not account for all of the decline. Another possible explanation could be a relatively more rapid adoption and integration of new technologies, leading to relatively more jobs disappearing sooner as they become automated and/or digitised. The increasing share for Europe is compatible with an overall increase in services employment as well as the finding from surveys that that European firms tend to offshore within Europe.[15] Furthermore, Ireland is also a major destination country for offshoring activities from the United States (IT-related activities in particular). Further analysis will examine the drivers and determinants of these trends.

These data present a number of caveats. Aggregates for the economy as whole may hide important differences across sectors, and across countries in the EU15 average. Furthermore, the ICT content of an occupation may differ across countries (and within countries) and over time. The remainder of this section examines the distribution of the share of employment potentially affected by sector. Differences across European countries are not considered here, but are examined in further analysis. It is not possible to control for differences in the ICT content of occupations, neither within nor between, countries.

Sectoral analysis

Many services sectors, and some manufacturing sectors, have a very high share of employment in occupations that could potentially be offshored (see Table 7.5). Many business services can be found at the top of the ranking (*e.g.* computer and related services, financial services, research and development [R&D]) with shares in excess of 30%. For most of these sectors (except insurance and services auxiliary to financial services), the share also increased substantially between 1995 and 2003. Most manufacturing industries have between 10 and 30% of occupations potentially affected by offshoring and the share has increased in all manufacturing industries. Some of this employment will consist of back-office service activities, for example. This may also be an indication of the growing importance of services activities in manufacturing sectors which, increasingly, derive an important part of their revenue from providing services. For example, the automobile manufacturing industry increasingly comprises financial services, R&D, marketing, sales services.

The average for EU15 and the average for non-EU15 Europe (countries for which data are available are Czech Republic, Hungary, Iceland, Norway, Slovak Republic and Switzerland) by sector are illustrated in Figure 7.7. It is important to note that since fewer data tend to be available for the latter countries, outliers can have greater effects and may distort the overall picture.

The share of employment potentially affected by offshoring in the manufacturing sectors is greater, on average, for EU15 countries than for the other European countries included in the sample, particularly for manufacture of computers and office equipment (sector 30). The picture is less clear cut for services sectors, but again, relatively fewer observations are available for non-EU15 countries so the average could be more strongly influenced by outliers.

15. See Millar (2002), for example.

Table 7.5. **Share of employment potentially affected by offshoring in total employment by sector,[1] EU15, 2003 and 1995**

%, decreasing order

% of total employment[2]	NACE 2-digit	Industry	Share (%) 2003	Share (%) 1995	Difference 03-95 (%-pts)
		>30%			
18.4%	72	Computer and related activities	79.5	69.5	9.9
	66	Insurance and pension funding, except compulsary social security	71.6	71.6	0.0
	67	Activities auxiliary to financial intermediation	68.1	73.6	-5.5
	65	Financial intermediation, except insurance and pension funding	62.9	53.8	9.1
	30	Manufacture of office machinery and computers	51.4	48.3	3.1
	74	Other business activities	47.7	46.8	0.8
	70	Real estate activities	44.4	40.3	4.1
	73	Research and development	41.4	33.8	7.5
	51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	37.5	33.9	3.6
	23	Manufacture of coke, refined petroleum products and nuclear fuel	35.3	31.3	4.0
	40	Electricity, gas, steam and hot water supply	33.0	25.6	7.3
	32	Manufacture of radio, television and communication equipment and apparatus	32.7	25.6	7.1
	24	Manufacture of chemicals and chemical products	30.9	26.1	4.8
		10-30%			
40.6%	41	Collection, purification and distribution of water	28.4	23.6	4.8
	64	Post and telecommunications	28.4	15.3	13.1
	71	Renting of machinery and equipment without operator and of personal and household goods	27.0	25.1	1.9
	91	Activities of membership organisation, n.e.c.	26.8	23.0	3.8
	33	Manufacture of medical, precision and optical instruments, watches and clocks	26.8	21.2	5.5
	63	Supporting and auxiliary transport activities; activities of travel agencies	25.6	22.1	3.5
	35	Manufacture of other transport equipment	25.1	18.3	6.8
	31	Manufacture of electrical machinery and apparatus, n.e.c.	23.6	20.7	3.0
	62	Air transport	23.4	19.7	3.8
	22	Publishing, printing and reproduction of recorded media	23.1	19.9	3.1
	75	Public administration and defence; compulsary social security	22.3	22.4	-0.1
	29	Manufacture of machinery and equipment, n.e.c.	20.5	18.3	2.3
	34	Manufacture of motor vehicles, trailers and semi-trailers	17.1	12.1	4.9
	50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	15.0	13.1	1.9
	25	Manufacture of rubber abd plastic products	14.9	14.1	0.7
	92	Recreational, cultural and sporting activities	14.8	13.6	1.3
	21	Manufacture of pulp, paper and paper products	14.5	11.9	2.6
	26	Manufacture of other non-metallic mineral products	14.0	10.9	3.1
	27	Manufacture of basic metals	13.8	11.0	2.8
	17	Manufacture of textiles	13.1	11.0	2.1
	28	Manufacture of fabricated metal products, except machinery and equipment	12.8	11.4	1.4
	36	Manufacture of furniture; manufacturing n.e.c.	12.3	9.4	2.8
	15	Manufacture of food products and beverages	11.7	10.6	1.1
	52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	11.4	9.3	2.0
		<10%			
38.2%	18	Manufacture of wearing apparel; dressing and dyeing of fur	9.5	5.5	4.0
	45	Construction	9.4	8.9	0.5
	60	Land transport; transport via pipelines	9.3	8.0	1.3
	90	Sewage and refuse disposal, sanitation and similar activities	9.2	7.7	1.6
	93	Other service activities	8.4	8.4	-0.1
	20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and	8.0	6.5	1.5
	85	Health and social work	7.7	7.5	0.2
	80	Education	7.6	6.0	1.6
	55	Hotels and restaurants	4.5	3.9	0.5
	1	Agriculture, hunting and related service activities	1.8	2.4	-0.7

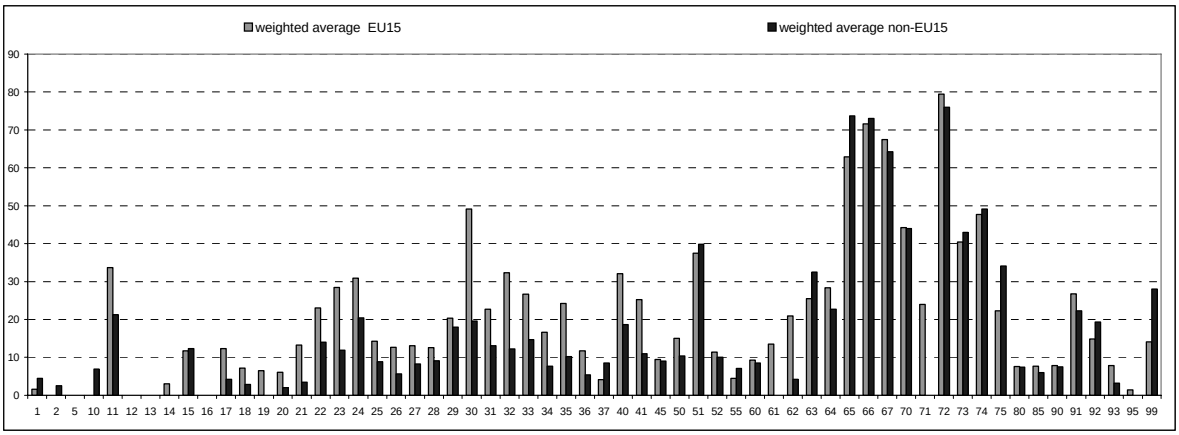
Notes: 1. Includes sectors for which the share was significant only.

2. Shows the percentage of total employment accounted for by the groups of sectors. These groups do not add up to 100% as only sectors with a significant share of employment potentially affected by offshoring are included. There are significant differences across the individual countries of the EU15. Total employment in the group of sectors with a share of over 30% accounts for between 11-22% of total employment, the group with a share between 10-30% for 33-45% of total employment, and the group of sectors with a share below 10% for 35-49% of total employment.

Source: Authors' calculations, based on EULFS (2004).

Figure 7.7. **The share of occupations potentially affected by offshoring in total employment by sector, EU15 and non-EU15 Europe, 2003**

%



Source: Authors' calculations, based on EULFS (2004).

For the United States, too, many business services can be found at the top of the ranking (see Table 7.6). Many retail sectors are also included in this group. In Europe the retail sector had a relatively low share of employment potentially affected by offshoring, but this could possibly be explained by the level of aggregation in the data and factors such as different firm sizes which may imply different organisational models. The 56 industries (out of 231 in total) with a share of employment potentially affected by offshoring in excess of 30% are shown in Table 7.6. Together, these industries account for 20.4% of total employment.

The sectoral results for Canada, Australia and Korea show, again, a similar pattern, with many services sector exhibiting high shares of employment potentially affected by offshoring (Tables 7.7, 7.8, and 7.9, respectively).

Table 7.6. **Sectors with a share of employment potentially affected by offshoring in total employment in excess of 30%, United States, 2002**[1]

%, decreasing order

Industries with a share >30%		Share (%) 2002
890	Accounting, auditing, and bookkeeping services	81.2
710	Security, commodity brokerage, and investment companies	62.3
732	Computer and data processing services	60.6
882	Engineering, architectural, and surveying services	58.9
711	Insurance	57.3
892	Management and public relations services	57.1
701	Savings institutions, including credit unions	55.3
442	Telegraph and miscellaneous communications services	49.6
700	Banking	48.0
602	Stores, dairy products	47.5
650	Liquor stores	46.0
362	Guided missiles, space vehicles, and parts	45.9
852	Libraries	45.5
432	Services incidental to transportation	45.2
930	Environmental quality and housing programs administratio	44.6
380	Photographic equipment and supplies	44.4
702	Credit agencies, n.e.c.	44.2
712	Real estate, including real estate-insurance offices	43.5
472	Not specified utilities	43.0
622	Miscellaneous vehicle dealers	42.7
582	Stores, Retail nurseries and garden	42.1
672	Fuel dealers	41.9
611	Food stores, n.e.c.	40.7
663	Catalog and mail order houses	40.6
921	Public finance, taxation, and monetary policy	40.5
590	Mobile home dealers	38.9
891	Research, development, and testing services	38.5
511	Metals and minerals, except petroleum	36.4
341	Radio, TV, and communication equipment	36.2
500	Motor vehcls and equipment	35.9
530	Machinery, equipment, and supplies	35.9
531	Scrap and waste materials	35.9
561	Farm supplies	35.6
332	Not specified machinery	35.3
623	Stores, apparel and accessory, except shoe	35.2
322	Computers and rel. equipment	35.1
562	Misc wholesale, nondurable goods	34.9
660	Jewelry stores	34.9
552	Petroleum products	34.6
931	Economic programs administratio	34.5
682	Stores, Miscellaneous retail	34.5
621	Gasoline service stations	34.1
441	Telephone communications	33.1
592	Variety stores	33.1
893	Miscellaneous professional and rel. services	33.1
571	Not specified wholesale trade	33.0
581	Hardware stores	32.9
640	Music stores	31.5
580	Lumber and building material retailing	31.3
200	Petroleum refining	31.2
501	Furniture and home furnishings	31.2
371	Scientific and controlling instruments	31.1
171	Newspaper publishing and printing	31.1
510	Professional and commercial equipment and supplies	31.0
321	Office and accounting machines	30.9
661	Gift, novelty, and souvenir shops	30.8

Note: 1. These sectors together accounted for 20.4% of total employment in 2002.

Source: Authors' calculations based on Current Population Survey (2003).

Table 7.7. **Share of employment potentially affected by offshoring in total employment by sector, Canada, 2003**

%, decreasing order, 2- and 3-digit sectors

Code	Industry	Share (%) 2003
	>30%	
522	Credit Intermediation and Related Activities	89.1
52	Finance and Insurance	83.3
523	Securities, Commodity Contracts, and Other Financial Investment and Related Activities	79.0
524	Insurance Carriers and Related Activities	67.9
54	Professional, Scientific and Technical Services	66.7
541	Professional, Scientific and Technical Services	66.7
513	Broadcasting and Telecommunications	38.1
51	Information and Cultural Industries	34.5
514	Information Services and Data Processing Services	31.9
912	Provincial and Territorial Public Administration	30.9
911	Federal Government Public Administration	30.7
	10-30%	
91	Public Administration	29.0
621	Ambulatory Health Care Services	23.4
334	Computer and Electronic Product Manufacturing	23.0
511	Publishing Industries	22.7
22	Utilities	21.5
221	Utilities	21.5
417	Machinery, Equipment and Supplies Wholesaler-Distributors	21.1
41	Wholesale Trade	20.7
211	Oil and Gas Extraction	18.8
813	Religious, Grant-Making, Civic, and Professional and Similar Organizations	17.5
561	Administrative and Support Services	16.3
416	Building Material and Supplies Wholesaler-Distributors	16.3
56	Administrative and Support, Waste Management and Remediation Services	16.1
418	Miscellaneous Wholesaler-Distributors	15.8
531	Real Estate	13.1
913	Local, Municipal and Regional Public Administration	13.0
21	Mining and Oil and Gas Extraction	12.2
488	Support Activities for Transportation	11.7
333	Machinery Manufacturing	11.6
53	Real Estate and Rental and Leasing	11.5
711	Performing Arts, Spectator Sports and Related Industries	11.3
62	Health Care and Social Assistance	11.2
31	Construction	11.0
325	Chemical Manufacturing	10.8
	<10%	
413	Food, Beverage and Tobacco Wholesaler-Distributors	9.9
622	Hospitals	9.9
81	Other Services (except Public Administration)	8.8
48	Wholesale Trade	8.7
492	Couriers and Messengers	8.1
71	Arts, Entertainment and Recreation	8.0
415	Motor Vehicle and Parts Wholesaler-Distributors	7.4
414	Personal and Household Goods Wholesaler-Distributors	7.3
484	Truck Transportation	7.2
336	Transportation Equipment Manufacturing	7.1
441	Motor Vehicle and Parts Dealers	7.0
61	Educational Services	7.0
611	Educational Services	7.0
811	Repair and Maintenance	6.3
23	Construction	6.0
323	Printing and Related Support Activities	5.6
232	Trade Contracting	5.6
231	Prime Contracting	5.1
481	Air Transportation	4.8
44	Wholesale Trade	4.6
713	Amusement, Gambling and Recreation Industries	3.7
453	Miscellaneous Store Retailers	3.6
452	General Merchandise Stores	3.3
332	Fabricated Metal Product Manufacturing	3.3
812	Personal and Laundry Services	3.3
444	Building Material and Garden Equipment and Supplies Dealers	3.1
311	Food Manufacturing	2.7
213	Support Activities for Mining and Oil and Gas Extraction	2.6
326	Plastics and Rubber Products Manufacturing	2.3
451	Sporting Goods, Hobby, Book and Music Stores	2.2
624	Social Assistance	2.2
491	Postal Service	2.1
11	Farming (N.E.C.)	2.1
321	Wood Product Manufacturing	1.9

Note: Sectors with zero and/or non-significant values are reported in Appendix Table 7.A1.8.
Source: Authors' calculations, based on Statistics Canada (2004).

Table 7.8. **The share of occupations potentially affected by offshoring in total employment, by sector, Australia, May 2004**
%, decreasing order

Industry	Share May 2004
>30%	
73 Finance	86.2
75 Services to Finance and Insurance	79.4
74 Insurance	71.4
78 Business Services	51.7
12 Oil and Gas Extraction	41.3
82 Defence	39.2
15 Services to Mining	32.8
81 Government Administration	32.0
36 Electricity and Gas Supply	30.0
10-30%	
91 Motion Picture, Radio and Television Services	29.4
24 Printing, Publishing and Recorded Media	29.2
71 Communication Services	26.3
65 Other Transport	25.0
92 Libraries, Museums and the Arts	25.0
45 Basic Material Wholesaling	22.4
25 Petroleum, Coal, Chemical and Associated Product Manufacturing	22.3
37 Water Supply, Sewerage and Drainage Services	21.8
46 Machinery andMotor Vehicle Wholesaling	21.5
03 Forestry and Logging	20.9
47 Personal and Household Good Wholesaling	19.7
77 Property Services	17.4
13 Metal Ore Mining	16.7
26 Non-metallic Mineral Product Manufacturing	16.3
62 Rail Transport	16.0
28 Machinery and Equipment Manufacturing	14.9
64 Air and Space Transport	14.1
96 Other Services	13.5
63 Water Transport	13.5
21 Food, Beverage and Tobacco Manufacturing	13.4
66 Services to Transport	12.8
02 Services to Agriculture; Hunting and Trapping	12.6
41 General Construction	12.2
14 Other Mining	11.0
22 Textile, Clothing, Footwear and Leather Manufacturing	11.0
93 Sport and Recreation	10.5
04 Commercial Fishing	10.0
<10%	
53 Motor Vehicle Retailing and Services	9.9
84 Education	9.6
27 Metal Product Manufacturing	9.6
11 Coal Mining	9.5
95 Personal Services	9.5
23 Wood and Paper Product Manufacturing	9.0
61 Road Transport	8.5
29 Other Manufacturing	8.4
86 Health Services	8.3
42 Construction Trade Services	8.0
52 Personal and Household Good Retailing	6.8
67 Storage	6.8
87 Community Services	6.5
01 Agriculture	5.1
57 Accomodations, Cafes and Restaurants	3.0
51 Food Retailing	2.2
97 Private Households Employing Staff	0.0

Note: Numbers shaded grey are based on estimates subject to sampling variability too high for most practical purposes.
Source: Authors' calculations, based on data provided by the Australian Bureau of Statistics.

Table 7.9. **The share of occupations potentially affected by offshoring in total employment, by sector, Korea, 2002**

%, decreasing order

Industry	Share (%) 2002
>30%	
Insurance and Pension Funding	90.4
Activities Auxiliary to Financial Intermediation	89.9
Computer and Related Activities	82.8
Financial Institutions, Except Insurance and Pension Funding	75.9
Research and Development	67.2
Professional, Scientific and Technical Services	60.5
Public Administration and Defence ; Compulsory Social Security	43.4
Electricity, Gas, Steam and Hot Water Supply	37.6
Collection, Purification and Distribution of Water	36.3
10-30%	
Post and Telecommunications	29.7
Publishing, Printing and Reproduction of Recorded Media	26.4
Motion Picture, Broadcasting and Performing Arts Industries	26.3
MF of Computers and Office Machinery	26.0
MF of Electronic Components, Radio, Television and Communication Equipment	19.8
Extra-Territorial Organizations and Bodies	19.6
MF of Medical, Precision and Optical Instruments, Watches and Clocks	19.2
General Construction	17.6
MF of Chemicals and Chemical Products	17.5
MF of Other Machinery and Equipment	17.4
MF of Other Transport Equipment	16.0
Membership Organizations n.e.c.	14.6
MF of Coke, Refined Petroleum Products and Nuclear Fuel	14.3
Air Transport	14.1
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motor Cycles	13.6
Sale of Motor Vehicles and Motorcycles ; Retail Sale of Auto	13.2
Real Estate Activities	12.8
MF of Basic Metal	12.1
MF of Motor Vehicles, Trailers and Semitrailers	11.7
Water Transport	11.1
Manufacture of Tabacco Products	10.4
<10%	
MF of Electrical Machinery and Apparatus	9.4
Human Health and Veterinary Activities	9.4
Business Support Services	9.1
MF of Other Non-Metalic Mineral Products	8.7
Renting of Machinery and Equipment	8.5
MF of Fabricated Metal Products	8.1
Supporting and Auxiliary Transport Activities ; Activities of Travel Agencies	8.0
Sewage and Refuse Disposal, Sanitation and Similar Activities	7.9
Education	7.5
Special Trade Construction	6.9
Maintenance and Repair Services	6.8
MF of Furniture; Manufacturing of Articles n.e.c.	6.8
MF of Rubber and Plastic Products	6.0
Other Recreational, Cultural and Sporting Activities	5.9
Manufacture of Pulp, Paper and Paper Products	5.6
Manufacture of Wood and of Products of Wood and Cork	4.6
Mining of Coal, Crude Petroleum and Natural Gas, Uranium Ore	4.6
Manufacture of Textiles, Excepts Sewn Wearing Apparel	4.5
Manufacture of Food Products and Beverages	4.2
Mining of Other Non-ferrous Metal Ores	4.0
Social Work Activities	4.0
Retail Trade, Except Motor Vehicles and Motorcycles	3.9
Manufacture of Sewn Wearing Apparel and Fur Articles	2.7
Land Transport ; Transport Via Pipelines	2.3
Tanning and Dressing of Leather	2.2
Other Services Activities	1.6
Fishing	1.4
Hotels and Restaurants	0.6
Agriculture	0.1
Forestry	0.0
Recycling	0.0
Private Households with Employed Persons	0.0

Note: It should be noted that important revisions to the occupational classification are currently underway in Korea. Changes will affect managerial occupations and business-related occupations in particular and are, therefore, likely to have a substantial impact on the sectoral distribution of the share of occupations potentially affected by offshoring (and could perhaps also explain the relatively low percentage of such occupations found in the category "business support services"). Furthermore, the occupational category "database manager" was not surveyed in 2002. The revised classification and data for 2003 should become available by the end of 2004.

Source: Authors' calculations, based on data provided by the Korean Work Information Center, Human Resource Development Service.

Conclusions

Even though there are no official statistics measuring the extent of offshoring, anecdotal evidence suggests that the international sourcing of IT and ICT-enabled services is growing rapidly. Analysis of data on trade in services suggests it is broadly distributed across countries even though some major suppliers, such as India, have emerged. Exports of other business services and computer and information services, which are used to approximate international services sourcing, are growing rapidly in many countries, with the fastest growth occurring mainly in OECD non-member economies.

The offshoring of services activities has also generated considerable debate, especially since it increasingly involves high-quality service jobs. However, even the largest projections of "jobs lost to offshoring" are relatively small in comparison to general job turnover and, if history is a guide, growing open economies should be able to adjust and thrive. Furthermore some firms, sectors and countries will directly gain from international services sourcing, and consumers will benefit from price and income effects working at aggregate level.

Results from the analysis of occupational employment data suggests that close to 20% of total employment in the EU15, the United States, Canada and Australia could potentially be affected by the international sourcing of services activities. Furthermore, the share is declining in the United States, Canada and Australia, particularly since 2001. This would be compatible with the ICT-enabled offshoring of services activities taking place, *e.g.* of back-office activities. Furthermore, services sectors such as financial and insurance services and computer and information services also have the largest shares of employment potentially affected by offshoring. In Europe (EU15) the share is increasing, which is consistent with increasing services employment in general, as well as the finding from surveys that European firms tend to offshore within Europe. Some countries, *e.g.* Ireland, are also known to be important recipients of offshoring activities.

The adjustment process may be costly though, especially for those who have lost their jobs. With some 20% of total employment potentially affected, active labour market adjustment policies are called for. Education and training programmes should be adapted to enable people to take advantage of new employment opportunities; life-long learning and skill-upgrading will become increasingly important. A change in mentality will be needed as people are increasingly likely to have multiple jobs and even careers. A measured response to international sourcing would be to take advantage of the benefits while managing the adjustment process and maintaining good labour conditions and social welfare provisions. Countries should also remain committed to liberalising trade in services and avoid a protectionist response.

In the absence of official statistics, little is known about the impact and extent of offshoring. This chapter examined indirect sources, trade data and occupational employment data, and has presented results from a new approach that exploits existing employment data. Considering the continued high policy interest in ICT-related international sourcing and associated structural changes in employment, further work will include: *(i)* extending and updating the analysis outlined in this chapter to cover as many countries over time as possible; *(ii)* adding a sectoral dimension to the analysis where possible to analyse the distribution of potentially affected occupations across the economy; *(iii)* examining decompositions of the employment potentially affected by offshoring (*e.g.* clerical versus non-clerical occupations); *(iv)* performing a more in-depth analysis of the trade data on both imports and exports; *(v)* relating the trade data to employment data where possible; *(vi)* analysing the most affected occupations and sectors in greater depth; and *(vii)* exploring the relations of international sourcing with changes in labour productivity.

REFERENCES

Bardhan, A. D. and C. Kroll (2003), "The New Wave of Outsourcing", *Fisher Centre Research Report*, No. 1103, University of California Berkeley, Fisher Centre for Real Estate and Urban Economics.

Bates, P., and U. Huws (2002), "Modelling eWork in Europe: Estimates, Models and Forecasts from the EMERGENCE Project", *IES Report 388*, Institute for Employment Studies.

Garner, C. A. (2004), "Offshoring in the Service Sector: Economic Impact and Policy Issues", *Economic Review*, Federal Reserve Bank of Kansas City, third quarter.

Global Insight (2004), *The Comprehensive Impact of Offshore IT Software and Services Outsourcing on the US Economy and the IT Industry*, Lexington, MA, March.

Kirkegaard, J. F. (2004), "Outsourcing – Stains on the White Collar?", www.iie.com/publications/papers/kirkegaard0204.pdf.

Mann, C. L. (2003), "Globalisation of IT Services and White Collar Jobs: The Next Wave of Productivity Growth", *Institute for International Economics Policy Brief*, No. PB03-11, December.

McKinsey & Company (2003), "India Information Technology / Business Process Offshoring: Case Summary", McKinsey Global Institute, San Francisco, available at www.mckinsey.com, accessed January 2004.

Millar, J. (2002), "Outsourcing Practices in Europe", *STAR Issue Report 27*, www.databank.it/star/list_issue/e.html.

OECD (2004a), *OECD Information Technology Outlook*, OECD, Paris.

OECD (2004b), *OECD Economic Outlook*, Vol. 2004/1, No. 75, June, OECD, Paris.

Pain, N., and D. van Welsum (2003), "Financial Liberalisation, Alliance Capitalism, and the Changing Structure of Financial Markets", in J.H. Dunning and G. Boyd (eds.), *Alliance Capitalism and Corporate Management – Entrepreneurial Cooperation in Knowledge Based Economies*, Edward Elgar.

Schultze, C. L. (2004), "Offshoring, Import Competition and the Jobless Recovery", *Policy Brief No. 136*, The Brookings Institution, August.

van Welsum, D. (2003), "International Trade in Services: Issues and Concepts", *Birkbeck Economics Working Paper 2003*, No. 4, Birkbeck College, London.

van Welsum, D. (2004), "In Search of 'Offshoring': Evidence from US Imports of Services", *Birkbeck Economics Working Paper 2004*, No. 2, Birkbeck College, London.

van Welsum, D. and G. Vickery (2005), "New Perspectives on ICT Skills and Employment", *DSTI Information Economy Working Paper*, DSTI/ICCP/IE(2004)10/FINAL, OECD, Paris.

ANNEX 7.A1

Table 7.A1.1. **IMF Balance of Payments categories**

7.	**Computer and information services**
7.1	Computer services
7.2	Information services
7.2.1	News agency services
7.2.2	Other information provision services
9.	**Other business services**
9.1	Merchanting and other trade-related services
9.1.1	Merchanting
9.1.2	Other trade-related services
9.2	Operational leasing services
9.3	Miscellaneous business, professional, and technical services
9.3.1	Legal, accounting, management consulting, and public relations
9.3.1.1	Legal services
9.3.1.2	Accounting, auditing, bookkeeping, and tax consulting services
9.3.1.3	Business and management consulting, and public relations
9.3.2	Advertising, market research, and public opinion polling
9.3.3	Research and development
9.3.4	Architectural, engineering, and other technical services
9.3.5	Agricultural, mining, mining, and onsite processing services
9.3.5.1	Waste treatment and depollution
9.3.5.2	Agricultural, mining and other on-site processing services
9.3.6	Other business services
9.3.7	Services between related enterprises, n.i.e.

Source: United Nations, International Monetary Fund, OECD, European Commission, United Nations Conference on Trade and Development and the World Trade Organization (2002), *The Manual on Statistics of International Trade in Services*, electronic version of the manual available free of charge at www.oecd.org/std/trade-services, accessed April 2005.

Table 7.A1.2. **United States: occupations potentially affected by offshoring**

CPS categories			
accountants and auditors	23	Archivists and curators	165
underwriters	24	Economists	166
other financial officers	25	Urban planners	173
management analysts	26	Authors	183
architects	43	Technical writers	184
aerospace engineer	44	Editors and reporters	195
metallurgical and materials engineers	45	Air traffic controllers	227
mining engineers	46	Computer programmers	229
petroleum engineers	47	Tool programmers, numerical control	233
chemical engineers	48	Supervisors and Proprietors, Sales Occupations	243
nuclear engineers	49	Insurance sales occupations	253
civil engineers	53	Real estate sales occupations	254
agricultural engineers	54	Securities and financial services sales occupations	255
Engineers, electrical and electronic	55	Sales occupations, other business services	257
Engineers, industrial	56	Supervisors, computer equipment operators	304
Engineers, mechanical	57	Supervisors, financial records processing	305
marine and naval architects	58	Chief communications operators	306
engineers, n.e.c.	59	Computer operators	308
surveyors and mapping scientists	63	Peripheral equipment operators	309
computer systems analysts and scientists	64	Secretaries	313
operations and systems researchers and analysts	65	Typists	315
Actuaries	66	Transportation ticket and reservation agents	318
Statisticians	67	File clerks	335
Mathematical scientists, n.e.c.	68	Records clerks	336
Physicists and astronomers	69	Bookkeepers, accounting, and auditing clerks	337
Chemists, except biochemists	73	Payroll and timekeeping clerks	338
Atmospheric and space scientists	74	Billing clerks	339
Geologists and geodesists	75	Cost and rate clerks	343
Physical scientists, n.e.c.	76	Billing, posting, and calculating machine operators	344
Agricultural and food scientists	77	Telephone operators	348
Biological and life scientists	78	Bank tellers	383
Forestry and conservation scientists	79	Data-entry keyers	385
Medical scientists	83	Statistical clerks	386
Librarians	164		

Source: OECD based on US Current Population Survey.

Table 7.A1.3. **Canada: occupations potentially affected by offshoring**

SOC91 Canada			
A121	Engineering, Science and Architecture Managers	C012	Chemists
A122	Information Systems and Data Processing Managers	C013	Geologists, Geochemists and Geophysicists
A131	Sales, Marketing and Advertising Managers	C014	Meteorologists
A301	Insurance, Real Estate and Financial Brokerage Managers	C015	Other Professional Occupations in Physical Sciences
A302	Banking, Credit and Other Investment Managers	C021	Biologists and Related Scientists
A303	Other Business Services Managers	C031	Civil Engineers
A311	Telecommunication Carriers Managers	C032	Mechanical Engineers
A312	Postal and Courier Services Managers	C033	Electrical and Electronics Engineers
A392	Utilities Managers	C034	Chemical Engineers
B011	Financial Auditors and Accountants	C041	Industrial and Manufacturing Engineers
B012	Financial and Investment Analysts	C042	Metallurgical and Materials Engineers
B013	Securities Agents, Investment Dealers and Traders	C043	Mining Engineers
B014	Other Financial Officers	C044	Geological Engineers
B022	Professional Occupations in Business Services to Management	C045	Petroleum Engineers
B111	Bookkeepers	C046	Aerospace Engineers
B112	Loan Officers	C047	Computer Engineers
B114	Insurance Underwriters	C048	Other Professional Engineers, n.e.c.
B211	Secretaries (except Legal and Medical)	C051	Architects
B212	Legal Secretaries	C052	Landscape Architects
B213	Medical Secretaries	C053	Urban and Land Use Planners
B214	Court Recorders and Medical Transcriptionists	C054	Land Surveyors
B311	Administrative Officers	C061	Mathematicians, Statisticians and Actuaries
B312	Executive Assistants	C062	Computer Systems Analysts
B412	Supervisors, Finance and Insurance Clerks	C063	Computer Programmers
B512	Typists and Word Processing Operators	C152	Industrial Designers
B513	Records and File Clerks	C172	Air Traffic Control Occupations
B514	Receptionists and Switchboard Operators	E012	Lawyers and Quebec Notaries
B521	Computer Operators	E031	Natural and Applied Science Policy Researchers, Consultants and Program Officers
B522	Data Entry Clerks	E032	Economists and Economic Policy Researchers and Analysts
B523	Typesetters and Related Occupations	E033	Economic Development Officers and Marketing Researchers and Consultants
B524	Telephone Operators	F011	Librarians
B531	Accounting and Related Clerks	F013	Archivists
B532	Payroll Clerks	F021	Writers
B533	Tellers, Financial Services	F022	Editors
B534	Banking, Insurance and Other Financial Clerks	F023	Journalists
B553	Customer Service, Information and Related Clerks	F025	Translators, Terminologists and Interpreters
B554	Survey Interviewers and Statistical Clerks	G131	Insurance Agents and Brokers
C011	Physicists and Astronomers		

Source: OECD based on Statistics Canada.

Table 7.A1.4. **Australia: occupations potentially affected by offshoring**

ASCO 4-digit	
1221 Engineering Managers	2521 Legal Professionals
1224 Information Technology Managers	2522 Economists
1231 Sales and Marketing Managers	2523 Urban and Regional Planners
1291 Policy and Planning Managers	2534 Journalists and Related Professionals
2111 Chemists	2535 Authors and Related Professionals
2112 Geologists and Geophysicists	3211 Branch Accountants and Managers (Financial Institution)
2113 Life Scientists	3212 Financial Dealers and Brokers
2114 Environmental and Agricultural Science Professionals	3213 Financial Investment Advisers
2115 Medical Scientists	3294 Computing Support Technicians
2119 Other Natural and Physical Science Professionals	3392 Customer Service Managers
2121 Architects and Landscape Architects	3399 Other Managing Supervisors (Sales and Service)
2122 Quantity Surveyors	5111 Secretaries and Personal Assistants
2123 Cartographers and Surveyors	5911 Bookkeepers
2124 Civil Engineers	5912 Credit and Loans Officers
2125 Electrical and Electronics Engineers	5991 Advanced Legal and Related Clerks
2126 Mechanical, Production and Plant Engineers	5993 Insurance Agents
2127 Mining and Materials Engineers	5995 Desktop Publishing Operators
2211 Accountants	6121 Keyboard Operators
2212 Auditors	6141 Accounting Clerks
2221 Marketing and Advertising Professionals	6142 Payroll Clerks
2231 Computing Professionals	6143 Bank Workers
2292 Librarians	6144 Insurance Clerks
2293 Mathematicians, Statisticians and Actuaries	6145 Money Market and Statistical Clerks
2294 Business and Organisation Analysts	8113 Switchboard Operators
2299 Other Business and Information Professionals	8294 Telemarketers
2391 Medical Imaging Professionals	

Source: OECD based on Australian Bureau of Statistics.

Table 7.A1.5. **Korea: occupations potentially affected by offshoring**

Korean occupations		
Managers in Financial Intermediation Service		Librarians and Archivists
Other Managers in Business Service		Web and Multimedia Designers
Managers in Information and Communication		Draught Persons(CAD)
Managers in Sales		Multimedia Directors(Including Web Directors)
Business Consultant		Trader Brokers
Certified Public Accountants		Construction Engineers
Taxation Accountants		Civil Engineers
Advertising and Public Relations Professionals		Landscape Engineers
Marketing and Market Research Professionals		Town Planners
Other Business and Accounting Professionals n.e.c.		Land Surveying and Mapping Engineers
Accounting Clerks		Quantity Surveyors
Book-keeping Clerks		Mechanical Engineer
Statistical Survey Clerks		Material Engineers
Secretary		Chemical Engineers
Clerks Helper and Word-Processor Operators		Electronic Engineers
Financial Investment and Credit Analysts		Electric Engineers
Financial Fund Managers		Computer Engineers
Stock Dealers		Telecommunication Engineers
Actuaries		Computer System Analysts and Designers
Other Finance Intermediation and Insurance Professionals n.e.c.		System Software Developers and Programmers
Financial Clerks		Application Software Developers and Programmers
Insurance Clerks		Network System Analysts and Developers
Bank Tellers		Computer Security Engineers
Insurance Agents and Brokers		Web Developers and Engineers
Insurance Sales Representatives		System Administrators
Natural Science Researchers		Information Technology Consultants
Biological Science Researchers		Industrial Safety Engineer
Jurists		Administration Clerks
Desk Top Publishers		Information, Receptionist and Telephonist
Translators		Customer Service Clerks
Journalists		Writers

Source: OECD, based on Korean Work Information Centre, Human Resource Development Service.

Kirkegaard (2004), based on information provided by Forrester Research identifies the following main US SOC occupational categories as potentially affected by offshoring. In 2002, these occupations accounted for around 44% of total employment.

Table 7.A1.6. **Main US SOC occupational categories identified by Forrester Research (as reported by Kirkegaard, 2004) as potentially affected by offshoring**

11-0000	Management occupations
13-0000	Business and financial operations occupations
15-0000	Computer and mathematical occupations
17-0000	Architecture and engineering occupations
19-0000	Life, physical, and social science occupations
23-0000	Legal occupations
27-0000	Arts, design, entertainment, sports, and media occupations
41-0000	Sales and related occupations
43-0000	Administrative support occupations

Source: Kirkegaard, J. F. (2004), "Outsourcing – Stains on the White Collar?", www.iie.com/publications/papers/kirkegaard0204.pdf.

In Bardhan and Kroll (2003), in 2001, 11% of US employment is in occupations potentially affected by offshore outsourcing – the outer limit of potential direct job loss. They include the following broad occupational categories as occupations potentially affected by offshoring: office support (including computer operators and data entry keyers, for example, business and financial support, computer and math professionals, paralegals and legal assistants, diagnostic support services and medical transcriptionists). The choice of these occupations was guided by a judgement on the "offshorability attributes", and whether some outsourcing had already taken place in them.

Table 7.A1.7. **US SOC occupational categories identified by Bardhan and Kroll (2003) as potentially affected by offshoring**

15-0000	Computer and mathematical occupations	43-3021	Billing and posting clerks and machine operators
23-2011	Paralegals and legal assistants	43-3031	Bookkeeping, accounting, and auditing clerks
29-2034	Radiological technologists and technicians	43-3051	Payroll and timekeeping clerks
31-9094	Medical transcriptionists	43-3061	Procurement clerks
13-1031	Claims adjusters, examiners, and investigators	43-4011	Brokerage clerks
13-1051	Cost estimators	43-4021	Correspondence clerks
13-1072	Compensation, benefits, and job analysis specialists	43-4041	Credit authorizers, checkers, and clerks
13-1111	Management analysts	43-4051	Customer service representatives
13-2011	Accountants and auditors	43-4111	Interviewers, except eligibility and loan
13-2031	Budget analysts	43-4131	Loan interviewers and clerks
13-2041	Credit analysts	43-4151	Order clerks
13-2051	Financial analysts	43-4161	Human resource assistants, except payroll and timekeeping
13-2053	Insurance underwriters	43-5061	Production, planning and expediting clerks
13-2082	Tax preparers	43-9011	Computer operators
43-1011	First line supervisors / Managers of office and administrative support workers	43-9021	Data entry keyers
43-2011	Switchboard operators, including answer service	43-9031	Desktop publishers
43-2021	Telephone operators	43-9041	Insurance claims and policy processing clerks
43-3011	Bill and account collectors	43-9111	Statistical assistants

Source: Bardhan, A. D. and C. Kroll (2003), "The New Wave of Outsourcing", *Fisher Centre Research Report*, No. 1103, University of California Berkeley, Fisher Centre for Real Estate and Urban Economics.

Table 7.A1.8. **Industries with a zero share of employment potentially affected by offshoring in Canada 2003**[1]

Industry	Code
Farming (N.E.C.)	110
Crop Production	111
Animal Production	112
Forestry and Logging	113
Fishing, Hunting and Trapping	114
Support Activities for Agriculture and Forestry	115
Mining (n.e.c.).	210
Mining (except Oil and Gas)	212
Beverage and Tobacco Product Manufacturing	312
Textile Mills	313
Textile Product Mills	314
Clothing Manufacturing	315
Leather and Allied Product Manufacturing	316
Paper Manufacturing	322
Petroleum and Coal Products Manufacturing	324
Non-Metallic Mineral Product Manufacturing	327
Primary Metal Manufacturing	331
Electrical Equipment, Appliance and Component Manufacturing	335
Furniture and Related Product Manufacturing	337
Miscellaneous Manufacturing	339
Farm Product Wholesaler-Distributors	411
Petroleum Product Wholesaler-Distributors	412
Wholesale Agents and Brokers	419
Furniture and Home Furnishings Stores	442
Electronics and Appliance Stores	443
Health and Personal Care Stores	446
Gasoline Stations	447
Clothing and Clothing Accessories Stores	448
Non-Store Retailers	454
Rail Transportation	482
Water Transportation	483
Transit and Ground Passenger Transportation	485
Pipeline Transportation	486
Scenic and Sightseeing Transportation	487
Warehousing and Storage	493
Motion Picture and Sound Recording Industries	512
Monetary Authorities - Central Bank	521
Rental and Leasing Services	532
Management of Companies and Enterprises	55
Waste Management and Remediation Services	562
Heritage Institutions	712
Private Households	814
Aboriginal Public Administration	914
International and Other Extra-Territorial Public Administration	919

Notes: 1. Except sector 521 – not available.

NEC = not elsewhere classified.

Source: OECD based on Statistics Canada.

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