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# The Internationalisation of Production, International Outsourcing and Employment in the OECD

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# THE INTERNATIONALISATION OF PRODUCTION, INTERNATIONAL OUTSOURCING AND EMPLOYMENT IN THE OECD

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**by**
**Margit Molnar, Nigel Pain and Daria Taglioni**

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## ABSTRACT/RÉSUMÉ


### The Internationalisation of Production, International Outsourcing and Employment in the OECD

This paper reviews some of the possible changes that may occur in the national labour markets of many OECD countries as a result of international trade and the internationalisation of production by multinational companies, with a particular focus on the impact of outward foreign direct investment (FDI) from OECD countries on employment in the home country of the investing firms. Existing studies suggest that the overall impact of trade and the internationalisation of production on aggregate labour market outcomes has been comparatively small, although particular skill and occupational groups have been affected more strongly. The empirical findings in the paper suggest that the aggregate employment impact of outward FDI varies across industries and countries. For manufacturing industries with strong commercial links with the non-OECD economies, there is evidence that domestic employment has become more sensitive to movements in domestic labour costs. At the country level, the growth of outward investment is found to have a significant positive effect on domestic employment growth in the United States. In contrast, there is a negative association in Japan, especially from outward investment in China.


*JEL classification:* F16, F23, J23.
*Keywords:* Trade; foreign direct investment; production fragmentation; employment; skills

**********


### L'internationalisation de la production, délocalisations et emploi dans les pays de l'OCDE

Ce papier présente quelques uns des changements possibles résultant du commerce international et de l'internationalisation de la production des firmes multinationales, qui ont pu affecter les marchés du travail de plusieurs pays de l'OCDE. Un intérêt particulier est porté sur l'impact des flux d'investissement direct étrangers sortants des pays de l'OCDE sur l'emploi dans le pays d'origine des firmes qui investissent. Les études existantes concluent que l'effet global du commerce et de l'internationalisation de la production sur le marché du travail a été limité. Toutefois, certaines catégories socioprofessionnelles et certains savoirs ont été touchés plus sensiblement. Les résultats empiriques du papier indiquent que l'impact sur l'emploi agrégé des flux d'investissement direct étrangers sortants est différent selon les pays et les industries. Pour les entreprises du secteur manufacturier qui ont des liens commerciaux forts avec les pays non-OCDE, on trouve que l'emploi est devenu plus sensible aux mouvements des coûts salariaux domestiques. Au niveau des pays, on trouve que la croissance des flux d'investissement sortants a un effet significatif positif sur le taux de croissance de l'emploi aux Etats-Unis. En revanche, cet effet est négatif au Japon, notamment pour les flux d'investissement vers la Chine


*Classification JEL* : F16, F23, J23.
*Mots clés :* Commerce ; investissement direct étranger ; fragmentation de la production ; emploi, qualifications

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# THE INTERNATIONALISATION OF PRODUCTION, INTERNATIONAL OUTSOURCING AND EMPLOYMENT IN THE OECD

by

Margit Molnar, Nigel Pain and Daria Taglioni[1,2]

## 1. Introduction and overview

1. In the long run, enhanced international engagement can normally be expected to be welfare-improving for each country involved, with greater specialisation and competition and the ability to access foreign knowledge all helping to raise productivity levels, employment and per capita incomes. But such improvements in income levels need not be experienced by all factors of production, especially comparatively unskilled workers in developed countries. The process of labour market adjustment following changes in trade and international investment patterns can also be prolonged.

2. This paper reviews some of the possible changes that may occur in the national labour markets of many OECD countries as a result of international trade and the internationalisation of production by multinational companies, with a particular focus on the impact of outward foreign direct investment (FDI) from OECD countries on employment in the home country of the investing firms. Although this provides only a partial picture of the overall effects of globalisation on labour market outcomes, it is an aspect about which comparatively little has been known until recently. The paper complements other analytical studies at the OECD on the labour market impact of trade (Baldwin, 1995; OECD, 2005; OECD, 2007).

3. In the economy as a whole, relative factor prices will reflect the full impact of globalisation if they are sufficiently flexible, with the price of factors of production that were comparatively scarce prior to enhanced global engagement falling relative to the price of more abundant factors. For most OECD countries the wages of more skilled workers and the returns to capital might thus be expected to rise relative to the wages of less skilled workers. But if there are significant labour market rigidities, or institutional features such as binding floors for the wages of less skilled workers, then it becomes more likely that there will a greater quantitative effect on aggregate employment and a smaller adjustment in the relative wages of different types of workers (Davis, 1998; Moore and Ranjan, 2005; OECD, 2005).

4. The issues examined in this paper have potentially important macroeconomic consequences. The integration and expansion of cross-border trade and production networks increases the ability of companies to change the location of production of both finished and intermediate goods and services. Such changes affect both the sensitivity of national factor demands to changes in factor prices and the speed and the

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1. At the time of writing, the authors were all members of the Macroeconomic Analysis and Systems Management Division of the Economics Department of the OECD. They are grateful to Pete Richardson, Jean-Philippe Cotis, Mike Feiner, Jorgen Elmeskov and other colleagues in the Economics Department for helpful comments and suggestions and to Diane Scott for assistance in preparing the document.

2. This paper forms part of the OECD Economics Department contribution to the OECD-wide Globalisation and Structural Adjustment project. Part of the work in the paper has been made possible by financial support from Japanese ESRI funding.

extent to which economic shocks are transmitted across national borders. Recent research has also begun to suggest that international trade in labour tasks, which is one consequence of the international fragmentation of production, might also have positive effects on productivity growth in firms that use intermediate inputs produced offshore (Grossman and Rossi-Hansberg, 2006; Amiti and Wei, 2005). Empirical investigation of this latter point is limited, but the results in this paper are suggestive that it might matter.

5. The existing theoretical and empirical literature is large, with a wide variety of approaches being used to study the effects of enhanced global engagement on the labour markets of developed countries. Some of the key findings from existing studies are as follows:

- The overall impact of both trade and the internationalisation of production on aggregate labour market developments is generally found to be comparatively small.

- There is some evidence that the bargaining power of employees and the labour share of income have been reduced by greater international integration.

- The impact of globalisation varies according to whether domestic and foreign components of production are complements or substitutes. The relative prices of domestic factors that are substitutes for the foreign factors utilised via international sourcing and production relocation are likely to decline.

- Increases in international competition affect different occupational and skill groups in different ways. In particular, international trade and investment account for a non-negligible proportion of the rising returns to skilled labour relative to those of unskilled labour.

- The international sourcing of intermediate inputs and also the internationalisation of production should have a greater impact on labour markets than trade in finished goods and services.

- The labour market effects of internationalisation of production should be strongest for cost-saving internationalisation of production (one component of vertical FDI), and also the smaller the home country relative to the location of affiliates.

- The substitution of employment between parent companies and foreign affiliates is stronger for affiliates located in Asia and Central and Eastern Europe than with affiliates located in other emerging countries. However, perhaps surprisingly, in-company employment substitution is on average higher with affiliates located in industralised countries than with affiliates located in developing countries.

- The complete equalisation of factor prices across countries is unlikely as long as there are marked productivity differences across countries, even if the entry of labour-abundant countries into world markets, and the consequent expansion of global labour supply, puts downward pressure on relative labour costs (adjusted for productivity) and the relative prices of labour-intensive, tradable products.

6. The absence of empirical evidence of large effects in most of the studies conducted to date does not provide an indication that this will be the case in future periods. The internationalisation of production is continuing rapidly and shifting towards organisational forms that can be expected to have larger labour market effects on home countries.

7. This paper contains two new empirical analyses using industry-level data on the outward stocks of foreign direct investment (FDI) and employment in the foreign affiliates of the G3 economies to

investigate the impact of the greater internationalisation of production on employment in home countries in the OECD. In general, these results suggest that the findings from studies of individual countries or particular industry groupings should be regarded with a degree of caution until they have been investigated more widely on other data sets. The key findings from the work are:

- The effects of outward investment in different industries and also in different countries are very heterogeneous. But there is evidence for at least some countries and industries that outward investment has a significant negative association with the domestic demand for labour after controlling for domestic output and real wages. One possible explanation for this is that enhanced offshoring may reduce the level of employment required to achieve a given level of output in the short-term, but raise productivity, output and employment in the longer term (Grossman and Rossi-Hansberg, 2006).

- In manufacturing industries in which there are comparatively strong commercial links between OECD and non-OECD countries there is significant evidence that outward investment makes the labour demand curve more elastic in the home country. There is also evidence that outward investment raises the speed at which employment adjusts in these industries following changes in demand and wages.

- The evidence at the country level is mixed. The growth of outward investment is found to have a significant positive effect on the growth of domestic employment in the United States, but a negative effect in Japan, especially from outward investment in China.

8. Overall, the findings from existing studies and from the additional empirical work in this paper provide few reasons for suggesting that the aggregate employment effects of international sourcing and outward investment differ greatly from the general effects of international trade, with overall gains and individual winners and losers. Neither of these factors necessarily changes the appropriate policies to encourage job creation and facilitate the reallocation of labour across sectors. But the increasing speed and scope of global integration does increase the need to have such policies in place, and also raises the potential costs of labour market distortions.

- Labour market adjustment is likely to be facilitated by carefully designed policies that help to compensate displaced workers for their foregone earnings, at least for a while, and also in some cases by the prompt use of active labour market policies (OECD, 2005 and 2007).

- New forms of globalisation could however require the changes in the design of some of these policies. In particular, the increasing tradability of many services is likely to result in the displacement of workers that typically have a higher average skill level in manufacturing. Such workers may have relatively less need of proactive labour market schemes to acquire the general skills necessary to move to new activities.

- More broadly, the restated OECD Jobs Strategy (OECD, 2006) suggests that new job creation is also likely to be aided by stability-orientated macroeconomic policy, the removal of impediments to labour market participation and measures to enhance the flexibility of labour and product markets and labour skills and competencies.

9. The remainder of this paper is as follows. Section 2 provides a short overview of recent trends in foreign direct investment, the activities of multinational companies, international sourcing and labour market outcomes. The terms offshoring, outsourcing and foreign production by multinationals are often used interchangeably, but in fact they are distinct concepts that overlap only partially (Box 1). Sections 3 and 4 contain summaries of some theoretical and empirical models of the impact of international trade in

goods and services on OECD labour markets, including the implications for factor price equalisation. A short overview of the theory of multinational companies and some of the associated implications for the ways in which investment will affect labour markets is given in Section 5. Existing empirical studies of the activities of the affiliate companies of multinational companies are reviewed in Section 6. New empirical work on the impact of the internationalisation of production on the demand for labour is reported in Section 7. Some summary conclusions to this empirical work are given in Section 8.

**Box 1. Outsourcing, offshoring and the internationalisation of production**

The terms outsourcing and offshoring are frequently used interchangeably to describe the process whereby intermediate goods and services are purchased from foreign suppliers, usually with slightly different definitions. In fact there is only a partial overlap between outsourcing and offshoring, and between both terms and the internationalisation of production by multinational companies.

Outsourcing refers to the purchase of goods and services that were previously produced inside the purchasing company. The company providing the intermediate inputs can be located inside (domestic outsourcing) or outside (international outsourcing) the country of the sourcing company. All firms outsource particular activities, but relatively few do so across national boundaries (Tomiura, 2005). Trade-based measures of outsourcing are discussed further in Annex A.

Offshoring refers to the purchase from companies in locations outside the country of goods and services previously produced inside the purchasing company. Thus it includes not only international outsourcing, but also international insourcing, with the foreign affiliates of domestic parent companies exporting to their parents.

The internationalisation of production refers to the establishment of affiliates abroad by parent companies in the home country. These affiliates may export back to the parent company (international insourcing), or provide goods and services to home and foreign markets. The goods and services produced by affiliates need not have been previously produced inside the parent company.

## 2. Recent trends in international investment and labour market outcomes

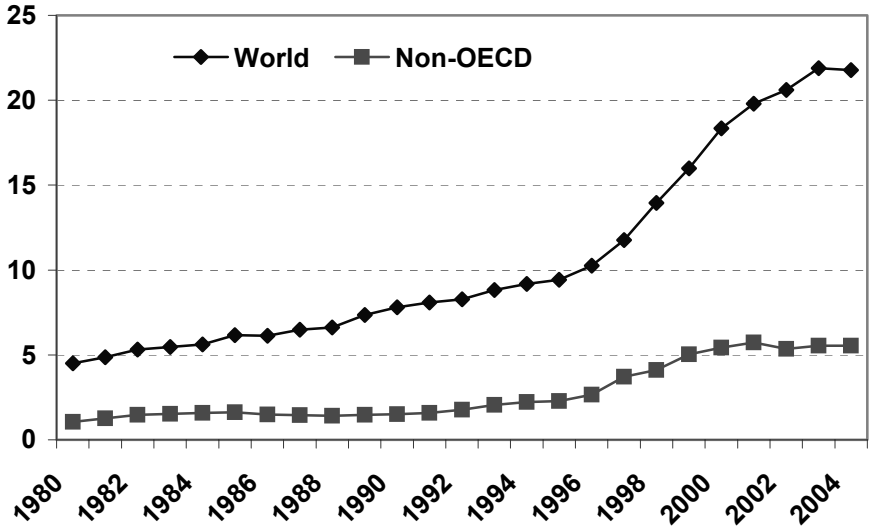
10. This section provides an overview of some of the major recent trends in international integration.[3] The creation and expansion of both trade and international production networks is a longstanding and ongoing process, with the ratio of global trade volumes having risen consistently relative to global GDP for over 50 years (WTO, 2005). But there are signals that the process of cross-border integration has accelerated over the past decade. This is readily apparent from Figures 1 and 2. The global stock of foreign direct investment relative to global GDP has accelerated noticeably since the early 1990s, as has the stock of inward FDI in the non-OECD economies. Coinciding with this change, imports from non-OECD countries into the OECD have also risen markedly since the early 1990s. To some extent this reflects the recent strengthening of oil and other commodity prices. But it also reflects the increasing extent of international sourcing of finished and intermediate goods and services from non-OECD countries.

11. The acceleration in the global stock of FDI is unlikely to be due only to increasing investments in production facilities in lower-wage economies, although that is clearly a powerful motivation for some investors. The majority of global FDI remains located in the OECD economies, with the proportion held in the non-OECD economies fluctuating between 25-30%, changing little in recent years (Figure 3). A similar pattern is apparent from the geographical distribution of the outward FDI stocks of the G7 economies (Figure 4). However, the destination for investment within the non-OECD is changing, with a rising share of investments being located in Central and Eastern Europe and, to a lesser extent, the Asian economies.

3. See also OECD (2005b).

Figure 1. **The global stock of inward Foreign Direct Investment**

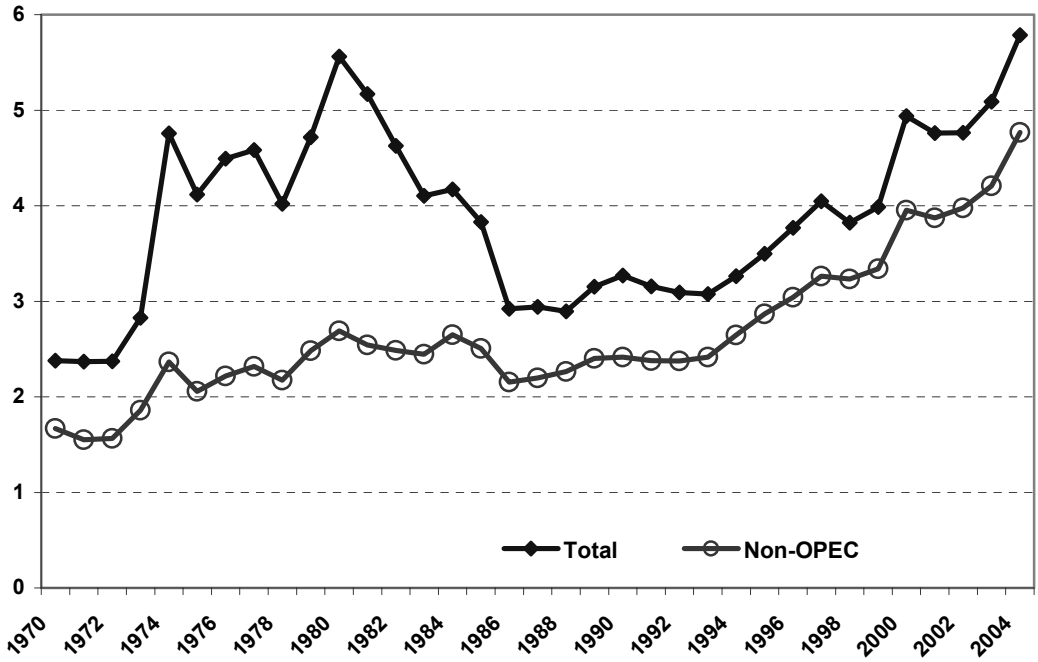
Per cent of world GDP at current prices




*Source*: UNCTAD World Investment Report Database and IMF Economic Outlook Database.

Figure 2. **OECD imports of goods from the non-OECD**

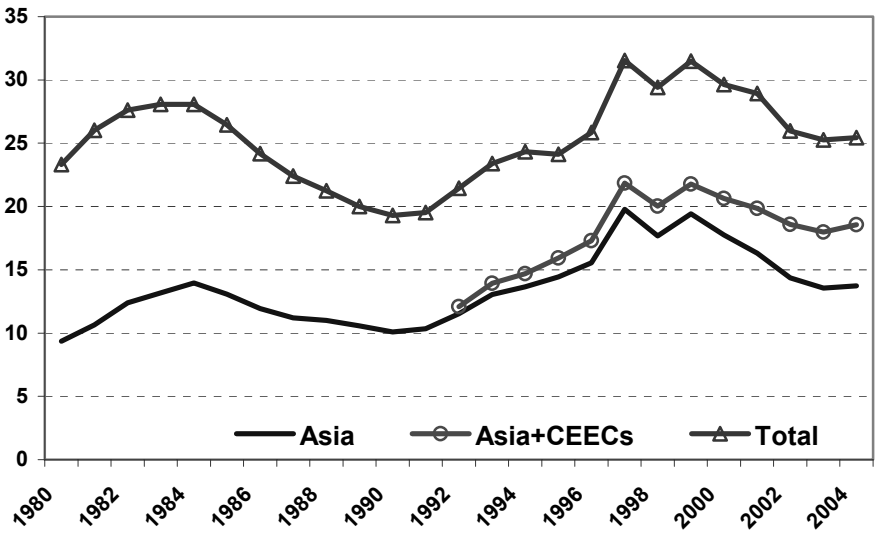
Per cent of OECD GDP, current prices




*Sources*: OECD International Trade Statistics database and Economic Outlook database.

Figure 3. **The inward investment stock in the non-OECD economies**

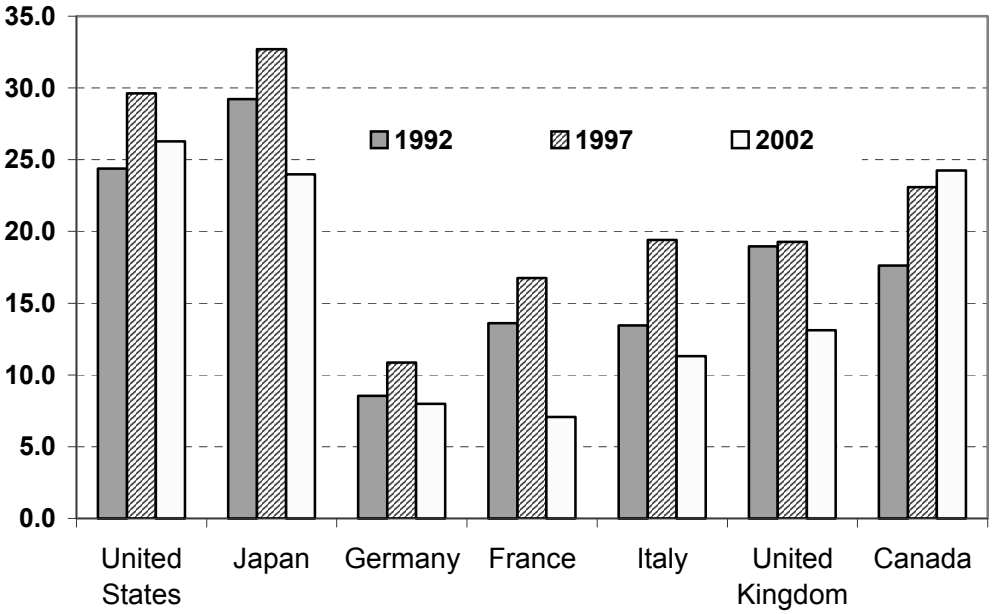
Per cent of global stock




*Source*: UNCTAD World Investment Report Database.

Figure 4. **The G7 outward FDI stock in the non-OECD economies**

Per cent of total




*Source*: Adapted from OECD (2005b).

12. The available data suggest that outward FDI stocks are typically larger in proportion to domestic output in smaller, open economies with comparatively higher labour costs, especially in Europe (Figure 5). Amongst the G7 economies the United Kingdom has the highest outward stock relative to the size of the domestic economy. As of the end of 2002, the size dispersion of FDI stocks was very wide, although this partly reflects the high level of stocks in three European economies that have a significant proportion of multinational holding companies -- Switzerland, the Netherlands and Belgium. All three countries have high flows of both inward and outward FDI.

13. Perhaps surprisingly, the available data suggest that many of the lower income OECD economies are amongst those with the highest proportions of their outward FDI stock invested in non-OECD countries (Figure 6). One possible explanation is that many of these countries have a higher proportion of longstanding commercial ties through trade with the non-OECD economies, especially those in close geographical proximity. However, the aggregate level of outward FDI from many lower income OECD economies is comparatively small, so that their investment in non-OECD economies is low in relation to their domestic GDP.

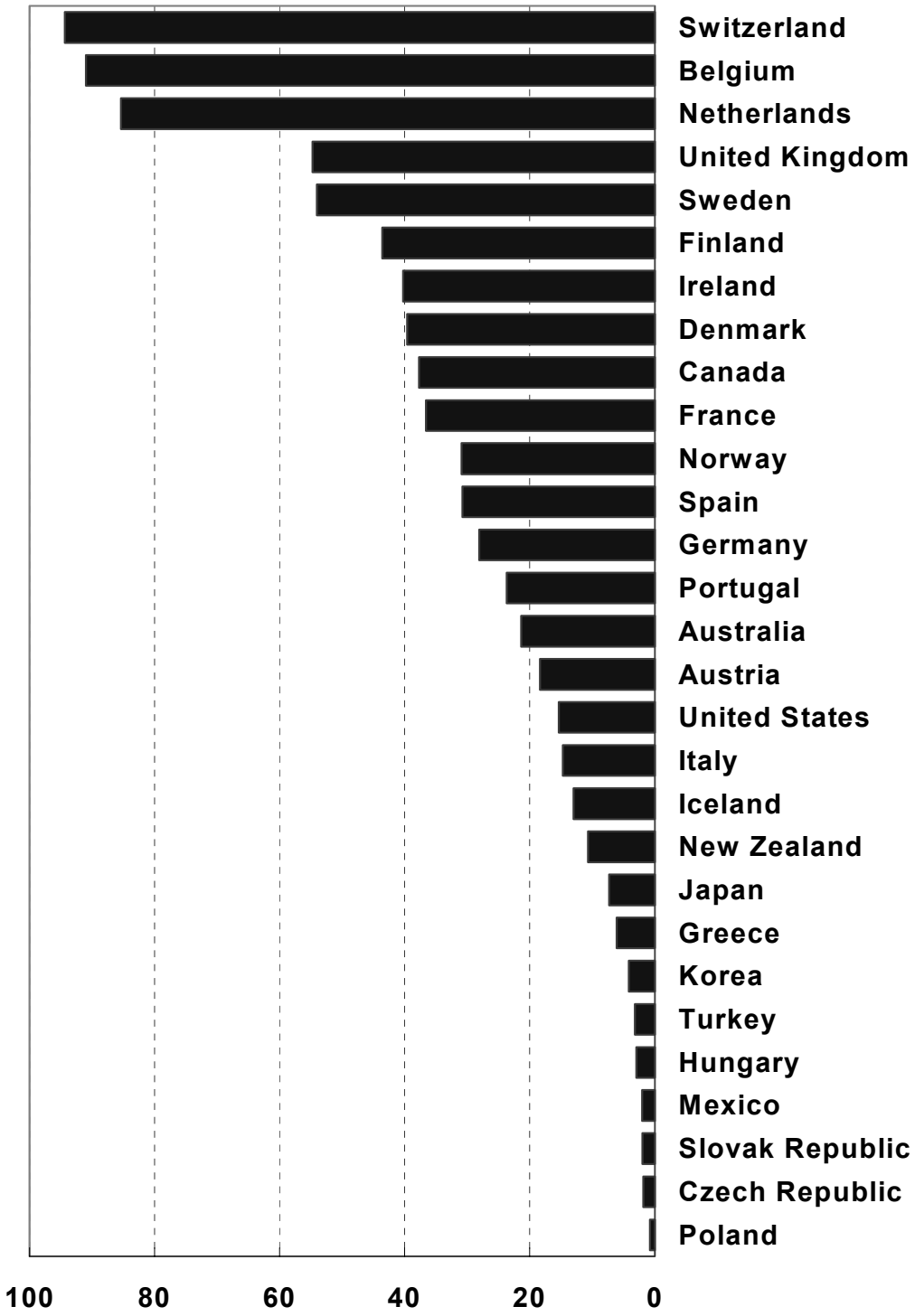
14. A further feature of direct investment is that in most countries it is dominated by investments in service sectors rather than manufacturing ones (Figure 7). Of the countries shown, only Finland and Korea have more than half their total outward stock in manufacturing activities. Despite the smaller scale of manufacturing investments compared to services investments, cross-border linkages appear to be a lot deeper in manufacturing. For instance, employment in foreign affiliates in the manufacturing sector is generally much larger as a share of domestic employment than employment in foreign affiliates in the service sector (Figure 8). There is clearly a considerable potential for cost savings by locating some activities in non-OECD economies (Figure 9), although this is offset to some extent by likely average differences in labour productivity.

15. A part of the production of many foreign affiliates will be used as intermediate inputs by parent companies. The extent of this, and indeed the extent of other forms of international sourcing, is difficult to measure, and a number of different concepts have been used, as discussed further in Annex A. Despite common perceptions that international sourcing has risen significantly, at least one commonly used measure suggests that imports of intermediate goods have not risen much faster than imports of final goods (Figure 10).[4] Imports of parts and components have risen as a proportion of domestic output (see Annex A), but this seems to have as much to do with the general rise in import penetration over time as with the fragmentation of production by multinational companies. Indeed, the share of OECD manufacturing imports accounted for by intermediate goods, parts and components has hardly changed at all between 1992 and 2004. Whilst intermediate imports into the OECD as a whole from China and the ASEAN have risen sharply (as a share of total manufacturing imports), this has been offset by reductions in intermediate imports from other countries. The share of imports from non-OECD economies has risen a little over time in most OECD countries, but has reached a similar level to imports from other OECD countries only in Japan and Korea (Figure 11). It is clear that regional integration in East Asia is well advanced (Ng and Yeats, 2003).

4. Information for tradeable services is not available on the same basis.

Figure 5. **The outward FDI stocks of OECD countries in 2002**

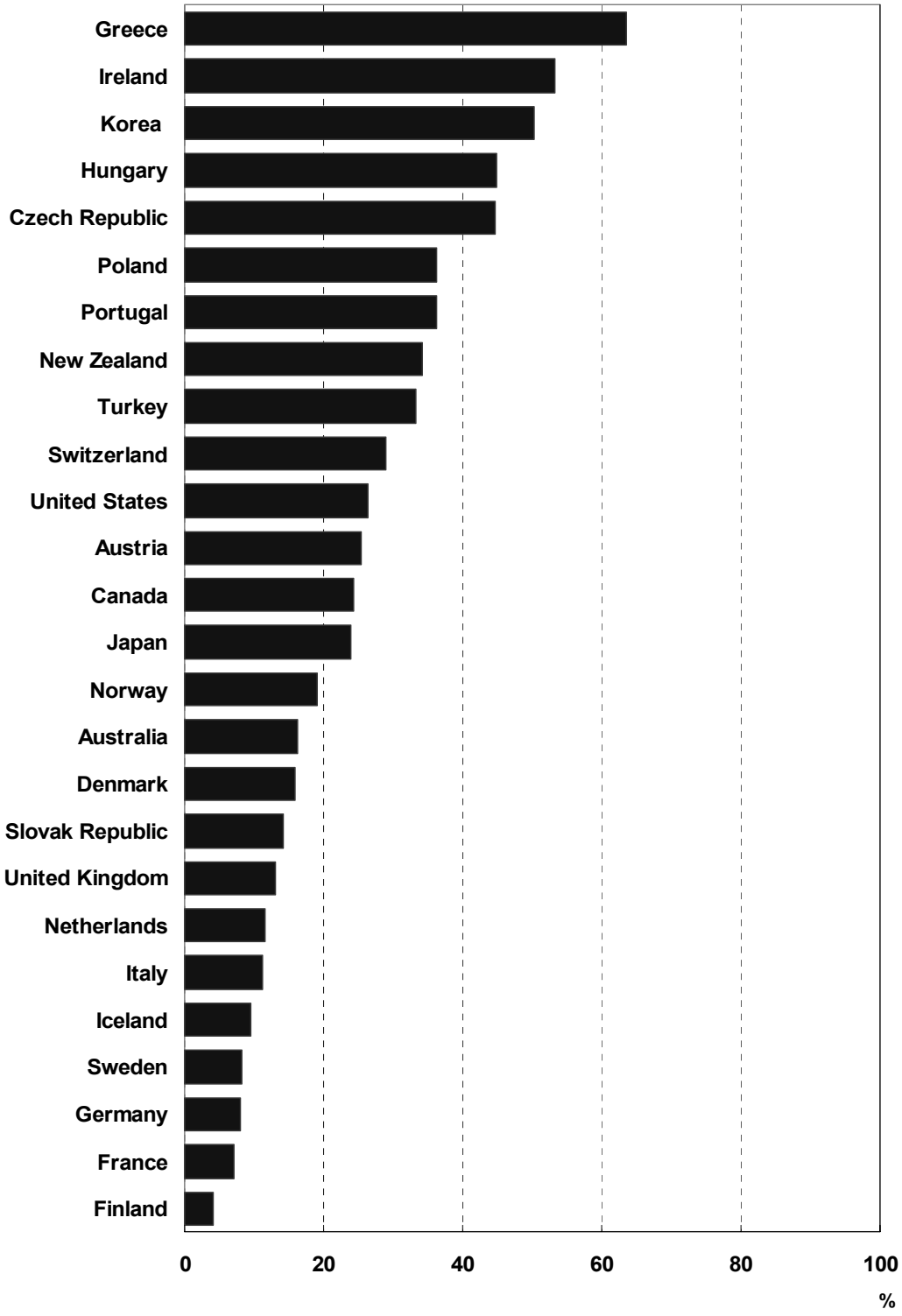
Per cent of GDP




*Source*: Adapted from OECD 2005(b).

Figure 6. **FDI in non-OECD countries by OECD countries**

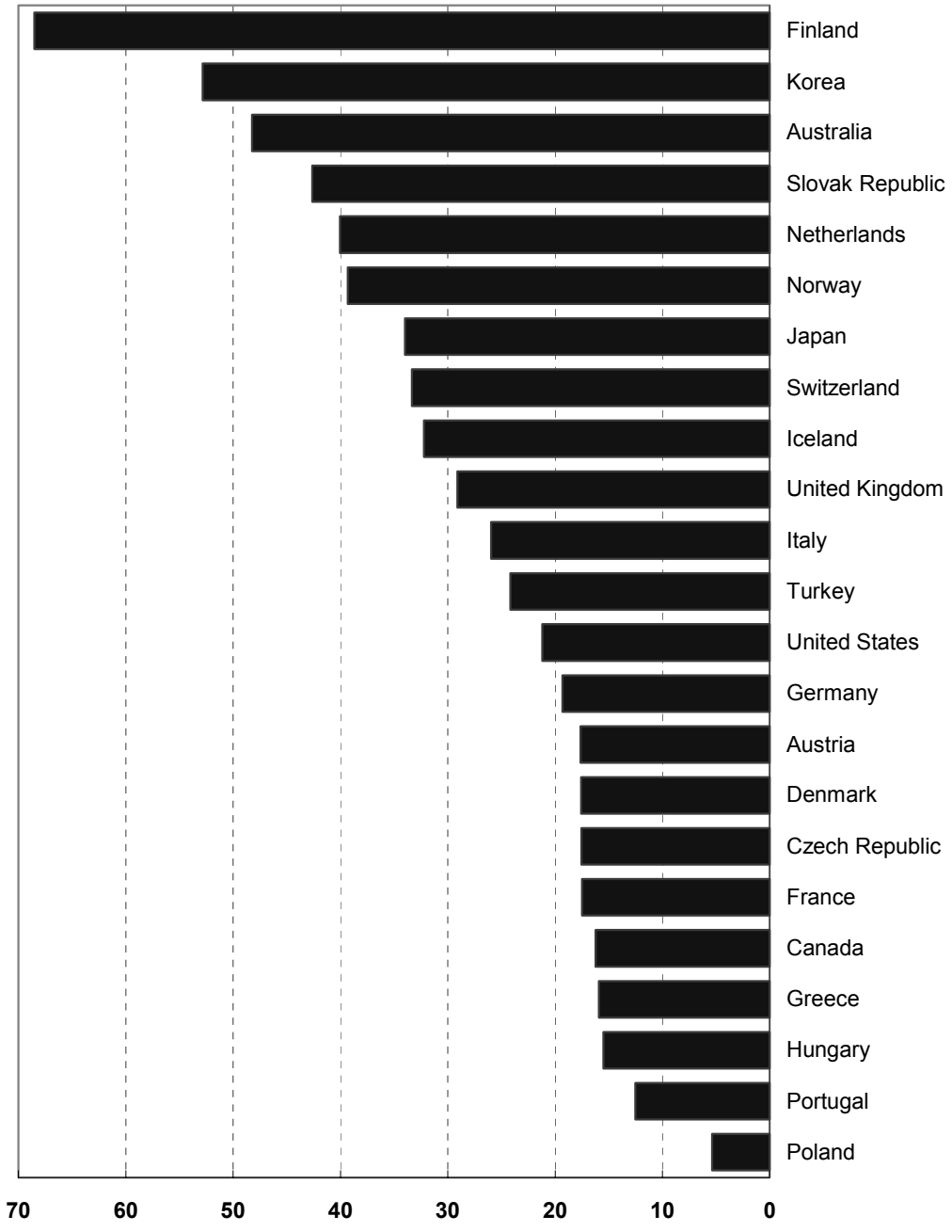
Per cent of total outward FDI stock in 2002




*Source*: Adapted from OECD (2005b).

Figure 7. **Outward FDI in manufacturing industries**

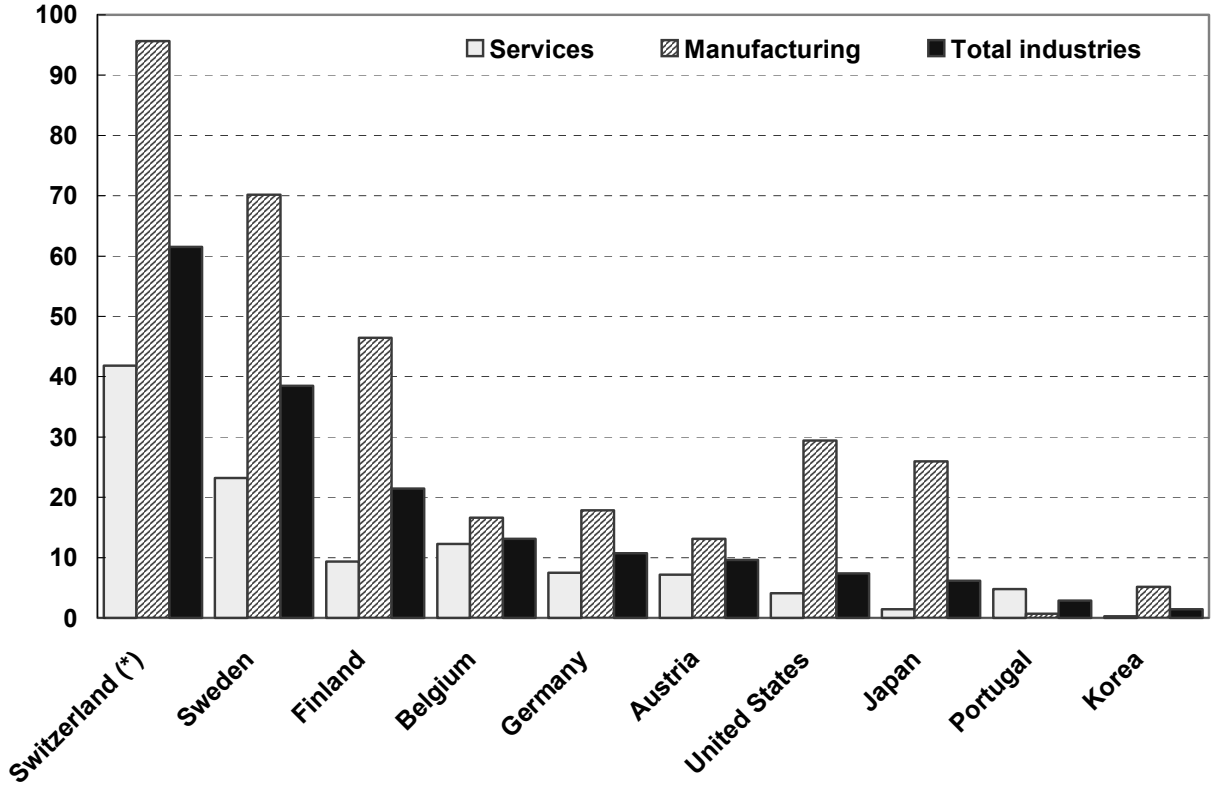
Per cent of total outward FDI stock in 2002




*Source*: Adapted from OECD (2005b).

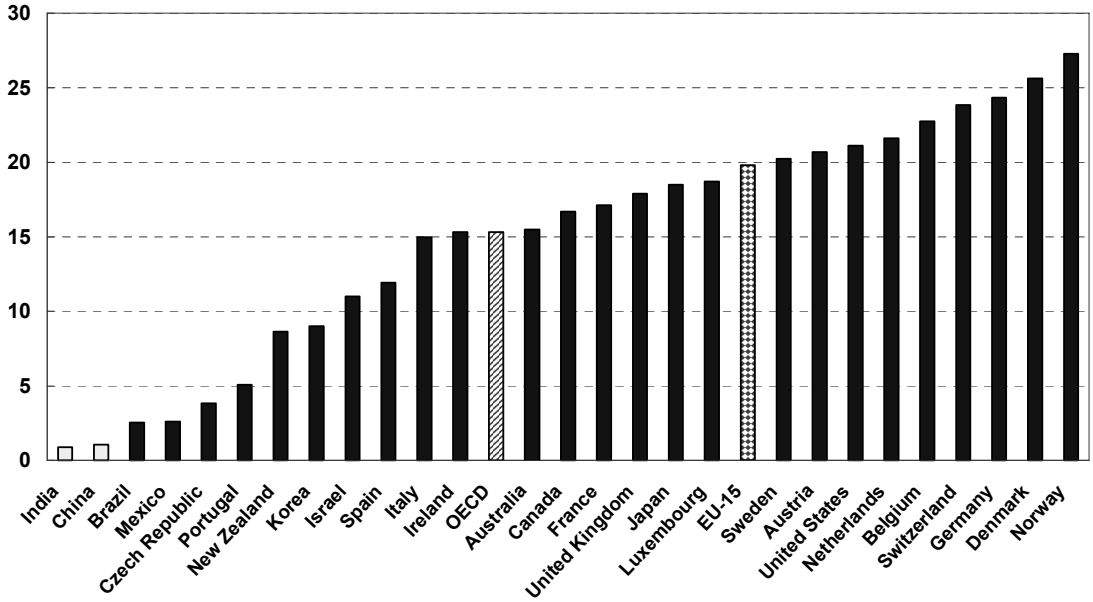
Figure 8. **Employment in outward foreign affiliates**

As a percentage of total national employment




*Source*: Adapted from OECD (2005b); data for Japan and Korea from the Ministry of Economy, Trade and Industry and the Korea Development Institute.

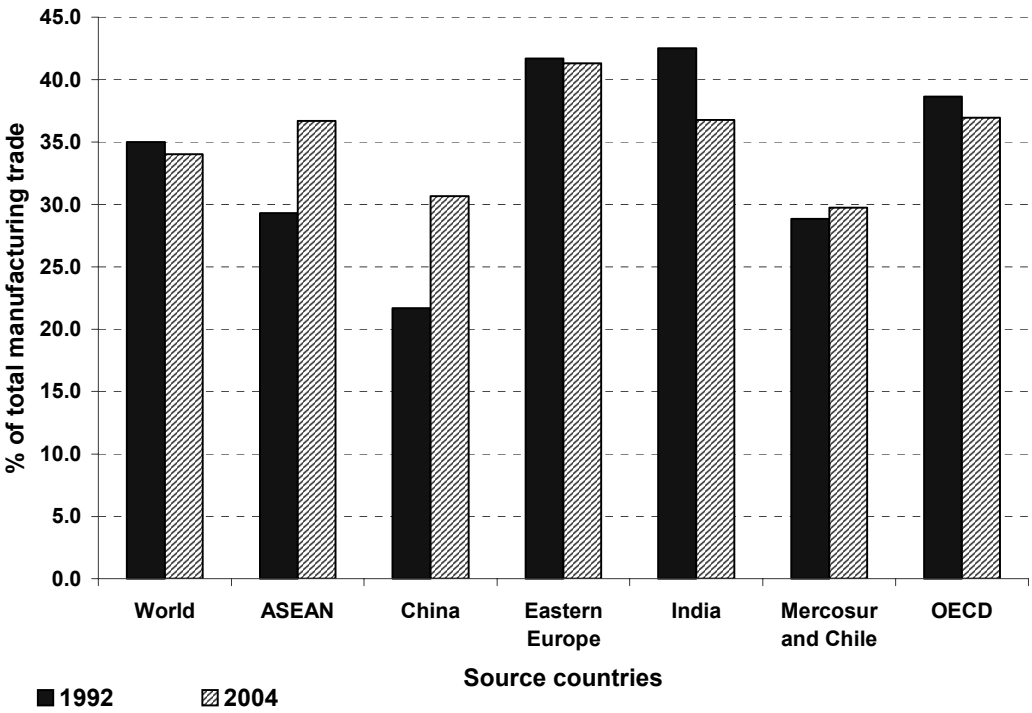
Figure 9. **Average hourly compensation for manufacturing production workers 2002 ($)**




*Source*: *OECD Employment Outlook*, 2005.

Figure 10. **OECD imports of intermediate goods, parts and components 1992 and 2004**

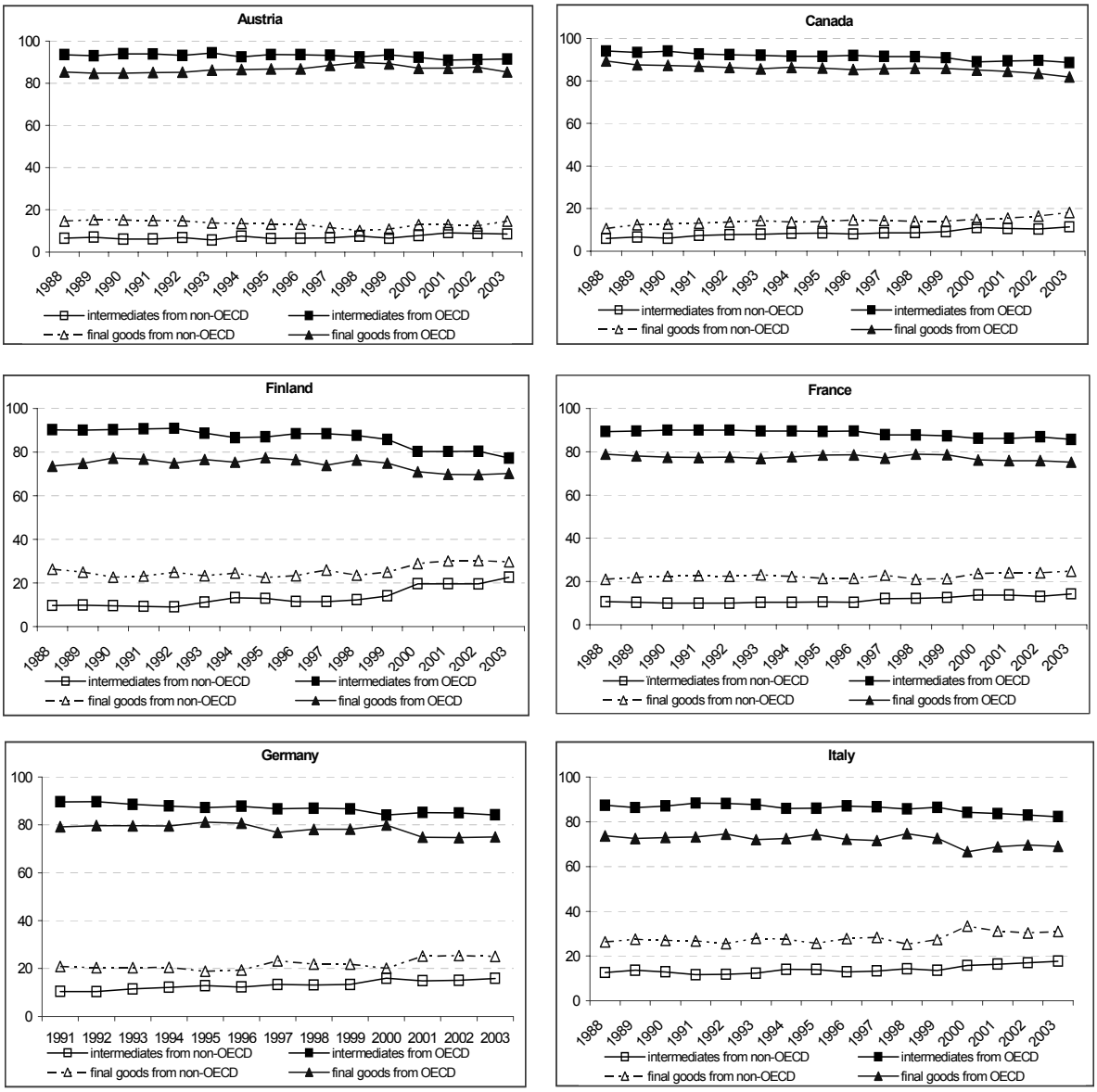
Per cent of total manufacturing imports from selected countries/regions




*Sources*: United Nations COMTRADE database.

Figure 11. **The sources of imports of finished goods and parts and components**

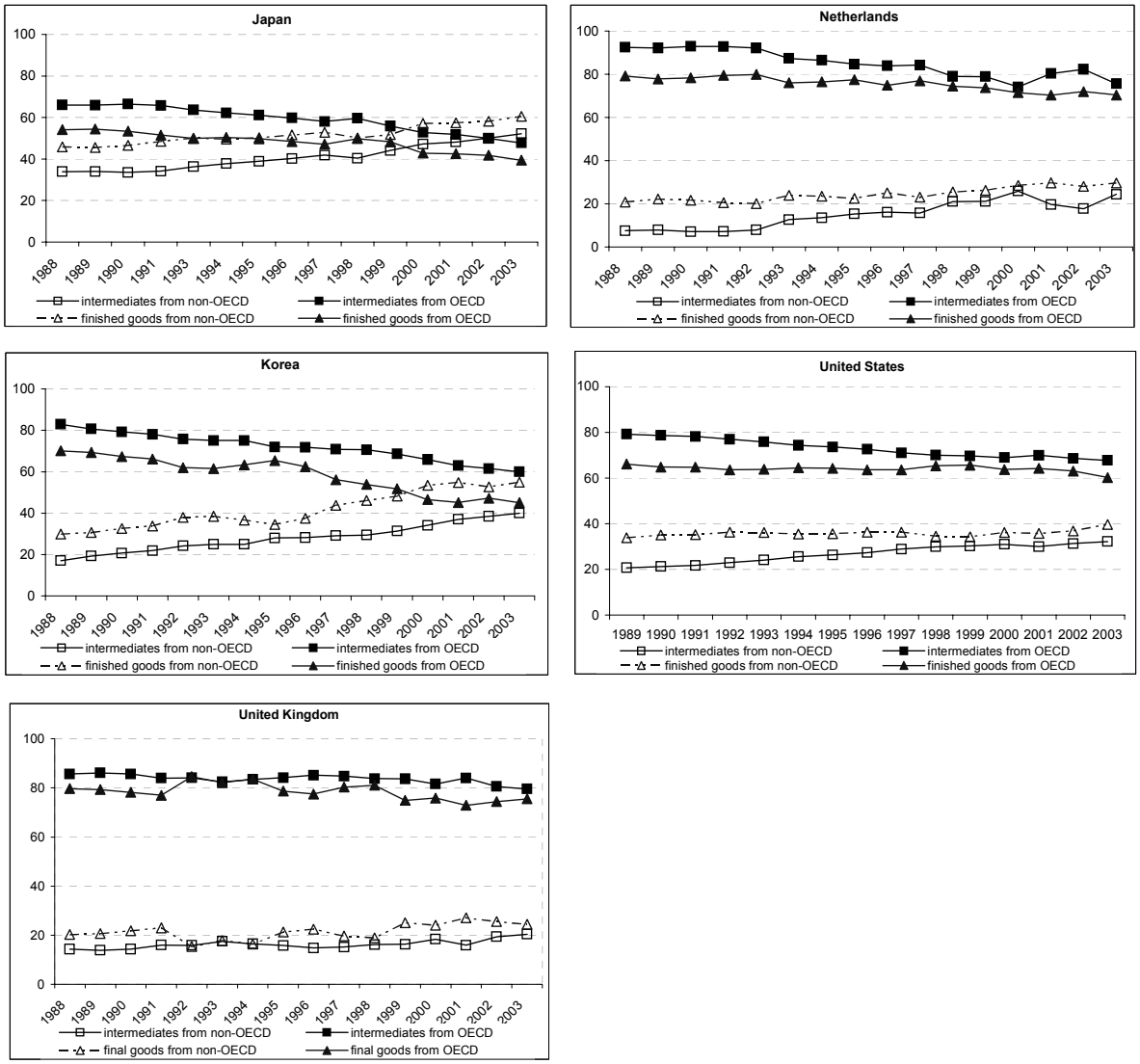
Per cent of total finished goods and total parts and components




*Source*: UN Comtrade database.

Figure 11. **The sources of imports of finished goods and parts and components** (cont'd)

Per cent of total finished goods and total parts and components

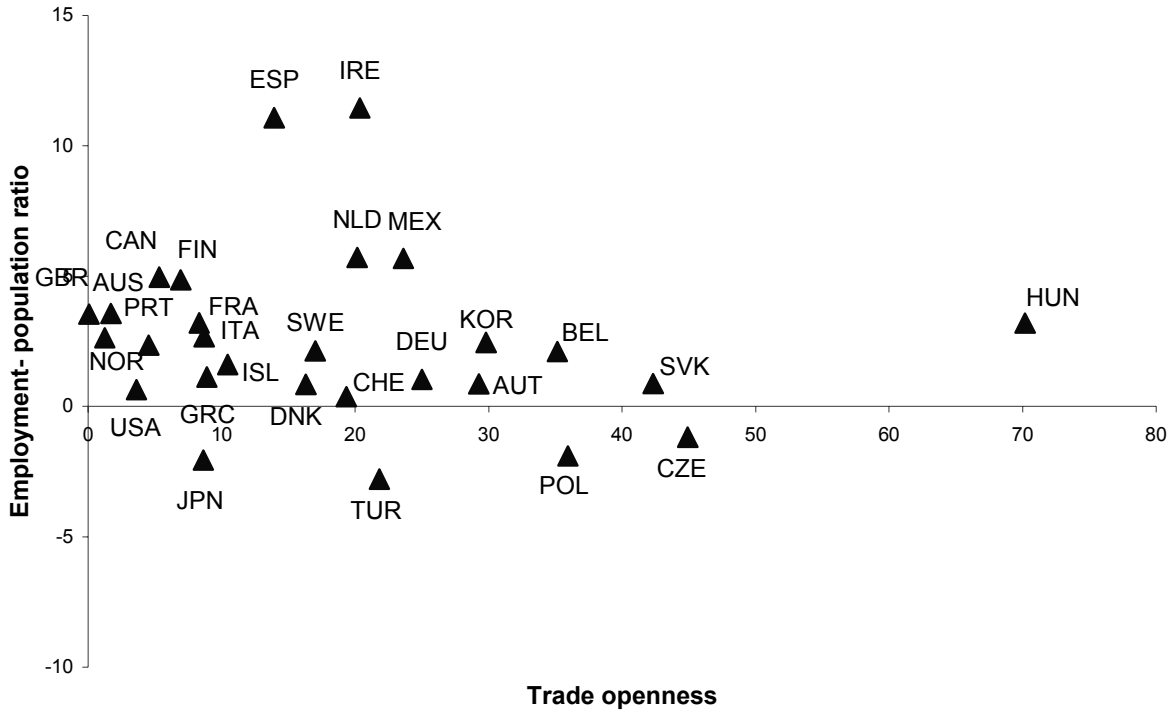



*Source*: UN Comtrade database.

16. There appears to be little direct correlation between the general trend towards greater international openness in all OECD economies, as measured by the sum of exports and imports relative to GDP, and differences across countries in evolution of employment rates (Figure 12).[5] Greater international openness has however coincided with a widening of wage dispersions in almost all OECD countries over the past two decades (Table 1), as well a modest downward adjustment in the labour share of national income (IMF, 2007). This is much more apparent in some economies than in others, possibly reflecting differences in specific institutional features in the labour market.

Figure 12. **Changes in trade openness and the employment-population ratio 1994-2004**

Percentage points




*Source*: Updated from OECD (2005) using OECD Economic Outlook database.

5. Over the period 1994-2004, there is a small negative correlation of -0.19 between greater openness and changes in employment rates. This is not significant, and becomes almost zero if the four OECD Central European economies are excluded.

Table 1. **Trends in earnings dispersion 1980-2001**

90-10 percentile ratios for gross earnings of full-time employees

| | Annual averages | | | | | 10-year change |
|---|---|---|---|---|---|---|
| | 1980-84 | 1985-89 | 1990-94 | 1995-99 | 2000-01 | 1985-89 to 1995-99 |
| Canada | .. | .. | .. | 3.65 | 3.71 | .. |
| France | 3.18 | 3.19 | 3.21 | 3.07 | .. | -0.12 |
| Germany | 2.88 | 2.86 | 2.79 | 2.87 | .. | 0.01 |
| Italy | .. | 2.29 | 2.35 | 2.40 | .. | 0.12 |
| Japan | 3.08 | 3.15 | 3.07 | 2.99 | .. | -0.15 |
| Korea | 4.59 | 4.25 | 3.75 | 3.77 | .. | -0.48 |
| United Kingdom | 3.09 | 3.30 | 3.39 | 3.45 | 3.40 | 0.15 |
| United States | 3.91 | 4.23 | 4.39 | 4.59 | 4.64 | 0.36 |

*Source*: *OECD Employment Outlook*, 2004.

## 3. International trade and labour markets: a review

17. This section contains an overview of different models of international trade and their implications for labour markets. There are many different theoretical models of trade, with some models treating labour as a homogeneous factor and others allowing for workers with different skill levels. In general it is clear from the studies that alternative models predict different trade effects on the wage and employment level. Ultimately, the question of their effects has to be empirical.

### *3.1. Theoretical models of international trade and factor price equalisation*

18. The conventional Heckscher-Ohlin (H-O) model of international trade provides a framework for some widely used propositions about trade, wages and employment. The model implies that there should be a positive correlation between enhanced international trade, the relative price of the good in which each country is comparatively specialised and the return to the factor with which each country is relatively well endowed. Trade protection and trade expansion impact on the distribution of factor incomes, producing winners and losers.

19. A simple version of the H-O model, with two factors, two countries and two goods, can be used to illustrate many basic propositions in international trade, including the so-called Stolper-Samuelson (SS) and Factor Price Equalisation (FPE) theorems. The SS theorem sets out a relation between the relative prices of output goods within a country and relative factor rewards in that country -- real wages and the real returns to capital. The FPE theorem states that, under certain conditions, the relative prices of (relative returns to) two identical factors of production in two different countries that integrate economically will eventually be equalised. The price for each single factor need not become equal, but relative factor prices will converge to a common ratio in both countries following integration.

20. The SS and FPE theorems have been cited widely in analyses of the possible effects of international market integration on the returns to factors of production, especially given their implication that international trade will adversely effect the relative returns to owners of the factors of production used intensively in import-competing sectors.

21. Several factors help to determine the outcome of enhanced international trade on wages and/or employment. In general, larger effects are to be expected the more similar countries are in consumer preferences, factor endowments and technology employed in production.[6] These effects are amplified in countries where producers act as price-takers and when the factors affected are geographically immobile. The SS and FPE theorems also assume that the quantities of national factor endowments are fixed; this helps to ensure that relative product prices and relative factor returns respond to changes in production as a result of international trade.

22. In practice, the assumptions of the standard trade model and hence the simple predictions from the model, are unlikely to be valid. A rich literature highlights that many problems arise when these theorems are applied to more realistic settings with multiple factors of production, traded and non-traded goods and services, imperfectly competitive markets, cross-country differences in technologies and factor productivities, and non-zero trading costs (Davis and Mishra, 2005; Ventura, 2005).[7]

23. A natural question to ask is whether factor price equalisation remains possible when the number of countries, factors and goods is arbitrary. The 'lens' condition, put forward by Deardorff (1994), shows this can happen only if the variation across countries in their relative factor endowments is less than the variation across industries in their relative factor intensities (when countries are combined). If so, it is possible for all countries to produce each type of good.[8]

24. Using the assumption that there are only two factors of production, labour and capital, Debaere and Demiroglu (2003) find that, after allowing for factor productivity differences across countries, 14 OECD economies satisfy the "lens" condition.[9] This means that the factor endowments of these countries are sufficiently similar to allow these countries to produce the same set of goods. So factor price equalisation is at least possible eventually between these countries. In a subsequent extension, Debaere and Demiroglu (2006) find that the productivity-adjusted "lens" condition is also satisfied for three East Asian economies -- Hong Kong, (South) Korea and Singapore -- and five of the G7 countries. However, at a global level, the current set of country factor endowments appear sufficiently different to rule out the possibility that all countries can produce a similar set of goods (Debaere and Demiroglu, 2003, Schott, 2003).

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6. This makes it less likely that production in the country will become completely specialised as trade expands. Complete specialisation of products across countries, in the sense that only one or a small subset of countries produce certain products, makes it almost impossible to achieve complete factor price equalisation.

7. Blackorby *et al.* (1993) explore the impact of differences in the technologies available in different countries. Although they conclude that Factor Price Equalisation may be more likely than sometimes thought in such circumstances, the necessary conditions remain stringent.

8. To date, this condition has been shown to be sufficient for factor price equalisation when there are only two countries (with multiple goods and factors), when there are only two factors (with multiple countries and goods), and when there are only two goods produced (with multiple countries and factors), see Deardorff (1994), Demiroglu and Yun (1999) and Xiang (2001). The second case is perhaps the most likely.

9. Debaere and Demiroglu extend the "lens" condition to allow for factor augmenting technological differences across countries. The extended condition implies that factor price equalisation can occur only when the variation across countries in relative productivity-adjusted factor endowments is less than the variation across industries in relative productivity-adjusted factor intensities.

25. The results described above indicate that there is some evidence that (productivity-adjusted) factor price equalisation could occur amongst particular subsets of trading economies. They do not provide an indication that it has already done so. Indeed, several studies have recently questioned whether FPE holds even within individual countries (see, for example, Bernard *et al*., 2005).

26. The extent of specialisation across countries, and hence the degree to which global wage and price arbitrage is broken, may depend not only on the similarities of productivity-adjusted factor endowments, but also on the extent to which product varieties from different countries are substitutes for each other. The evidence from US trade prices reported in Schott (2004) suggests that specialisation occurs within product groups rather than across product groups. Many capital-abundant and labour-abundant countries export and import similar product groups (in terms of their industrial classification). The difference lies in the quality and the variety of products that are traded. In effect, lower-wage labour abundant economies produce lower-value items within each product group, a model consistent with the existence of international sourcing of intermediate goods by higher wage countries from lower wage economies. These differences in product varieties across countries reduce the likelihood that factor price equalisation will occur.

27. The likelihood of international FPE, and the potential speed at which it might occur, are also both affected by the scale of countries that become integrated into the global trading system. The complete integration of large labour-abundant developing countries, such as China and, increasingly, India, can be expected to affect global product prices via a reduction in the relative prices of the goods that such countries export. For the countries they export to, this provides a welfare-improving *ex-ante* appreciation in the terms of trade, all else being equal.[10] The extent to which this translates into changes in absolute and/or relative factor returns depends on many things, including the degree of specialisation in production, the extent to which market imperfections prevent factor prices from adjusting, and the extent to which rising incomes in the newly integrated developing countries raise demand for the products produced by developed countries.[11] Thus, there can be no automatic presumption that an expansion in trade between OECD countries and a large, labour-abundant emerging economy will result in eventual factor price equalisation across countries.

28. The merit of the basic Heckscher-Ohlin model and the SS and FPE theorems is that they provide a clear indication of the ways in which factor endowments can drive trade patterns and how the distribution of factor incomes can be affected by the changes in trade patterns. The dependence of the theorems on assumptions such as perfect competition and constant returns to scale frameworks has led to the development of alternative trade models that incorporate imperfect competition and increasing returns to scale. A number of different possible approaches are summarised in Box 2.

10. All else may not be equal if strong demand from large developing countries that use globally traded commodities and raw materials intensively helps to push up the real price of such commodities. In this case developed countries will face lower prices for the goods they import directly from large developing economies, but also higher global commodity prices. The impact on the terms-of-trade is then ambiguous.

11. Some industries pay higher wages than others even when workers have similar qualifications and productivity because of non-competitive markets that provide workers and firms with premiums and rents (Katz and Summers, 1989). Moving away from perfectly competitive product and labour markets thus reduces the likelihood of factor price equalisation.

**Box 2. Alternative models of trade and their implications for factor returns**

**Specific factor content studies**: This approach, most commonly found in the labour literature, identifies changes in relative international prices as the main channel for the wage and employment effects of trade liberalisation. It stresses the complementarities between factors and their production costs, typically focusing on one factor at the time, using a partial equilibrium analysis. In these models, trade liberalisation has an effect on trade if and only if productivity differentials among countries are greater than transport costs. When this is the case, wage and productivity differentials will be directly correlated, with lower wages in countries and sectors with low productivity and higher wages in countries with high productivity. Unemployment contracts in countries and sectors with high productivity and expands in countries with low productivity. Overall, these models predict that real wages or -- more generally -- the purchasing power of workers, will fall as the relative price of labour intensive goods falls.

**Ricardian models of trade**: Although the basic form of these models is unable to determine the income distribution effects of trade, recent extensions (Yeaple, 2003) identify technology and factor proportions as channels through which trade liberalisation impacts on employment and wages. In these models, convergence of technical coefficients and technology transfers are necessary conditions for the international convergence of wages and employment effects.

**Monopolistic competition models**: It is normally the case that the existence of scale economies, imperfect competition and product differentiation offset any tendency towards factor price equalization. Models with these features predict less dislocation for workers than the Heckscher-Ohlin framework. However, recent extensions focusing on firm heterogeneity in production reach more complex conclusions. In particular they predict magnified Stolper-Samuelson effects for a country's abundant factors and reduced effects for a country's scarce factors. The effects also appear to be stronger for countries that are smaller, with higher domestic pre-liberalisation competition and lower fixed and variable costs of production relative to the trading partner.

**Economic geography models**: This approach highlights backward and forward linkages as well as interactions between technology and geography as key determinants of the wage and employment outcomes of changes in trade. The effect is *a priori* indeterminate and depends on the patterns of specialisation.

**Models of trade and technical change**: In these models the interplay between skill-biased technological change and changes in trade determines wage and employment outcomes. In general, the effects are positive for high skilled workers and negative for low-skilled workers in both the capital and the labour abundant country.

**Models of outsourcing/ trade in intermediates**: These models emphasise that the employment and wage effects of trade liberalisation depend on the nature of the outsourced activity. When outsourcing involves the production of intermediate goods and services that are subsequently re-imported, there will be an indirect effect on the source country. Such effects will be positive if the intermediate good does not compete with goods produced domestically or if the elasticities of substitution with goods produced domestically are very low. Such a positive effect stems from the fact that outsourcing reduces the non-labour cost component of production.

### *3.1.1 Summary of the wage and employment effects of trade expansion*

29. Overall, the existing theoretical literature suggests that larger effects are to be expected as trading partners become more similar in terms of consumer preferences, endowments of labour and capital, and the technology employed in production. The likelihood of factor price equalisation theory is lower when there are trade costs and other frictional barriers, "love for variety" in consumer preferences and scale economies that lead to differentiation of production and specialisation in certain sectors. There can also be cases in which trade expansion leads to a divergence of factor rewards.

30. Recent theories incorporating heterogeneous firms suggest circumstances in which there may be a magnified factor price equalisation effect for each country's abundant factor and an attenuated effect for each country's scarce factor (Melitz, 2003). Such theories also suggest that the effect of trade on factor prices should be stronger for countries that are smaller, with higher domestic competition and lower fixed and variable costs of production relative to trading partners.

## 4. Empirical studies of the labour market effects of trade

31. The empirical effects of trade on wages and employment have been analysed in numerous studies and surveys and so are summarised only briefly here.[12] A number of different empirical approaches have been used to study both the effects of aggregate trade in goods and services and trade in intermediates. A summary is provided in Box 3; additional studies are discussed in OECD (2005) and OECD (2007). The full long-run effects of trade and employment will depend on many factors, including the eventual changes in the structure of production and consumer demand that can be expected to occur as a result of the changes in wages, consumer prices and productivity brought about by rising trade volumes and the falling relative prices of many tradable goods and services. However, these wider economic effects are neglected in most econometric studies, especially those that estimate the effects of trade on employment.

**Box 3. Empirical approaches to modelling the effects of trade on labour markets**

There is a large empirical literature that explores different aspects of the relationship between trade and labour market outcomes. This Box provides a short summary of some approaches that have been used.

i) Models based on comparative advantage. Labour outcomes are modelled using the relative prices of imports and control variables such as measures of relative factor proportions, trade barriers and technology. Studies in this area assume that several classes of labour exist, each of which is perfectly mobile across sectors and across skill levels. If wages are not fully adjustable, unemployment will result. Examples of studies using this methodology include Lawrence and Slaughter (1993), Sachs and Shatz (1994), Leamer (1996) and Feenstra and Hanson (1999, 2003).

ii) Factor content models that focus on the impact of trade volumes from different countries on the earnings of workers with different skills. Empirical analyses of this type assess the extent to which domestic unskilled labour is displaced by the unskilled labour incorporated in net imports by estimating the factor content of trade -- the direct and indirect amount of factor inputs necessary to produce a given amount of traded output (Wood, 1994). Such studies have also been extended to also include the job "gains" associated with exports (Groshen *et al.*, 2005).

iii) Fixed-factor studies. These are often based on detailed investigation of labour market developments during periods of trade liberalisation. Such studies are often undertaken or countries undergoing one-time reforms in trade policies. Examples include trade liberalisation in Mexico and Central and Eastern European countries (see Robertson, 2004 and Brulhart and Koenig, 2003).

iv) Models of the international fragmentation of production, making use either of estimates of trade in intermediates or estimates of offshore outsourcing of intermediate inputs. Examples of this type of analysis are discussed in greater detail in the main text.

32. Most studies of the general effects of trade on the wages of different skill groups have found that enhanced trade between developed and developing countries places some downward pressure on the relative returns to unskilled, low wage workers in developed countries, although trade is rarely found to account for the majority of the observed changes in earnings inequality since the early 1980s (Baldwin,

12. Surveys include Baldwin (1995), Cline (1997), Slaughter (1998), Johnson and Stafford (1999), Gaston and Nelson (2000), Greenaway and Nelson (2001), Feenstra and Hanson (2003), Hoekman and Winters (2005), Davies and Mishra (2005), OECD (2005) and European Commission (2005).

1995; Feenstra and Hanson, 2003; OECD, 2005).[13] A limitation of these studies is that they often ignore the changes in technology and knowledge that can be embodied in international trade. These make it difficult to disentangle completely the separate effects of trade and technology on factor prices.

### *4.1 Trade in finished goods*

33. Studies of the effect of international trade on aggregate employment typically find that trade can give rise to adjustment costs, with workers having to move between different sectors and occupations. Many also report a negative relationship between net imports and aggregate employment in goods producing industries in the importing economy (Baldwin, 1995; Greenaway and Nelson, 2001; OECD, 2005), although domestic factors are typically found to be the principal determinant of employment changes. However, the direction of causality between trade and employment is not always easy to establish. This is especially true for comparatively small open economies where access to international capital and world markets may be necessary to support economic growth and hence employment growth (see, for example, Kee and Hoon, 2005). The time dimension considered in any study also matters. Some of the approaches outlined in Box 4 evaluate the contribution of trade to changes in labour markets at the same point in time as changes in trade take place (Slaughter, 1998). This is unlikely to capture the full effects of the changes in trade.[14]

34. Ultimately, the effects of trade on wages and employment will depend on labour market institutions, the efficiency of capital markets and the mobility of factors across sectors (Hoekman and Winters, 2005). If relative factor prices and relative factor demands are able to adjust fully in the importing economy, and labour markets are not segmented, then employment should eventually return to its long-run sustainable level, with the relative price of factors used intensively in import-competing sectors being lower than before. But if these conditions are not fulfilled, adjustment is likely to be reflected in a long-run reduction in factor demands, with only a smaller adjustment in relative factor prices. This insight has been put forward as an explanation for the different labour market outcomes observed in Europe and the United States (Davis, 1998; Moore and Ranjan, 2005), as well as an explanation for the opposition of particular groups to policy reforms that liberalise product market competition (Saint-Paul, 2005). Evidence in OECD (2005) suggests that displaced workers in the EU have a smaller probability of becoming re-employed than do workers in the United States, but face a smaller decline in their earnings when re-entering employment.

### *4.2 Trade in intermediate goods*

35. Part of the global rise in the trade to merchandise GDP ratio over the past two decades is attributable to increasing trade in intermediate inputs. This has given rise to a distinct literature examining the effects of trade in intermediates on labour market outcomes. Feenstra and Hanson (2003) argue that trade in intermediates may have more widespread implications for labour markets than has trade in final goods. This is because trade in intermediates may affect not only labour demand in the sectors in which the imports occur, but also labour demand in other sectors that use imported intermediates to produce final goods and services. The overall direct effects on labour demand, for given wages, will depend on the extent of adjustment required in the import-competing sectors and the extent to which imported intermediates lower the costs of production in downstream industries. If there are no domestically produced goods competing with imported intermediates then the overall effect of trade in intermediates should be beneficial (Davis and Mishra, 2005).

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13. These studies have adopted either a trade perspective or a labour perspective. The important differences in the assumptions made in the two separate perspectives are discussed in detail by Haskel and Slaughter (2001).

14. A recent study on Mexico finds that trade-induced labour market effects take three to five years to emerge fully (Robertson, 2004).

36. Empirical results reflect this conceptual ambivalence. There is evidence for many OECD countries that international outsourcing of goods and services has a positive association with the relative demand and/or wages of skilled workers.[15] Estimates indicate that in most cases, international outsourcing can account for between one-quarter and one-half of the observed skill upgrading in these countries. However, this finding is not universal. Some studies fail to find any evidence of substitution between labour and either imported materials or imported services.[16]

37. Some studies for European countries have also found evidence that international sourcing may affect skilled or semi-skilled workers in the home country, as well as unskilled workers. For instance, Ekholm and Hakkala (2005) find that outsourcing from Sweden to low income countries has a significant negative effect on the demand in Sweden for workers with an intermediate level of education. Outsourcing to higher income countries, which represents the largest component of total international outsourcing from Sweden, has no significant effect on labour demand. Marin (2004) finds evidence suggesting that German and Austrian manufacturing firms offshore some skill intensive areas of production to Eastern Europe. This suggests that local labour market conditions and the proximity to lower cost countries with comparatively skilled labour may affect the forms of outsourcing that are undertaken. The results in IMF (2007) suggest that globalisation may be having a larger impact in those industries with a higher share of skilled labour.

### *4.3 Offshoring of services*

38. Comparatively little is known about the impacts of the growing level of offshoring in services, not least because the precise scale is hard to measure in most countries. Markusen (2005) suggests that there are few reasons why tradeable services should not be analysed in the same manner as traded finished and intermediate goods. The impact of the enhanced tradability of services could be significant, as the levels of employment in potentially tradable service sectors and occupations are high (van Welsum and Vickery, 2005; Blinder, 2005). For the United States, Jensen and Kletzer (2005) estimate that the number of workers potentially exposed to international trade in tradable professional and business service industries is larger than the number in manufacturing industries.

39. The studies by Amiti and Wei (2005a, 2005b) are among the very few that explore the labour market implications of increased international outsourcing of services, with measures of outsourcing constructed from input-output tables. The latter study finds for the United States that the effect of outsourcing on aggregate employment in both manufacturing and services is non-negative, especially when detailed industries are aggregated into larger sectors.[17] In contrast, for the United Kingdom, Amiti and Wei (2005a) find that the international sourcing of intermediate service inputs increases employment in manufacturing but decreases it in services sectors. This raises the possibility that international sourcing, at least in services, substitutes directly for tasks that would otherwise be undertaken at home. However, in manufacturing industries international sourcing of services may help to reduce costs, thus supporting employment.[18]

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15. Examples include the United States (Feenstra and Hanson, 1995, 1999 and 2003), Japan (Ng and Yeats, 1999; Tanaka and Nakazawa, 2005), Germany (Geisheker, 2005), France (Strauss-Kahn, 2003; Aubert and Sillard, 2005), the United Kingdom (Hijzen *et al.*, 2005), Canada (Yan, 2006), Spain (Gomez *et al.*, 2004) and Ireland (Gorg and Hanley, 2005).

16. See for example, Falk and Koebel (2002), Amiti and Wei (2004) and Helg and Tajoli (2005).

17. At a very detailed level of data, evidence of job displacement is more likely to be found in import-competing industries.

18. It may also help to improve productivity levels (Amiti and Wei, 2005).

40. Jensen and Kletzer (2005) use the *Displaced Workers Survey* in the United States to examine the characteristics of displaced workers in service activities relative to those in manufacturing. In general, displaced workers in tradable services are found to have greater educational attainment, higher skills and earnings than those in manufacturing.[19] The majority of the workers displaced in tradable services are at the bottom end of the skill distribution in these activities. To this extent, trade displacement in services is similar to that for goods, with comparatively low skilled workers being affected in both tradable services and in manufacturing. However, as the average skill level of workers in tradable services is higher than that in the overall manufacturing sector, the greater tradability of services also implies that the average skill level of workers displaced by trade might be higher than would otherwise have been the case if services were not internationally tradeable.

### *4.4 Summary*

41. Overall, there is little evidence to suggest that countries with a higher degree of openness or faster trade liberalisation rate have either a poorer aggregate employment performance or experience prolonged periods of subdued growth in real wages (European Commission, 2005; OECD, 2005). Indeed, a range of studies demonstrate that higher external openness is positively associated with economic growth and living standards. However, it is also the case that enhanced international competition can contribute to a range of microeconomic changes that have significant costs for those affected, and which may require a policy response (OECD, 2005).

42. An important caveat is that the full impact of some key recent forces behind greater global integration has yet to be observed. The full integration of China and India into the global trading system undoubtedly offers benefits to other countries because of the potential size of their domestic markets. But it also poses challenges for competitors because of the scale of these economies, and the consequent effect they might have on trade prices. Such challenges can be expected to be comparatively large for small open economies, including some in the OECD, that produce similar tradable products to those now produced in China and India.

43. Service sector offshoring exposes new areas of the economy to foreign competition. Whilst theory suggests that the effect should be similar to those from the offshoring of manufacturing goods and tasks, it is also the case that services offshoring is likely to affect higher skilled workers, on average, than offshoring in manufacturing. To date, there is little evidence to indicate whether the resulting labour market adjustments will differ.

44. It is also possible that changes in productivity and skill levels in lower wage economies can eventually erode some of the overall gains in higher wage economies from trade with lower wage economies (Samuelson, 2004). What matters is whether such changes occur in the sectors in which low wage economies have a comparative advantage or whether they occur in the sectors in which high wage economies have a comparative advantage (Bhagwati *et al.*, 2004). In the former case, the prices of exports from low wage countries will decline, with a corresponding rise in the terms of trade, and living standards in high wage economies. In the latter case, the prices of exports from high wage economies will fall, implying a fall in the terms of trade and living standards in high wage economies, all else being equal.[20] Whether this happens depends in part on whether the international sourcing of goods and services from lower-wage economies has a significant positive impact on the capabilities of local factors to produce new import-competing goods and services.

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19. Seventy-five per cent of displaced workers in tradeable services had at least some college education, compared to 46% in manufacturing.

20. In the limit it is theoretically possible that welfare levels under trade will be the same as those under autarchy.

## 5. Multinationals and labour markets in home countries

### *5.1 Vertical and horizontal multinationals*

45. This section summarises some of the effects that the operations of multinational firms and foreign direct investment (FDI hereafter) might have on the labour markets in source economies.[21] One basic distinction is between "vertical" and "horizontal" multinationals. Vertical MNEs are ones that fragment different stages of the production process across different countries, with the location of stages depending on where the factor of production they use intensively is relatively cheap. Each activity, including final production, occurs in only a few, or even a single, location, depending on endowments and factor prices. Horizontal MNEs are multi-plant firms that produce similar outputs in both home and host countries, thus economising on any costs of exporting. Such firms are more likely to occur when the host countries are of similar size (to avoid the costs of having costly capacity in small markets), have similar factor endowments, and there are positive costs to international trade (Brainard, 1997). Both forms of multinational are particular examples of the knowledge capital model set out by Carr *et al*. (2001) and Markusen (2002). The knowledge capital model exploits the insight that multinational firms must possess some kind of knowledge-based firm-specific asset to allow them to take advantage of profitable opportunities in foreign markets that other national companies in those markets cannot exploit.

46. Knowledge capital has three principal characteristics -- it can be easily transferred between parent companies and their affiliates, it can be used simultaneously in a number of different production activities and locations and it has a high skill intensity. The ability to use knowledge capital in multiple locations at the same time implies that multinational firms will have firm-level scale economies, providing a motive for horizontal MNEs. The transportability of knowledge capital and its high skill intensity facilitate the vertical fragmentation of production. Such fragmentation is more likely to occur between countries with comparatively dissimilar factor endowments, and also as trading costs, or more generally the costs of market access, come down. Knowledge capital also becomes more easily exploitable as international communications costs decline. All these factors suggest that vertical multinationals should be becoming more prevalent over time, with different parts of the production of goods and services being produced increasingly in different locations.

47. In practice, the distinction between horizontal and vertical multinationals is rarely clear cut. Many firms have 'complex' integration strategies, involving a mixture of both kinds of outward investment (Yeaple, 2003). It is also rarely the case that firms within an industry have identical levels of productivity, not least because of the existence of firm-specific knowledge based assets. The existence of non-zero transport costs, and differences in the fixed costs of establishing foreign affiliates in different locations offer firms a rich variety of possible production strategies (Grossman *et al.*, 2006). Choosing between them will depend on the costs of outsourcing, the costs of trade in finished goods, the costs of establishing foreign affiliates and the intra-industry dispersion of productivity.[22]

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21. As apparent from the definitions in Box 1, there are inevitably some similarities in the effects of international trade and multinational enterprises (MNEs) on home country labour markets. But the overlap is only partial – imports of finished and intermediate goods and services do not have to be purchased from the foreign affiliates of parent companies. Equally, parent companies may establish their foreign affiliates in order to enhance foreign market access beyond what could otherwise have been achieved through exporting.

22. For example, empirical evidence suggests that foreign direct investment becomes more prevalent relative to trade when the intra-industry dispersion of productivity is higher, as more (higher productivity) firms are able to bear the fixed costs of establishing foreign affiliates (Helpman *et al.*, 2004). Related models consider the choice between international sourcing and undertaking production abroad in foreign affiliates (Grossman and Helpman, 2005).

### *5.2 The labour market effects of foreign direct investment*

48. The importance of distinguishing between different models of FDI is that each offers different predictions about the possible effects of investment on home country labour markets, and in particular the relationship between employment in the parent company and its foreign affiliates.

49. For vertical-type foreign investments, the effect on home countries will vary on the stages of production moved offshore and, more generally, with the relative factor abundance of home and host countries. If investment takes place from countries with a high relative endowment of skilled labour, other stages of the production chain will produce comparatively lower-skill labour intensive activities, with parent companies producing higher-skill outputs such as "headquarter services" (Helpman and Krugman, 1985).

50. Assuming perfect factor markets, the initial effects at the level of the parent company are likely to involve a reduction in employment and a rise in the relative demand for skilled labour. Subsequently, employment is likely to rise, both because of additional production of skill-intensive inputs for foreign affiliates, and because the cost savings from production fragmentation may be reflected in price reductions, expanding market share and the scale of output.[23] In the economy as a whole, the cost of skilled labour is likely to rise relative to the cost of unskilled labour. If factor markets clear, then eventually there should be a negligible effect on total employment, but a change in the relative price of skilled-unskilled labour. So the overall outcome is likely to depend in part on the structural features of national labour markets. If there are significant labour market rigidities, or institutional features such as binding wage floors for less skilled workers, then it becomes more likely that there will a greater quantitative effect on unemployment and a smaller adjustment in the relative wages of different types of workers (Moore and Ranjan, 2005; OECD, 2005).

51. For horizontal-type foreign investments, the effect on the labour market in the home country will depend in part on the exact scope of the production processes being replicated by the parent company and its affiliates (Head and Ries, 2002). At one extreme, with affiliates replicating all activities of the parent using identical factor proportions, employment and output growth in the home country after the investment takes place could be weaker than might otherwise have been the case. Foreign market growth is met by production in foreign affiliates rather than by the parent company.[24] A second possibility is that horizontal affiliates replicate only the final goods part of production in the parent company. In this case demand for intermediate goods and services produced by the parent company could rise if the overall scale of production by the multinational firm increases. The knowledge capital model implies that at least some of these additional activities in the parent will be high-skill intensive.

52. The examples discussed so far assume that the activities undertaken by foreign affiliates are either less or as skill-intensive as those that continue to be undertaken by parent companies. It is also possible that high skill-intensive activities are undertaken in affiliates; a recent example of this is provided by the increasing globalisation of many R&D activities (UNCTAD, 2005). The effect of this on the home country depends on the motivating factors for such investments. One possibility is that the short-run demand for highly-skilled activities at home is decreased. But if high-skill intensive investments are being made to access and exploit knowledge in the host countries, then the eventual result could be faster technical change and productivity growth in the home country (Grossman and Helpman, 1991; Amiti and Wei, 2005a) and a higher level of economic activity and employment.

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23. These are referred to as the substitution, scope and scale effects by Hanson *et al.* (2003).

24. This assumes that the parent company would be otherwise be able to export to foreign markets. Evidence for services sectors in the United States, suggests that outward investment does weaken the growth of services exports for given market size (Pain and van Welsum, 2004).

## 6. Empirical studies of multinationals and home country labour markets

### *6.1 Foreign direct investment and employment*

53. The full impact of the internationalisation of production on employment in home countries depends on many factors, including those that affect labour demand directly and others that have an indirect effect, such as induced changes in exports and fixed investment (Andersen and Hainaut, 1998). This section contains an overview of the findings from a series of recent studies that have sought to test directly the substitutability of aggregate employment in parent companies and their affiliates, using firm or industry level data on multinationals. Many of the studies test whether the effects on employment in the home country of establishing or expanding foreign affiliates differ according to the location of the affiliates. The most commonly used empirical approach is to augment otherwise standard labour demand models for the parent companies with measures of labour employed in, or the wage costs of affiliate companies.[25]

54. The findings from studies of the transfer of production within multinational companies fail to provide a clear picture across countries and industries of the relationship between the expansion of activities abroad and total employment at home. One example is provided by recent studies using data for the United States. Desai *et al.* (2005) and Hanson *et al.* (2003) both find that over a period spanning 1982-99, an expansion in the scale of activities in their foreign affiliates has a significant positive association with employment growth in the parent companies of United States multinationals in the manufacturing sector.[26] In contrast, using a related data set over a sub-sample of 1983-92, Brainard and Riker (1997) obtain evidence of substitution between labour in the parent companies of United States manufacturing MNEs and labour in their affiliates, although the effects are generally small.[27] The evidence of employment substitution between affiliates in different countries is found to be markedly higher than between the parent company and the affiliates. This is especially so for affiliates in low value-added sectors and comparatively low income locations, suggesting that the location of vertically integrated labour-intensive investments is likely to be particularly sensitive to wage costs in different potential hosts.

55. Using a similar data set for Sweden, Hatzius (1998) reports that employment in the parent companies (affiliates) of Swedish multinational companies is positively associated with foreign (Swedish) labour costs. This also suggests that foreign and domestic employment may be substitutable at the margin. However, in contrast to the results of Brainard and Riker (1997), Braconier and Ekholm (2000) report that the labour substitution between Swedish parent companies and their affiliates is more likely to occur with

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25. The majority of studies reviewed in this section provide direct evidence about the impact of the internationalisation of production by using firm level data for parent companies and their foreign affiliates. Such data include the full range of activities produced by foreign affiliates. Other studies have focused more closely on one particular aspect related to the activities of foreign affiliates -- the production of intermediate goods and services for parent companies. Often this can be observed only indirectly, using international trade data on imports of intermediates. Using such data it is difficult to separate out the effects of the international insourcing of production of intermediates within multinational companies and international outsourcing between otherwise unrelated companies. Whilst both are important for understanding the effects of enhanced international openness, the particular focus in this paper is on the impact of the transfer of production within multinational companies. For more detailed overviews of third-party trade and the general offshoring of services activities see OECD (2005) and van Welsum and Vickery (2005).

26. Desai *et al.* (2005) use the growth of employment in foreign affiliates, Hanson *et al.* (2003) use the growth of sales by foreign affiliates.

27. For example, a 10% fall in wages in affiliates in Mexico is found to be associated with a reduction of 0.17% in employment in parent companies in the United States.

affiliates in higher-income countries than with affiliates in lower-income countries, suggesting that FDI in low cost locations was not at the expense of employment in Sweden.

56. Ahn *et al.* (2005) include measures of both FDI and imports in an econometric model of plant-level employment growth in Korea over the period 1990-2002. This is one of the few studies to allow directly for possible effects on domestic employment from both forms of global engagement. The results across a range of different empirical specifications show that employment changes in Korea are more closely related to outward FDI than to the growth of imports. In general, industry-level outward FDI is found to have a significant positive relationship with domestic employment growth. The sole exception is for FDI in China, which is found to have a significant negative effect on domestic employment growth, possibly reflecting the direct substitution of labour intensive activities. The findings for industry-level import growth are mixed. Only trade growth with China and Japan is found to be consistently significant. Import growth from China is found to be associated with reductions in employment in Korea, whereas import growth from Japan is found to have a positive association with employment growth.

57. A number of studies using data on European multinationals have sought to test whether employment in parent companies and employment in affiliates located in Central and Eastern Europe (CEE) are substitutes. Recent examples include Konings and Murphy (2003), Becker *et al.* (2005), Cuyvers *et al.* (2005) and European Commission (2005). On balance, the studies suggest that there is evidence of employment substitution, though for some countries the effects are small. A 10% reduction in labour costs in CEE affiliates is found to be associated with a 0.3% reduction in parent employment in Belgium and a 0.2% reduction in France (European Commission, 2005). Larger effects for German and Swedish multinationals are obtained by Becker *et al.* (2005), who find that a 10% reduction in wage costs in CEE host countries is associated with a decline of 0.5% in parent company employment in Germany and a decline of 0.9% in parent company employment in Sweden.

58. The studies by Konings and Murphy (2003) and Becker *et al.* (2005) both find that substitution between parent company and affiliate employment is significantly higher for affiliates located in the EU15 than it is for affiliates located in Central and Eastern Europe. In contrast, the results in European Commission (2005) suggest that employment in parent companies in Belgium is not affected by that in EU15 affiliates, while employment in French parent companies and EU15 affiliates is complementary. It is difficult to know what lies behind these different results, but it may suggest that firms from each of these countries have followed different integration strategies within Europe.

59. The question of whether the impact of outward FDI on employment in parent companies might differ with their size as well as the location of affiliates is examined by Falzoni and Grasseni (2005), using a sample of Italian multinationals over the period 1994-98.[28] Their findings suggest that foreign operations in both developed and developing countries have a negative effect on domestic employment only for small firms (those in the lower half of the size distribution). For larger firms, it is only employment in Asian affiliates that has a significant negative effect on employment in parent companies. It is not clear whether these results reflect only the comparatively unusual size distribution of firms in Italy, or whether they are more generally applicable.

28. The basic data show that small and medium-sized companies have a higher share of affiliate employment in developing countries rather than developed countries. The share of affiliate employment in total employment is also found to be decreasing by size of company.

60. An important issue when evaluating the impact of outward FDI is the possible counterfactual if investment had not taken place.[29] For this to be evaluated properly, firms making outward investment need to be compared with other, purely domestic, firms who had similar characteristics immediately before the outward investment took place. One of the few studies of this type is that of Barba Navaretti and Castellani (2004). Using a matched sample of Italian multinationals and purely national companies, they report that there are no significant differences between the growth rate of domestic employment in either set of companies after foreign investment took place. For these firms at least, expansion abroad appears not to have affected directly employment in the parent company.

61. Another issue to consider, as suggested by the differing results discussed above using data on United States MNEs, is that the relationship between outward investment and the activities of the parent company may change over time (Hanson *et al.*, 2003). Some related evidence is provided by Higuchi and Matsuura (2003), using firm-level data for Japan, who find that job losses in firms with overseas production plants can persist for up to five years after the establishment of the overseas plant. Thereafter, employment growth is stronger in firms with overseas production plants than in purely domestic firms.

62. An additional finding in several empirical studies is that outward investment has differential effects on different skill groups in the home country, with skilled workers more likely to benefit than unskilled workers, as might be expected in many skill-abundant OECD economies.[30] For example, Head and Ries (2002) find that changes in the ratio of foreign affiliate employment to domestic employment can explain about one-tenth of the rise in the share of non-production workers in the labour costs of Japanese manufacturing sectors during the 1970s and 1980s. Sasaki and Sakura (2004) find that overseas production shifted labour demand toward high-skilled workers (university graduates) and so did the increasing share of imports from East Asia. The widening wage gap between the skilled and the unskilled, however, is attributable to skill-biased technological change as much as to globalisation. Ito and Fukao (2005) also report that overseas activities and vertical intra-industry trade contribute to skill upgrading and home and increase the demand for skilled workers. They do not, however, find a clear pattern in the impact of the geographical distribution of overseas activities on the demand of skilled labour at home. Skill upgrading in Japan was found to be most closely associated with the expansion of affiliates in low-income countries, consistent with what might be expected for vertical investments when production is fragmented across national borders.

63. Related results are reported by Hanson *et al*. (2003) who find that the relationship between employment in United States parent companies and their foreign affiliates varies by skill. For a given level of output, employment in the parent is found to be a price complement with high-skilled foreign labour and a price substitute with low-skilled foreign labour. The findings from studies that use data on multinationals are similar to those from the studies summarised in Section 4 that examine the impact of imports of goods and services on the skill premium of home economies.

### *6.1.1 Summary*

64. It is clear from the empirical literature that there is considerable heterogeneity in the effects of outward investment on employment in the home country. In part this may reflect the different motives

29. For example, relocating particular stages of production to lower cost locations might be necessary to ensure survival of the firm. In such cases, even if employment in the parent company did decline, the job losses would be smaller than if the firm had not survived.

30. Theoretically there is no necessary reason why this should always be the case. Depending on the range of commodities produced and traded, and the endowments of the factors required as inputs for each, the fragmentation of production across national borders and the transfer of unskilled labour fragment to foreign countries could even result in a higher local return to unskilled workers (Jones, 2003).

underlying different forms of foreign investment. Some studies have found evidence of substitution between employment in foreign affiliates and parent companies, but others have found that the two are complements. In either case the reported effects are generally small and may vary over time.

### *6.2 Internationalisation and the price elasticity of labour demand*

65. The studies discussed in section 6.1 all consider whether enhanced internationalisation results in the substitution of employment between the home country and foreign countries. One general implication of the finding of (weak) substitutability between parent and affiliate employment, as well as the increasing use made of international sourcing by non-multinational companies, is that labour demand curves may have become more elastic, both in home and host countries (Rodrik, 1999; Hatzius, 1998), because of greater opportunities to move production to lower cost locations following a rise in domestic costs.[31] Other things being equal, a more elastic demand curve implies that national factor demands may become more sensitive to changes in factor prices over time as FDI and international sourcing increase, although there is no theoretical reason why this will always be the case (Panagariya, 1999). It also implies that the relative bargaining power of workers and employers could change.[32] This is discussed further in Box 4.

66. Indirect evidence in favour of the proposition that factor demands have become more sensitive to factor prices over time is provided by Hatzius (2000), who shows that the elasticity of manufacturing fixed investment with respect to labour costs has risen over time in the United Kingdom and Germany, especially in industries with comparatively high FDI levels. Related evidence for the United States is provided by Slaughter (2001), who finds that the price elasticity of demand for unskilled workers has risen over time in a number of manufacturing industries. In contrast, few changes are found over time in the elasticity of demand for skilled workers. The proportion of the assets of multinational companies held by foreign affiliates, the international sourcing of intermediate inputs and net exports and are each found to explain part of the different outcomes found for the different skill groups.

67. Other studies that have tested for the impact of greater openness on the price elasticity of labour demand have focused largely on the impact of international trade, see, for example, Jean (2000), Bruno *et al.* (2004), Riihimäki (2005), Senses (2006) and OECD (2007). Overall, these studies provide some support for the proposition that in at least some industries in some countries, the demand for labour has become more elastic over time as a result of enhanced international openness. However, this is not a universal finding and uncertainty remains about the possible magnitude of such shifts and the factors responsible for them. This suggests that it would be worthwhile to undertake an equivalent analysis using measures of outward direct investment. It is possible that two offsetting forces are at work - the availability of foreign labour can increase domestic labour demand elasticities, but this might also reduce the share of unskilled workers in employment, pushing down the overall labour demand elasticity (Senses, 2006). Ultimately the balance of these forces is an empirical matter.

68. Most of the studies using trade focus on labour demand in a single country. One exception is the study of Bruno *et al.* (2004), who test the impact of changes in import penetration on the price elasticity of demand for labour in an industry-year panel for eight OECD countries.[33] Their results also provide evidence of heterogeneity across countries in the effects of greater global engagement. Rising import

31. Purely domestic firms may also be able to switch if they are able to outsource production.

32. FDI, in particular, may increase workers' insecurity in some countries (Scheve and Slaughter, 2004).

33. Bruno *et al.* (2004) estimate labour demand equations including both import penetration and an interaction term between import penetration and a relative factor price (labour to capital). The interaction term is included to test whether changes in import penetration directly shift the price elasticity of demand for labour. As import penetration has risen over time, this is in effect equivalent to testing whether the price elasticity of demand for labour has risen over time.

penetration was found to raise significantly the price elasticity of demand for labour in the United Kingdom and, to a lesser extent, in France and Italy. In contrast, it was found to significantly lower the elasticity of labour demand in Japan, and to have little effect in the remaining countries examined.

69. A related question is whether multinationals are also able to adjust their labour demand more quickly than purely domestic firms, especially if they have a low-cost option to move particular tasks to their affiliates. There are also comparatively few empirical tests of this issue, despite the importance of adjustment speeds for determining the pace at which labour markets adjust to economic "shocks".

70. The most comprehensive study is that of Barba Navaretti *et al*. (2003), using firm-level data for a number of European countries. Their results suggest that the speed of employment adjustment in foreign-owned firms is significantly faster than in purely national companies. They also report evidence that the wage elasticities of labour demand in the affiliates of multinational firms vary little across countries when interacted with country-level indicators of labour market regulation. In contrast, wage elasticities in purely domestic firms are lower in countries with more heavily regulated labour markets. One explanation of this finding is that multinational firms may be less affected by some labour market regulations than are purely domestic companies, although the extent to which this occurs in practice is far from clear.

**Box 4. Internationalisation, wage bargaining and the labour share of income**

An additional implication of any increase in the sensitivity of factor demands to factor prices is that globalisation may affect the distribution of income and employment by changing the relative bargaining powers of different factors, especially workers (Rodrik, 1999). The possibility of transferring production to an alternative location gives firms an exit option. Even if this is not exercised, its existence could change the relative bargaining power of employees and employers in favour of the latter (Gaston, 2002). The importance of such effects depends in part on the extent to which wage bargaining reflects economy-wide factors or industry or firm-specific factors. If bargaining reflects economy-wide developments, then the exit options of firms are likely to become more important as the number, or for smaller countries the size, of firms with such options rises.

The impact of greater global engagement on the bargaining power of workers and unions will also depend on the nature of the bargaining process and the preferences of those involved in the bargain. In a right-to-manage setting, with bargaining occurring only over wages, a reduction in the bargaining power of employees relative to employers is likely to result in lower real wage growth, all else being equal. But if bargaining takes place over both wages and employment levels, then any reduction in the bargaining power of employees could be reflected in wages, employment or both. It is also possible that the effects of any common cross-country change in bargaining power could vary across countries, depending on differences in bargaining processes and institutions.

Some recent empirical studies do indeed suggest that indicators of globalisation are negatively correlated with both union bargaining power (Dumont *et al.*, 2006) and with union membership (Dreher and Gaston, 2005) in a number of OECD countries.[1] Few studies appear to have sought to test the proposition about enhanced capital mobility and the labour income share directly. One exception is Gopinath and Chen (2003), who find that the labour income share in 11 OECD countries over the period 1975-1995 is significantly negatively related with the outward FDI stock, but significantly positively related with the inward FDI stock. Putting the two terms together, there is a small negative effect from net outward FDI on the labour income share. This suggests that as FDI flows out of the country, capital becomes increasingly scarce relative to labour, causing its rents to rise and those of labour to decline. The robustness of this particular finding has not yet been assessed.

The IMF (2007) find evidence that globalisation has, on average, had a negative impact on the labour share of income in the advanced economies over the period from 1982-2002, as have changes in technologies and labour market policies. Globalisation is captured by three factors -- imported intermediate inputs (as a share of total intermediate inputs), trade prices and the share of the foreign-born in the total labour force. Together, these three factors account on average for annual declines in the labour share of about 0.1 percentage point per annum, just under half of the average annual decline across all advanced economies. Of the three factors considered, the immigration variable makes the largest single contribution to this finding.

1. Dumont *et al.* (2006) use indicators based on imports and the activities of affiliate companies in the European Union. Dreher and Gaston (2005) use an indicator constructed from a large number of different indicators using principal components.

## 7. The industry-level effects of foreign direct investment on labour demand

71. The implications of both the theoretical literature and existing empirical studies is that the effects of the internationalisation of production are likely to be heterogeneous, both across countries and across industries. This section reports preliminary findings from a series of models that examine the effects of the internationalisation of production on employment in the home country of the investing companies. Two sets of models are estimated, one using industry data on employment in the foreign affiliates of parent companies from the G3 countries, and one using industry data on the stock of outward foreign direct investment (as a percentage of domestic industry output) for 11 OECD economies.[34] Foreign direct investment may be an imperfect measure of the scale of activities carried out in foreign affiliates,[35] but for many countries it is the only data available.

Table 2. **Industries included in the empirical analysis**

| | Industry | ISIC Rev.3 Group |
|---|---|---|
| ***Manufacturing*** | Food, beverages and tobacco | 15,16 |
| | Textiles | 17,18 |
| | Wood, paper, printing and publishing | 20,21,22 |
| | Chemicals, rubber and plastics | 24,25 |
| | Basic metals and fabricated metal products | 27,28 |
| | Machinery | 29 |
| | Electrical and optical equipment | 30,31,32,33 |
| | Transport equipment | 34,35 |
| ***Services*** | Wholesale and retail trade | 50,51,52 |
| | Transport and storage | 60,61,62,63 |
| | Post and telecommunications | 64 |
| | Financial services | 65,66,67 |
| | Business services | 71,72,73,74 |

72. The industries covered consist of (up to) eight manufacturing sectors and five service sectors, with the availability of data on internationalisation normally determining those included in the sample for each country. A summary of the sectors included is given in Table 2. All domestic industry data are taken from the OECD STAN database over the period 1980-2003. The industries chosen each cover a wide variety of different types of activity and products, and it is likely that there is considerable within-industry specialisation (Schott, 2004). The data for the G3 countries come directly from the providers of the data in

34. The G7 economies, plus Austria, Finland, the Netherlands and Korea.

35. This is because foreign direct investment is a financial flow rather than a measure of the fixed capital investment undertaken by foreign affiliates. Fixed capital investment by affiliates that is financed by borrowing in the host country will not be reflected in the outward FDI data.

the respective countries.[36] Data on outward direct investment stocks are from the OECD International Direct Investment Statistics database, and adjusted for breaks in definitions and coverage as far as possible, with additional data being obtained from national sources for seven of the 11 countries for which data are available in sufficient detail.[37] In general, the level of industrial and country detail available for direct investment is more limited than that available in the STAN database, placing a constraint on the degree of disaggregation possible in the empirical work.

73. In both estimated models the indicators of internationalisation in each sector are used to augment otherwise conventional labour demand relationships in which domestic employment in that sector is related to the volume of domestic output and real producer wages in the sector and a sector-specific time trend to allow for labour-augmenting technical progress. Two sets of relationships are estimated for each model. The first, which is analogous to that used in several of the empirical studies, simply tests whether there is an association between internationalisation and domestic employment after controlling for the scale of production and labour costs.[38] The second enables tests to be undertaken of two propositions in the literature (see Section 6.2) -- whether internationalisation changes the domestic price elasticity of demand for labour in the sector in which internationalisation takes place, and whether internationalisation changes the speed at which domestic employment in that sector is adjusted following changes in output or wages. The underlying specifications of the separate models are set out in Box 5.

74. The specifications of the equations set out in Box 5 are more likely to identify the effects of vertical-type outward investments designed to move parts of the production process from the domestic company to foreign affiliates. The direction of such effects will depend in part on the stages of production that are moved. Pure horizontal-type investments, in which the factor proportions and activities of the foreign affiliate are identical to those of the parent company, are less likely to be identified, as the model controls for any substitution of production away from the parent by including domestic output as a scale measure. The scale effect from horizontal investments can be controlled for fully only by either conditioning on the (unobserved) total volume of output produced at home and in foreign affiliates, or by estimating a further equation relating the share of OECD output produced to (net) outward FDI.[39]

36. These are the Bureau of Economic Analysis in the United States, the Ministry of Economy, Trade and Industry in Japan and the Deutsche Bundesbank.

37. The International Direct Investment Statistics database contains separate information on the industrial composition of direct investment and on the geographical location of total direct investment. It does not contain combined information on the geographical location of investment in each industry. This information is available from national sources in some countries, but has not been collected for the current paper.

38. Some of the effects of internationalisation might already be embodied in output produced domestically. Regressions were therefore run using both value-added and gross output as scale variables. The latter includes intermediate inputs sourced from abroad. A further step would be to utilise data on the total output produced at home and in the foreign affiliates of domestic parents. However, value-added data of this type are available for few countries.

39. Either of these approaches is complicated because all countries are also hosts to the affiliates of multinationals in other countries. So inward FDI and the output of the foreign parent companies would also have to be taken into account.

**Box 5. The empirical framework**

The empirical work undertaken for the two sets of studies uses different baseline models, reflecting the nature of the data available. For the analyses of the G3 countries using data on employment in foreign affiliates, only a short time span of data is available. Thus while it is possible to look at the factors affecting employment growth, it is not practicable to examine those affecting the long-run level of employment. The equations used take the basic form set out in [1] and [2] (augmented by additional lags of output and wage growth where possible):

$$\Delta \ln L_{i,t} = \alpha_0 + \alpha_1 \Delta \ln Y_{i,t} + \alpha_2 \Delta \ln RW_{i,t} + \alpha_3 \Delta \ln LF_i + \varepsilon_{i,t} \quad [1]$$

$$\Delta \ln L_{i,t} = \alpha_0 + \alpha_1 \Delta \ln Y_{i,t} + [\alpha_2 + \gamma(LF_{i,t-1} / L_{i,t-1})] \Delta \ln RW_{i,t} + \alpha_3 \Delta \ln LF_i + \varepsilon_{i,t} \quad [2]$$

Here, Li denotes domestic employment in industry *i*, Y and RW denote output and real wages respectively, and LF denotes employment in the foreign affiliates of home country parent companies. Industry fixed effects are included to pick-up any otherwise excluded industry specific factors. The specification shown in [2] enables a test to be undertaken of whether a rising share of employment in foreign affiliates has any short-run effect on the response of employment to a change in wages ($\gamma \neq 0$).

For the analysis of the impact of outward FDI stocks on domestic employment two related specifications were used, shown as [3] and [4], where FDI denotes the (log) ratio of the outward stock of foreign direct investment to the nominal value of domestic output in the sector concerned. The span of the data is considerably greater, with detailed industry level stocks on foreign direct investment being available back to the early 1980s for some countries, making it possible to look for long-run effects on employment.

$$\Delta \ln L_{i,t} = \alpha_0 + \alpha_1 \Delta \ln Y_{i,t} + \alpha_2 \Delta \ln RW_{i,t} + \alpha_4 (\ln L_{i,t-1} + \lambda_1 \ln Y_{i,t-1} + \lambda_2 \ln RW_{i,t-1} + \lambda_3 FDI_{i,t-1}) + \beta T_i + \varepsilon_{i,t} \quad [3]$$

$$\Delta \ln L_{i,t} = \alpha_0 + \alpha_1 \Delta \ln Y_{i,t} + \alpha_2 \Delta \ln RW_{i,t} + [\alpha_4 + \gamma_1 FDI_{i,t-1}](\ln L_{i,t-1} + \{\lambda_1 + \gamma_2 FDI_{i,t-1}\} \ln Y_{i,t-1} + \{\lambda_2 + \gamma_3 FDI_{i,t-1}\} \ln RW_{i,t-1} + \lambda_3 FDI_{i,t-1}) + \beta T_i + \varepsilon_{i,t} \quad [4]$$

The specification shown in [4] permits a direct test of whether higher levels of foreign direct investment raise the speed of adjustment of employment towards its long-run sustainable level ($\gamma_1 > 0$). It also provides a test of whether higher levels of foreign direct investment change the price elasticity of the demand for labour ($\gamma_3 \neq 0$).

### *7.1 Employment in foreign affiliates and domestic employment*

75. Data for each of the G3 economies provide an indication of the extent to which employment in foreign affiliates has risen over time relative to employment in the same domestic sectors (Figures 13, 14 and 15).[40] As might be expected, in all three countries the ratio of foreign to domestic employment is typically higher in manufacturing industries than in service sectors (see also Figure 8). The transport equipment, the electrical and optical equipment and the chemical industries are amongst the industries with the highest foreign-domestic employment ratio in all three countries. Although the data used do not cover

40. The data for Germany stop in 2001 because of a change in the definition of foreign employment after then.

every industry in which outward investment has occurred, the omitted industries have a comparatively low share of total employment in foreign affiliates.

76. The estimation period differs for each country. The full sample of data is truncated for estimation purposes in order to retain some lagged observations for use in the instrumental variable estimates of [1] and [2]. The largest sample used is for the United States, with data for all 13 of the sectors identified in Table 2. For Germany, the estimation sample spans 1994-2001. Japan has the shortest sample, covering only six years from 1998 to 2003. Both the German and Japanese samples have one sector missing, reflecting the unavailability of data for some service industries. Common slope parameters are imposed across all industries in each country model, with the short sample period making it unfeasible to test for differing parameters across industries by estimating separate equations for particular industries or industry groups. However, this question is addressed in the subsequent regressions that use the outward FDI stock.

77. The sign and significance of the coefficients on the foreign employment terms are summarised in Table 3. After controlling for domestic output and wage effects, significant coefficients on the growth of employment in foreign affiliates are found for both the United States and, to a lesser extent, Japan. No significant effects were found in Germany.

Table 3. **Summary of impact of foreign affiliate employment on domestic employment growth**

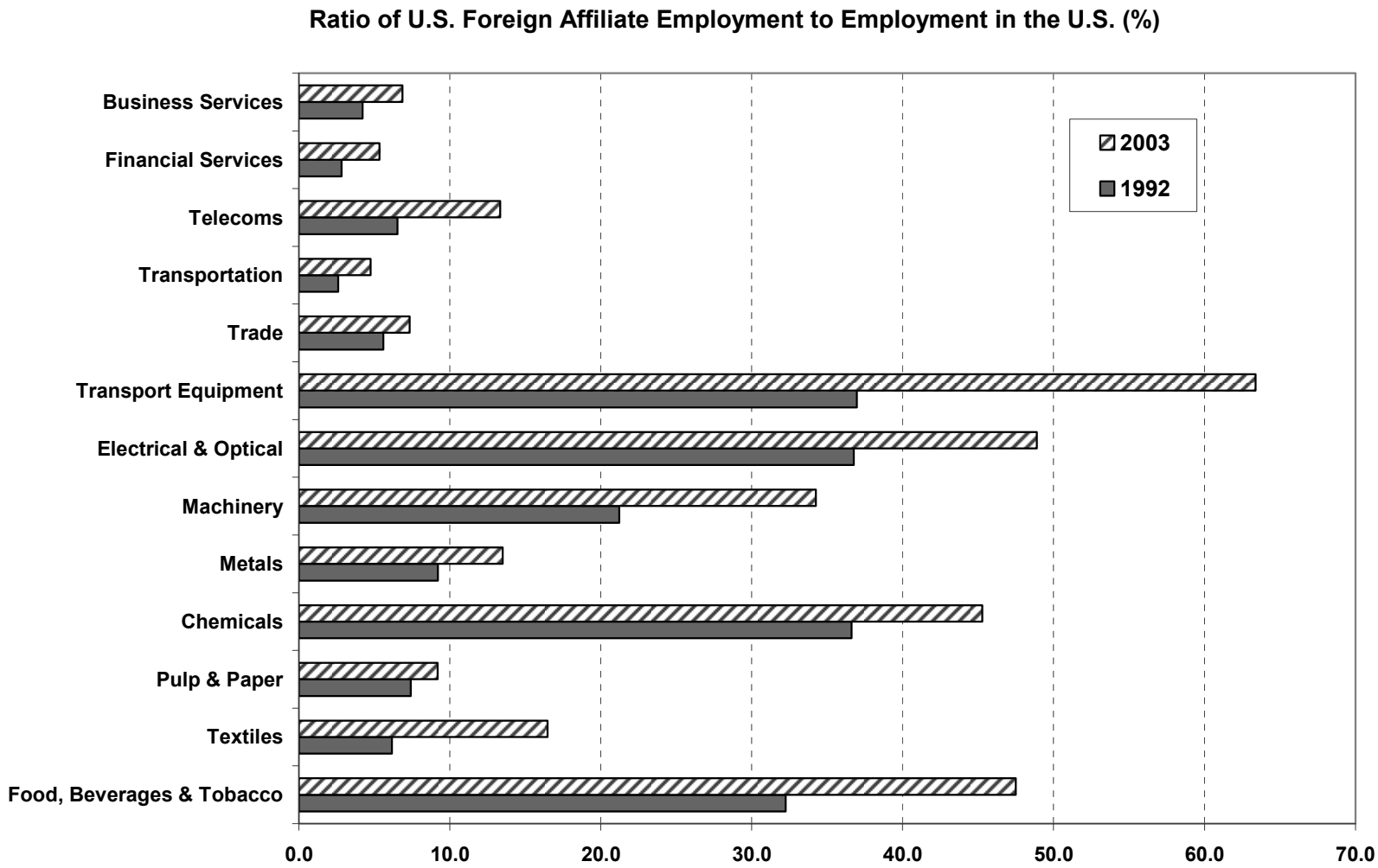
| | United States | | Japan | | Germany | |
|---|---|---|---|---|---|---|
| | OLS | IV | OLS | IV | OLS | IV |
| MODEL 1 | | | | | | |
| Foreign employment growth | +** | +** | -** | - | + | + |
| MODEL 2 | | | | | | |
| Foreign employment growth | +** | +** | -** | - | + | + |
| Wage interaction term | - | - | + | + | + | + |

*Note*: +/- denotes the sign of the estimated coefficient in Table 4 and ** denotes a coefficient significant at the 5% level. For definitions of Model 1 and Model 2, see Box 5 in the main text. For the wage interaction term, a negative (positive) sign means that foreign employment has raised (reduced) the responsiveness of domestic employment to a change in domestic wages.

78. The complete set of regression results from estimating relationships [1] and [2] in Box 5 is reported in Table 4.[41] In all three countries stronger output growth and slower growth of real wages are found to be significantly positively related to domestic employment growth, as might be expected, although the magnitude of the estimated effects differs considerably across countries and across different estimation techniques. The first year effects on employment of changes in output and wages are typically found to be larger in the United States than in the other two countries. Japan has the smallest first year effects from changes in output and wages.

41. The panel relationships are estimated using a standard industry fixed effect estimator. This is found to be statistically preferable to a random effects model.

Figure 13. **Employment in United States foreign affiliates relative to domestic employment (%)**

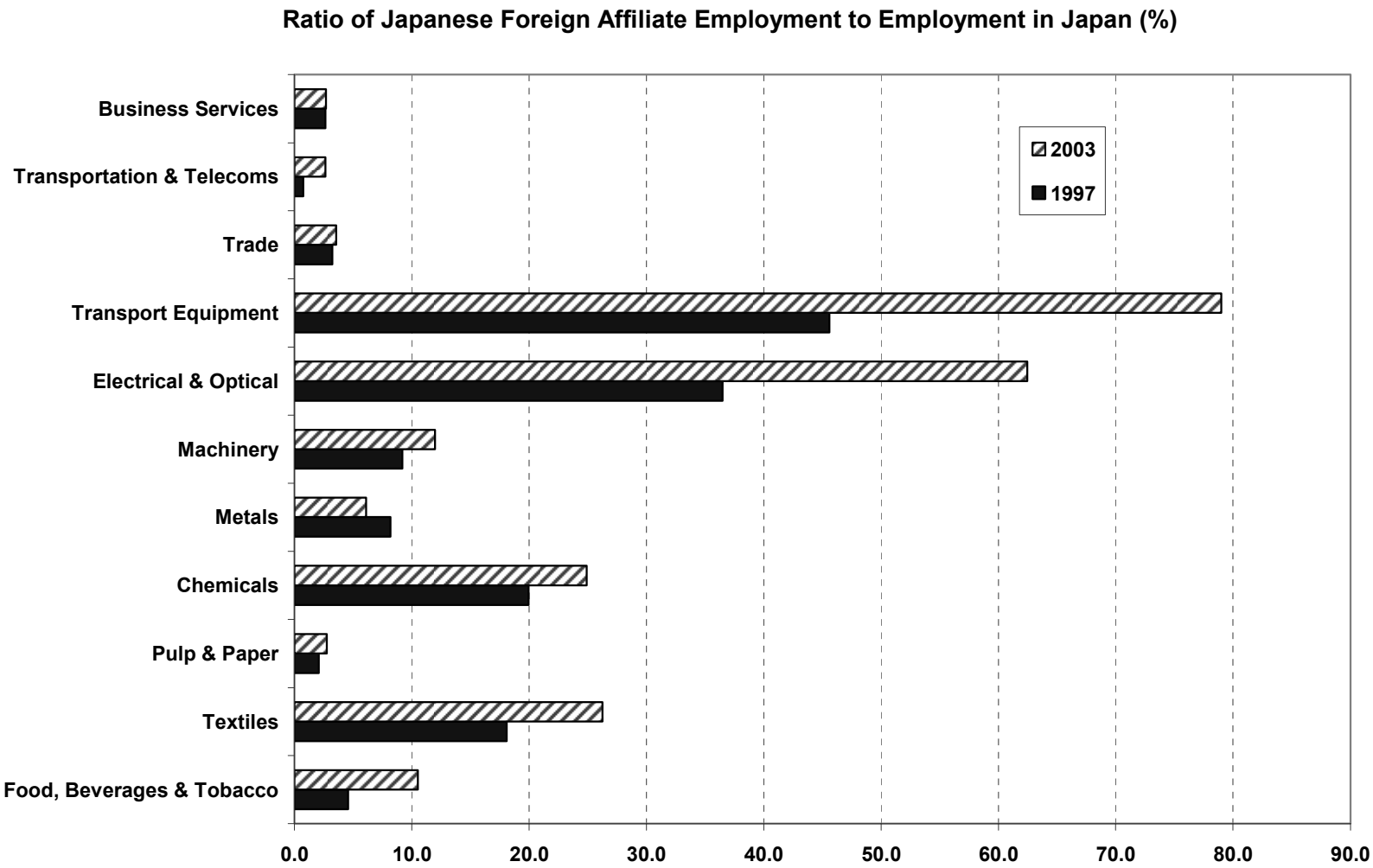



*Source*: Bureau of Economic Analysis and OECD STAN database.

Figure 14. **Employment in German States foreign affiliates relative to domestic employment (%)**

*Source*: Deutsche Bundesbank and OECD STAN database.

Figure 15. **Employment in Japanese foreign affiliates relative to domestic employment (%)**




*Source*: METI Survey on Activities of Foreign Affiliates and OECD STAN database.

79. For the United States, stronger employment growth in affiliates is found to have a significant positive association with domestic employment growth, implying that employment growth at home and abroad may be complements. This finding appears consistent with recent evidence using firm level data (Desai *et al.*, 2005, Table 2). The magnitude of the estimated effect is relatively small. A 1% rise in foreign employment is associated with a rise of between 0.1-0.2% in domestic employment after two years if output and real wages are unchanged.

80. In contrast, for Japan there is evidence of a negative coefficient on foreign employment growth, implying that foreign and domestic employment may have been substitutes, all else equal, over this period.[42] The coefficient is statistically significant using conventional fixed effects estimation, but not when using instrumental variable techniques. The magnitude of the effect from the first of these results is smaller in absolute terms than for the United States, with a 1% rise in foreign employment growth found to be associated with a reduction in domestic employment growth of 0.02% after one year.

81. To further investigate the negative effect of foreign affiliate employment on domestic employment, equations [1] and [2] were also estimated with affiliate employment being disaggregated by geographical area. There is some evidence that the increase in affiliate employment in China has a significant negative effect on domestic employment and its size is much larger than that of worldwide affiliate employment. Rising employment in Asian affiliates is also found to have had a negative impact on domestic employment, though this effect is only marginally significant (at the 10% level). Employment growth in affiliates in other country groups such as the ASEAN or the NIES (Newly Industrialised Economies, including Korea; Hong Kong, China; Singapore and Chinese Taipei) are not found to have a significant negative association with employment in Japan.

82. The findings from estimating model [2] in Box 5 are summarised in the lower panel of Table 4. In all three countries there is no statistically significant evidence that changes in the ratio of foreign to domestic employment have any impact on the short-run price elasticity of labour demand.

83. For the United States there are also sufficient observations available to estimate the labour demand equation using gross output rather than value added as the scale variable in [1]. Gross output includes any intermediate inputs that are produced by the foreign affiliates of parent companies. Thus if there are important scale effects on the overall level of domestic employment, with some formerly domestic activities being moved offshore, they are more likely to appear in the regressions with gross output.

84. The resulting estimates show that foreign employment growth continues to be positively associated with domestic employment growth, but the short-run effects are weaker than found when using value-added output. This suggests that some of the effects of outward investment are reflected in gross output, and that at least some imported intermediates are complements to domestic employment. A further feature of the results using gross output is that the short-run effects of higher wage growth on domestic employment are lower than found when using value-added output as the scale variable.

42. The existing evidence from Japanese studies is mixed. Some suggest that the growth of employment in foreign affiliates is negatively associated with domestic employment growth (MHLW, 2003), but others using firm-level data, suggest that in general no significant impact of outward expansion on employment can be identified Higuchi (2004). The specification used in Table 4 does not provide an indication of whether the estimated negative short-run effect persists into the longer term.

Table 4. **Foreign affiliate employment and domestic employment**

Dependent Variable = $\Delta$ ln (Domestic Employment)$_t$

UNITED STATES

| | {1} | {2} | {3} | {4} | {5} | {6} |
|---|---|---|---|---|---|---|
| $\Delta$ ln(Output Growth)$_t$ | 0.406 (10.1) | 0.376 (8.4) | 0.406 (10.0) | 0.606 (5.8) | 0.594 (4.9) | 0.606 (6.5) |
| $\Delta$ ln(Output Growth)$_{t-1}$ | 0.357 (8.0) | 0.372 (8.5) | 0.366 (8.0) | 0.272 (4.3) | 0.259 (3.5) | 0.302 (4.8) |
| $\Delta$ ln(Real Wage Inflation)$_t$ | -0.344 (8.3) | -0.120 (3.9) | -0.266 (4.2) | -0.608 (4.6) | -0.362 (3.4) | -0.349 (2.3) |
| $\Delta$ ln(Real Wage Inflation)$_{t-1}$ | -0.242 (5.30) | 0.010 (0.3) | -0.229 (3.2) | -0.075 (0.9) | 0.173 (2.3) | -0.215 (1.0) |
| $\Delta$ ln(Foreign Employment Growth)$_t$ | 0.056 (3.1) | 0.028 (1.4) | 0.054 (3.0) | 0.189 (2.7) | 0.072 (1.0) | 0.136 (2.2) |
| $\Delta$ ln(Foreign Employment Growth)$_{t-1}$ | 0.033 (1.6) | 0.046 (3.0) | 0.034 (1.7) | 0.036 (1.3) | 0.064 (2.9) | 0.032 (1.4) |
| FRAT*$\Delta$ ln(Real Wage Inflation)$_t$ | | | -0.200 (1.2) | | | -0.521 (0.8) |
| FRAT*$\Delta$ ln(Real Wage Inflation)$_{t-1}$ | | | -0.037 (0.2) | | | 0.249 (0.4) |
| $R^2$adj. | 0.765 | 0.787 | 0.764 | 0.676 | 0.702 | 0.709 |
| Log-Likelihood | 370.2 | 377.2 | 370.9 | | | |
| Serial Correlation [p-value] | 0.11 | 0.001 | 0.106 | 0.259 | 0.801 | 0.744 |
| Over-identifying restrictions [p-value] | | | | 0.11 | 0.30 | 0.05 |
| No of observations | 143 | 143 | 143 | 143 | 143 | 143 |
| Output Measure | Value-added | Gross output | Value-added | Value-added | Gross output | Value-added |
| Estimation method | OLS | OLS | OLS | IV | IV | IV |

Variable definitions: FRAT = one year lag of ratio of foreign employment to domestic employment

*Note:* All regressions use industry-specific data. Industry fixed effects are also included in the regressions. All t-statistics are heteroscedastic-consistent. Sample period is 1993-2003. The IV regressions treat current dated terms in output, wages and foreign employment as endogenous.

Dependent Variable = $\Delta$ ln (Domestic Employment)$_t$

GERMANY

| | {1} | {2}? | {3} | {4} | {5} | {6}? |
|---|---|---|---|---|---|---|
| $\Delta$ ln(Output Growth)$_t$ | 0.139 (2.6) | | 0.127 (2.4) | 0.561 (2.8) | 0.245 (1.0) | |
| $\Delta$ ln(Output Growth)$_{t-1}$ | 0.366 (10.2) | | 0.364 (9.9) | 0.407 (4.9) | 0.388 (4.2) | |
| $\Delta$ ln(Real Wage Inflation)$_t$ | -0.074 (0.6) | | -0.112 (0.8) | -0.239 (1.1) | -0.785 (1.8) | |
| $\Delta$ ln(Real Wage Inflation)$_{t-1}$ | -0.342 (5.2) | | -0.378 (4.6) | -0.268 (2.2) | -0.526 (1.0) | |
| $\Delta$ ln(Foreign Employment Growth)$_t$ | 0.020 (1.3) | | 0.021 (1.4) | 0.032 (0.4) | 0.035 (0.6) | |
| $\Delta$ ln(Foreign Employment Growth)$_{t-1}$ | 0.005 (0.3) | | 0.006 (0.3) | 0.003 (0.1) | 0.012 (0.4) | |
| FRAT*$\Delta$ ln(Real Wage Inflation)$_t$ | | | 0.463 (0.5) | | 0.542 (1.6) | |
| FRAT*$\Delta$ ln(Real Wage Inflation)$_{t-1}$ | | | 0.350 (0.7) | | 0.185 (0.8) | |
| $R^2$adj. | 0.714 | | 0.707 | 0.531 | 0.525 | |
| Log-Likelihood | 207.5 | | 207.8 | | | |
| Serial Correlation [p-value] | 0.49 | | 0.36 | 0.61 | 0.86 | |
| Over-identifying restrictions [p-value] | | | | 0.11 | 0.59 | |
| No of observations | 80 | | 80 | 80 | 80 | |
| Output Measure | Value-added | | Value-added | Value-added | Value-added | |
| Estimation method | OLS | | OLS | IV | IV | |

Variable definitions: FRAT = one year lag of ratio of foreign employment to domestic employment

*Notes:* The table has the same format as for the United States; however some regressions are not possible using the available data for Germany. These are denoted with a ? symbol. All regressions use industry-specific data. Industry fixed effects are also included in the regressions. All t-statistics are heteroscedastic-consistent. Sample period is 1994-2001. Gross output data are not available in STAN for some industries in Germany.The IV regressions treat current dated terms in output, wages and foreign employment as endogenous.

Table 4. **Foreign affiliate employment and domestic employment** (cont'd)

| Japan I | Dependent Variable=Δln(Domestic Employment)$_t$ | | | | | |
|---|---|---|---|---|---|---|
| | {1} | {2}? | {3} | {4} | {5} | {6}? |
| Δln(Output Growth)$_t$ | 0.150 (2.96) | | 0.155 (3.00) | 0.123 (1.91) | 0.154 (2.38) | |
| Δln(Real Wage Inflation)$_t$ | -0.034 (1.68) | | -0.024 (0.91) | -0.039 (1.58) | -0.024 (0.68) | |
| Δln(Foreign Employment Growth)$_t$ | -0.019 (1.73) | | -0.019 (1.71) | -0.020 (0.98) | -0.024 (1.14) | |
| FRAT*Δln(Real Wage Inflation)$_t$ | | | -0.102 (0.66) | | -0.157 (0.85) | |
| $R^2$ adj. | 0.614 | | 0.608 | 0.609 | 0.605 | |
| Log-Likelihood | 175.4 | | 175.816 | | | |
| Serial Correlation [p-value] | 0.5886 | | 0.5387 | 0.4474 | 0.4257 | |
| Over-identifying restrictions [p-value] | | | | 0.2208 | 0.1493 | |
| No of observations | 62 | | 62 | 62 | 62 | |
| Output Measure | Value-added | | Value-added | Value-added | Value-added | |
| Estimation Method | OLS | | OLS | IV | IV | |

| Japan II | Dependent Variable=Δln(Domestic Employment)$_t$ | | | | | |
|---|---|---|---|---|---|---|
| | {1} | {2}? | {3} | {4} | {5} | {6}? |
| Δln(Output Growth)$_t$ | 0.123 (2.60) | | 0.127 (2.64) | 0.090 (1.53) | 0.087 (1.42) | |
| Δln(Real Wage Inflation)$_t$ | -0.029 (1.50) | | -0.021 (0.98) | -0.034 (1.48) | -0.037 (1.31) | |
| Δln(Chinese Affiliate Employment Growth | -0.026 (3.02) | | -0.027 (3.04) | -0.006 (0.29) | -0.007 (0.32) | |
| FRAT*Δln(Real Wage Inflation)$_t$ | | | -0.027 (0.72) | | -0.424 (0.50) | |
| $R^2$ adj. | 0.665 | | 0.661 | 0.665 | 0.6375 | |
| Log-Likelihood | 179.86 | | 180.3054 | | | |
| Serial Correlation [p-value] | 0.2312 | | 0.1448 | 0.851 | 0.9026 | |
| Over-identifying restrictions [p-value] | | | | 0.22 | 0.06 | |
| No of observations | 62 | | 62 | 51 | 51 | |
| Output Measure | Value-added | | Value-added | Value-added | Value-added | |
| Estimation Method | OLS | | OLS | IV | IV | |

| Japan III | Dependent Variable=Δln(Domestic Employment)$_t$ | | | | | |
|---|---|---|---|---|---|---|
| | {1} | {2}? | {3} | {4} | {5} | {6}? |
| Δln(Output Growth)$_t$ | 0.155 (3.04) | | 0.158 (3.05) | 0.130 (2.10) | 0.098 (1.57) | |
| Δln(Real Wage Inflation)$_t$ | -0.034 (1.66) | | -0.028 (1.18) | -0.042 (1.78) | -0.035 (1.28) | |
| Δln(Asian Affiliate Employment Growth)$_t$ | -0.029 (1.83) | | -0.029 (1.82) | -0.031 (0.94) | -0.028 (1.00) | |
| FRAT*Δln(Real Wage Inflation)$_t$ | | | -0.116 (0.48) | | -0.018 (0.07) | |
| $R^2$ adj. | 0.618 | | 0.610 | 0.594 | 0.6025 | |
| Log-Likelihood | 175.73 | | 175.92 | | | |
| Serial Correlation [p-value] | 0.5682 | | 0.0222 | 0.2621 | 0.236 | |
| Over-identifying restrictions [p-value] | | | | 0.303 | 0.509 | |
| No of observations | 62 | | 62 | 62 | 62 | |
| Output Measure | Value-added | | Value-added | Value-added | Value-added | |
| Estimation Method | OLS | | OLS | IV | IV | |

Variable definitions: FRAT = one year lag of ratio of foreign employment to domestic employment.

*Note*: The table has the same format as for the United States; however, some regressions are not possible given the available data for Japan. These are denoted with a ? symbol. All regressions use industry-specific data. Industry fixed effects are also included in the regressions. All t-statistics are heteroscedastic-consistent. Sample period is 1998-2003. The IV regressions treat current dated terms in output, wages and foreign employment as endogenous.

85. The question arises as to why different results are found for the United States and Japan. A possible explanation relates to the time period covered and the maturity of foreign investments from the different countries. American multinationals have typically been established for longer than Japanese multinationals. As suggested by other empirical studies, it is possible that after having initially been substitutes during the initial process of changing the location of production, employment at home and in foreign affiliates become complementary over time (Andersen and Hainaut, 1998). If so, it could be argued that job losses at home are more likely to coincide with job creation abroad in Japan than the United States.

### *7.2 Outward direct investment and domestic employment*

86. The second model estimated uses stocks of outward foreign investment (as a proportion of domestic output) as the indicator of internationalisation. The available data set is much richer, with over 2000 observations in total, compared to that for the initial analysis using the foreign affiliate employment data for the G3 economies. The principal focus of the analysis using outward FDI stocks has been on potential differences in the effect of internationalisation on employment across industries.[43,44] A variety of different specifications are estimated using both value added output and gross output as alternate scale variables.

87. For the purposes of testing whether the effects of internationalisation differ across industries, the thirteen sectors in the dataset were separated into three groups. One of these groups comprises the five service sectors. The manufacturing sectors were separated into two groups using information from the G7 economies on the share of imports in these sectors coming from non-OECD countries and the proportion of outward investment in these sectors located in non-OECD economies. A high share of imports from the non-OECD and a high proportion of FDI in non-OECD economies are suggestive of sectors in which production may have been, or is able to be, moved offshore to comparatively lower cost locations. The four sectors that were found to have the highest commercial ties with the non-OECD were textiles, transport equipment, electrical and optical equipment, and food, beverages and tobacco. These four sectors were thus included in a second group, with the remaining four manufacturing sectors forming a third group.

88. The complete set of regression results from estimating relationships [3] and [4] in Box 5 are reported in Tables 6 and 7.[45] The models are estimated both for the full panel and separately for each of the three groups of different sectors.[46] The results provide strong evidence of clear, statistically significant, differences in the factors affecting labour demand across the three groups of different sectors. Likelihood ratio tests of imposing common coefficients and a common error variance across all three groups, as would be required for the full panel model to be valid, are heavily rejected by the data. This does not only reflect differences between manufacturing and services sectors, common parameters are also rejected across the two manufacturing groups.

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43. It is not feasible to estimate a separate model for each industry in each country, because sufficient data are not always available in all cases. So standard fixed effects panel data estimators and estimators robust to the presence of heterogeneity have been used to estimate models across industry groups, with every country within each of the industries implicitly having a common coefficient.

44. Preliminary estimates, not reported in this paper, suggested that the overall fit of the panel when allowing for different coefficients across industry groups was clearly superior to that when allowing for different coefficients across countries. The analytical work has therefore focused mainly on differences across industries.

45. The panel relationships are again estimated using a fixed effects estimator. Separate fixed effects are included for each industry-country pair. Common slope parameters are imposed across countries within each industrial sector.

46. The models were also estimated with a common variance for the three industry groups, which did not produce significantly different results.

Table 5. **Summary of impact of outward direct investment on domestic employment growth**

| | All industries | | Manufacturing industries with strong links to non-OECD | | Other manufacturing industries | | Services | |
|---|---|---|---|---|---|---|---|---|
| **A. Value-added output** | | | | | | | | |
| | OLS | IV | OLS | IV | OLS | IV | OLS | IV |
| **MODEL 3** | | | | | | | | |
| Outward FDI | +** | -** | -** | -** | -* | + | + | + |
| **MODEL 4** | | | | | | | | |
| Outward FDI | - | -* | -** | -** | + | + | +** | +** |
| Wage interaction term | - | -** | -** | -** | + | - | + | +* |
| Adjustment speed to long-run | +** | - | -** | -* | +** | + | +** | +** |
| **B. Gross output** | | | | | | | | |
| | OLS | IV | OLS | IV | OLS | IV | OLS | IV |
| **MODEL 3** | | | | | | | | |
| Outward FDI | -** | -** | -** | -** | + | + | - | - |

*Note*: +/- denotes the sign of the estimated coefficient in Tables 6 and 7 and ** denotes a coefficient significant at the 5% level. A negative (positive) sign for the wage interaction term means that the labour demand curve has become more (less) elastic. A negative (positive) sign for the adjustment coefficient means that the adjustment of employment has risen (slowed).

89. In all three industry groupings, as well as the single combined panel, there is evidence that stronger output and lower real wages are significantly positively related to domestic employment, both in the short term and in the long run. In almost all the regressions the long-run output elasticity is less than two standard deviations away from unity, and the long-run real wage elasticity is less than two standard deviations away from -1. The point estimates of the long-run output and wage elasticities in the group of service sectors (labelled Group 3 in Tables 6 and 7) are generally above those found for the two manufacturing groups.

90. The sign and significance of the coefficients found on the foreign employment terms are summarised in Table 5. There are marked differences across groups in the impact of outward direct investment, especially in the coefficients found on the separate outward FDI stock term ($\lambda_3$ in [3] in Box 5). For all specifications shown it is the case that significant negative effects are found for the group of manufacturing sectors with the strongest commercial ties with the non-OECD countries. Other things being equal, a rise in the outward investment-output ratio in this group will be associated with some reductions in domestic employment.

91. There are two possible explanations for this finding. The first is that labour at home may be directly substitutable with foreign labour in this group of manufacturing sectors. An alternative is that outward investment helps to raise labour-augmenting technical progress at home, reducing the level of employment required to achieve a given level of output in the short term, but raising productivity, output and employment in the longer term (Grossman and Rossi-Hansberg, 2006). It is not possible to distinguish fully between these two hypotheses in the model.[47]

47. In the latter case, the higher level of productivity may help to reduce costs and expand output, offsetting any subsequent decline in employment levels.

Table 6. **Outward Foreign Direct Investment and labour demand in the home country**

| | All Sectors | | Group 1 | | Group 2 | | Group 3 | |
|---|---|---|---|---|---|---|---|---|
| | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** |
| *Long-run coefficients* | | | | | | | | |
| Output | 0.845 | 35.5 | 0.851 | 21.5 | 0.707 | 17.0 | 1.088 | 13.1 |
| Wage | -0.917 | -30.9 | -0.871 | -17.9 | -0.871 | -15.1 | -1.197 | -11.9 |
| FDI | 0.022 | 4.9 | -0.058 | -5.5 | -0.015 | -1.9 | 0.006 | 0.9 |
| *Short-run coefficients* | | | | | | | | |
| Dynamic coefficient | -0.281 | -26.3 | -0.260 | -13.0 | -0.341 | -14.9 | -0.229 | -12.6 |
| Output | 0.420 | 26.9 | 0.390 | 15.4 | 0.460 | 18.6 | 0.377 | 10.8 |
| Wage | -0.263 | -16.4 | -0.268 | -9.0 | -0.297 | -11.8 | -0.180 | -6.2 |
| No. Obs. | 2131 | | 709 | | 741 | | 681 | |
| R-sq | 0.541 | | 0.510 | | 0.618 | | 0.593 | |
| Log likelihood | 4066.52 | | 1284.68 | | 1487.95 | | 1314.51 | |
| Output measure | Value-added | | Value-added | | Value-added | | Value-added | |

| | All Sectors | | Group 1 | | Group 2 | | Group 3 | |
|---|---|---|---|---|---|---|---|---|
| | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** |
| *Long-run coefficients* | | | | | | | | |
| Output | 0.838 | 35.0 | 0.844 | 23.7 | 0.767 | 15.0 | 1.111 | 14.6 |
| Wage | -0.943 | -31.0 | -0.928 | -19.9 | -0.886 | -13.9 | -1.170 | -12.5 |
| FDI | -0.011 | -0.1 | -0.564 | -4.3 | 0.170 | 0.9 | 0.659 | 3.0 |
| *Short-run coefficients* | | | | | | | | |
| Dynamic coefficient | -0.265 | -18.4 | -0.315 | -10.3 | -0.285 | -9.3 | -0.218 | -10.2 |
| Output | 0.401 | 26.2 | 0.370 | 14.9 | 0.467 | 18.9 | 0.383 | 11.6 |
| Wage | -0.270 | -17.3 | -0.266 | -9.2 | -0.301 | -12.0 | -0.193 | -6.9 |
| *Interaction term coefficients* | | | | | | | | |
| FDI-VA | -0.003 | -1.0 | 0.021 | 3.3 | -0.010 | -1.9 | -0.018 | -4.2 |
| FDI-W | -0.002 | -0.6 | -0.027 | -3.9 | 0.009 | 1.4 | 0.007 | 1.7 |
| FDI-Employment | 0.006 | 2.0 | -0.019 | -2.8 | 0.013 | 2.3 | 0.020 | 4.6 |
| No. Obs. | 2131 | | 709 | | 741 | | 681 | |
| R-sq | 0.564 | | 0.541 | | 0.624 | | 0.638 | |
| Log likelihood | 4121.07 | | 1327.69 | | 1497.16 | | 1397.60 | |
| Output measure | Value-added | | Value-added | | Value-added | | Value-added | |

| | All Sectors | | Group 1 | | Group 2 | | Group 3 | |
|---|---|---|---|---|---|---|---|---|
| | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** | ***Coefficient*** | ***t-value*** |
| *Long-run coefficients* | | | | | | | | |
| Output | 0.826 | 16.2 | 1.137 | 6.8 | 0.613 | 8.4 | 0.853 | 11.2 |
| Wage | -0.561 | -11.2 | -0.569 | -4.6 | -0.882 | -8.2 | -0.870 | -9.7 |
| FDI | -0.044 | -4.4 | -0.130 | -3.1 | 0.013 | 0.8 | -0.002 | -0.3 |
| *Short-run coefficients* | | | | | | | | |
| Dynamic coefficient | -0.182 | -13.6 | -0.110 | -5.3 | -0.268 | -8.9 | -0.238 | -12.0 |
| Output | 0.432 | 19.1 | 0.450 | 11.4 | 0.415 | 12.2 | 0.403 | 10.6 |
| Wage | -0.088 | -4.6 | -0.055 | -1.7 | -0.143 | -4.2 | -0.173 | -5.8 |
| No. Obs. | 1357 | | 512 | | 419 | | 426 | |
| R-sq | 0.498 | | 0.478 | | 0.548 | | 0.715 | |
| Log likelihood | 2477.66 | | 873.06 | | 813.68 | | 841.07 | |
| Output measure | Gross output | | Gross output | | Gross output | | Gross Output | |

*Notes: The table reports the coefficients obtained when estimating equations [3] and [4] in Box 4 of the main text. Group 1 comprises four manufacturing industries - food/beverages/tobacco, textiles, transport equipment and electrical and optical equipment, with strong commerical links with the non-OECD. Group 2 consists of wood/paper/printing, chemicals, basic metals and machinery. Group 3 comprises five service sectors. Further details of the industries are reported in Table 2.*

Table 7. **Outward Foreign Direct Investment and labour demand in the home country: IV estimates**

| | All Sectors | | Group 1 | | Group 2 | | Group 3 | |
|---|---|---|---|---|---|---|---|---|
| | *Coefficient* | *t-value* | *Coefficient* | *t-value* | *Coefficient* | *t-value* | *Coefficient* | *t-value* |
| *Long-run coefficients* | | | | | | | | |
| Output | 0.818 | 15.0 | 0.915 | 12.1 | 0.743 | 8.9 | 1.377 | 7.2 |
| Wage | -0.906 | 15.8 | -0.952 | -12.7 | -1.054 | -7.2 | -1.100 | -5.2 |
| FDI | -0.025 | -3.6 | -0.050 | -3.1 | 0.005 | 0.5 | -0.005 | -0.6 |
| *Short-run coefficients* | | | | | | | | |
| Dynamic coefficient | -0.271 | -11.6 | -0.273 | -6.1 | -0.385 | -9.1 | -0.229 | -9.6 |
| Output | 0.730 | 6.9 | 0.764 | 4.3 | 0.380 | 2.3 | 0.784 | 0.2 |
| Wage | 0.052 | 0.3 | -0.463 | -1.6 | -0.807 | -3.5 | 0.002 | 0.0 |
| No. Obs. | 2031 | | 701 | | 737 | | 657 | |
| R-sq | 0.223 | | 0.346 | | 0.368 | | 0.376 | |
| Output measure | Value-added | | Value-added | | Value-added | | Value-added | |

| | All Sectors | | Group 1 | | Group 2 | | Group 3 | |
|---|---|---|---|---|---|---|---|---|
| | *Coefficient* | *t-value* | *Coefficient* | *t-value* | *Coefficient* | *t-value* | *Coefficient* | *t-value* |
| *Long-run coefficients* | | | | | | | | |
| Output | 0.857 | 20.2 | 0.941 | 13.0 | 0.824 | 6.9 | 1.284 | 7.3 |
| Wage | -0.966 | -22.1 | -0.975 | -15.3 | -1.165 | -6.4 | -1.078 | -4.9 |
| FDI | -0.394 | -3.6 | -0.546 | -3.0 | 0.015 | 0.1 | 0.678 | 2.3 |
| *Short-run coefficients* | | | | | | | | |
| Dynamic coefficient | -0.326 | -11.9 | -0.378 | -7.6 | -0.345 | -5.2 | -0.220 | -8.2 |
| Output | 0.712 | 7.2 | 0.855 | 4.9 | 0.449 | 2.5 | 0.684 | 3.2 |
| Wage | -0.066 | -0.4 | -0.739 | -2.4 | -0.873 | -3.8 | -0.070 | -0.3 |
| *Interaction term coefficients* | | | | | | | | |
| FDI-VA | 0.014 | 2.8 | 0.024 | 2.1 | 0.000 | -0.1 | -0.019 | -3.7 |
| FDI-W | -0.017 | -3.4 | -0.030 | -2.4 | -0.002 | -0.3 | 0.010 | 1.9 |
| FDI-Employment | -0.012 | -2.4 | -0.023 | -1.8 | 0.001 | 0.1 | 0.021 | 4.1 |
| No. Obs. | 2031 | | 701 | | 737 | | 657 | |
| R-sq | 0.333 | | 0.226 | | 0.330 | | 0.517 | |
| Output measure | Value-added | | Value-added | | Value-added | | Value-added | |

| | All Sectors | | Group 1 | | Group 2 | | Group 3 | |
|---|---|---|---|---|---|---|---|---|
| | *Coefficient* | *t-value* | *Coefficient* | *t-value* | *Coefficient* | *t-value* | *Coefficient* | *t-value* |
| *Long-run coefficients* | | | | | | | | |
| Output | 0.710 | 13.3 | 0.877 | 7.1 | 0.546 | 5.2 | 0.999 | 10.0 |
| Wage | -0.422 | -8.6 | -0.520 | -3.4 | -0.915 | -5.3 | -0.791 | -7.3 |
| FDI | -0.038 | -3.6 | -0.114 | -3.0 | 0.027 | 1.3 | -0.014 | -1.6 |
| *Short-run coefficients* | | | | | | | | |
| Dynamic coefficient | -0.236 | -10.6 | -0.154 | -4.4 | -0.358 | -6.4 | -0.233 | -10.2 |
| Output | 0.290 | 4.9 | 0.271 | 2.5 | 0.169 | 0.8 | 0.616 | 5.5 |
| Wage | 0.469 | 2.1 | 0.358 | 1.3 | -0.579 | -2.5 | -0.078 | -0.6 |
| No. Obs. | 1303 | | 497 | | 403 | | 408 | |
| R-sq | 0.136 | | 0.287 | | 0.286 | | 0.681 | |
| Output measure | Gross output | | Gross output | | Gross output | | Gross Output | |

*Note*: The table reports the coefficients obtained from instrumental variables estimation of the relationships in Table 6. Group 1 comprises four manufacturing industries – food/beverages/tobacco, textiles, transport equipment and electrical and optical equipment with strong commercial links with the non-OECD. Group 2 consists of wood/paper/printing, chemicals, basic metals and machinery. Group 3 comprises five service sectors. Further details of the industries are reported in Table 2.

92. In the remaining two groups the long-run coefficients found on the separate outward investment-output ratio are generally insignificant, although there are two occasions in which a significant positive coefficient is found for the group of service sectors when estimating model [4] in Box 5.[48]

93. There are also noticeable differences in the findings obtained for each group when testing whether outward investment has a significant effect on either the long-run wage elasticity of demand or the speed at which employment adjusts towards its long-run sustainable level. For the group of manufacturing sectors that have strong commercial links with the non-OECD countries, there is statistically significant evidence that increases in outward investment raise the long-run wage elasticity and also the speed of adjustment of domestic employment. In contrast, for the group of service sectors, an increase in outward investment is found to be associated with significant reductions in the speed of adjustment of employment, other things being equal. Thus whilst there is evidence that domestic and foreign employment are substitutable to some extent in industries with strong linkages with the non-OECD, they are more likely to be possible complements in services sectors.

94. The estimated coefficients imply that the strong growth of outward investment seen over the sample period is having noticeable effects on the price elasticity of demand for labour in at least some industries. For example, for the group of manufacturing industries with strong commercial links with the non-OECD, a sustained rise of 1% in real wages is found to reduce domestic employment by between 0.8-0.9% when evaluated at two standard deviations below the sample mean for the FDI ratio. But evaluated at two standard deviations above the sample mean for the FDI ratio, the elasticity rises to between 0.9-1.0%. If the sample maximum is used,[49] the elasticity rises to above 1%, although not significantly so. The changes in FDI are also reflected in differing speeds of employment adjustment towards the long run, as can be seen from Figure 16.

## 8. Conclusions from the new empirical evidence

95. Overall, the preliminary empirical evidence obtained at both the country and the industry level supports several of the propositions advanced in the literature about the possible effects of the internationalisation of production. However, there are significant differences in developments across countries and industries, making it difficult to draw strong policy conclusions. There is evidence that in some manufacturing industries outward investment has made the demand for labour more elastic, and raised the speed at which employment is adjusted following changes in output and wages. However, there is also evidence that the opposite may have occurred in some services sectors. At the country level, the expansion of employment in the foreign affiliates of domestically owned companies appears to have a significant positive impact on domestic employment in the United States, but not in Germany or Japan.

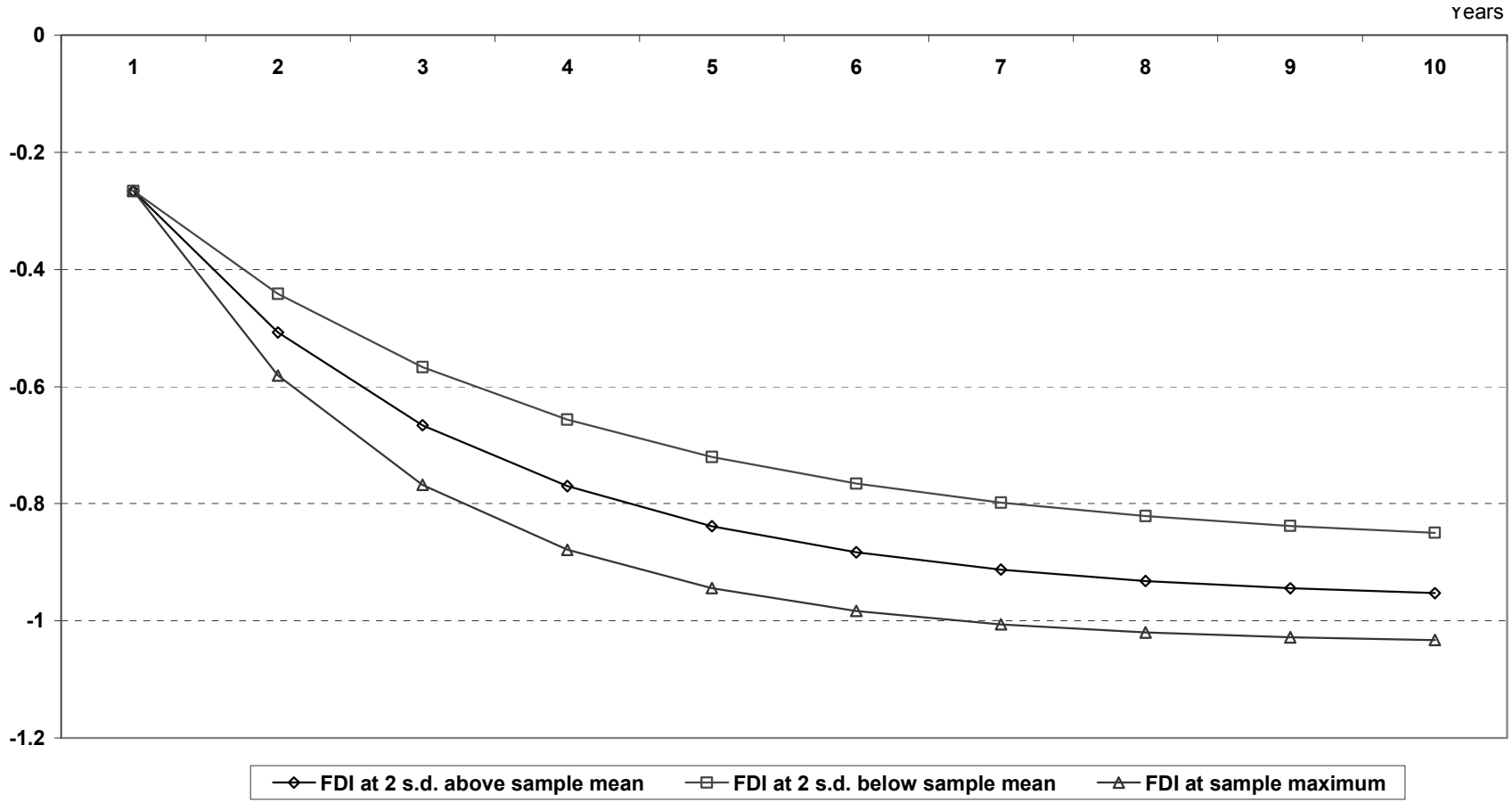
96. There are a number of additional ways in which the issues explored in this paper might be studied. One approach would be to further extend the new databases in order to incorporate additional country data on employment in foreign affiliates and an enhanced degree of industrial disaggregation, although this is almost certainly likely to reveal even greater heterogeneity. A second approach might to be to seek to allow for other factors that can affect labour demand, such as anti-competitive product market regulations and other aspects of globalisation, to see whether the effects of outward investment can be

48. The effect of FDI does not change substantially when controlling for employment protection practices for regular workers. In the manufacturing sectors with close ties with non-OECD countries, its impact is still negative and significant, albeit the size of the impact is reduced to one-half. In services, the employment-creating impact of outward FDI is larger and more significant when controlling for employment protection of regular workers.

49. This is approximately three standard deviations away from the sample mean.

estimated more precisely. A third approach would be to either estimate an equation in which the share of OECD value-added output produced in different member states is related to (net) outward FDI stocks or, equivalently, use OECD-wide output in the national labour demand equations (Barrell *et al*., 1995). Finally, it would be of interest to gain a more complete picture of labour market developments by also exploring the impact of the internationalisation of production on real wages in the home country.

Figure 16. **The direct effect on domestic employment of a 1% increase in real wages in manufacturing industries with strong commercial links with non-OECD economies (per cent)**




*Source*: Calculated using the coefficients reported for the industries in Group 1 in Table 6.

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# ANNEX A. MEASURES OF OUTSOURCING FROM TRADE STATISTICS

## A1. Measuring outsourcing and trade in intermediate goods

97. Whereas the growing trade in intermediate inputs has constituted an important part of the rise in global merchandise trade relative to production over the past two decades, the extent of international outsourcing is difficult to measure accurately. A number of different concepts are used in the literature. This section discusses some of these measures and the features of an associated data set used to assess developments in the growth of trade in intermediate goods, parts and components (hereafter referred to as "intermediate goods") over the period between 1989 and 2004.

### *A1.1 Indices of international outsourcing*

98. Recent studies attempt to shed light on development and trends in international outsourcing, using a range of different measures and data sources. In reviewing the scope of these, OECD (2006) broadly distinguishes two main approaches which differ mainly according to the type of data sets used, as between firm and sectoral level information. Whereas measures based on firm-level data are likely to be the most refined, they are subject to a number of important limitations. Firstly, the underlying firm-level micro-data are often limited for confidentiality reasons. They are often collected to comply with national regulations in diverse areas, and hence vary quite considerably from country to country with respect to underlying definitions and criteria, levels of sectoral aggregation and frequency of collection. As a result, their international comparability is extremely limited. Corresponding sectoral approaches are by definition less precise but provide a more practical basis for cross-country comparisons using relatively long and up-to-date time series. The three main sources of sectoral data are customs statistics on outward processing trade, input-output tables and international trade statistics.

99. Customs statistics provide information from customs arrangements in which tariff exemptions or reductions are granted in accordance to the domestic input content of imported goods. The US Offshore Assembly Programme and the EU Outward Processing Trade data sets are examples of such data. Both have been used in a number of empirical studies; see, for example, Görg (2000), Egger and Egger (2001) and Feenstra *et al.* (2000). In general, such sources tend to be limited with respect to country and regional comparability and also the length of time series available.

100. Measures of outsourcing developed by matching Input-Output statistics with import penetration measures for given sectors, provide a basis for analysing simultaneously developments across industries and time. A major advantage of these measures is that they will capture developments in non-tradeable final services. Typically, such measures are computed as the share of inputs from sector $j$ into sector $i$ in the total inputs of sector $i$, times the import penetration rate of sector $j$. Studies using input-output based measures include OECD (2006, 2007), Hummels *et al.* (2001) and Hijzen *et al*. (2004). More specifically, OECD (2006) proposes the use of an "outsourcing index" for an industry $i$ and for a set of categories of goods or services $j$ of the following form:

$$OI_i = \sum_i \left[ \frac{purchases\ of\ inputs\ \ j\ by\ industry\ i}{total\ inputs\ excluding\ energy\ used\ by\ i} \right] \bullet \left[ \frac{M_j}{D_j} \right]$$

where $M_j$ = imports of goods or services of sector of industry j

$D_j$ = domestic demand for goods or services of industry j

The first term is calculated directly from input-output information, while the second term, which represents the overall rate of penetration of imports of goods or services of sector $j$ , is calculated from available trade or balance of payments statistics, which obviously tend to be more limited in the case of services. A more general limitation of such measures concerns the choice of appropriate measures of import penetration. Typically these include finished goods and further assume that the share of imports in the intermediate inputs purchased from sector $j$ by all other industries is identical, which seems unlikely to be the case (Tomiura, 2005).

101. The use of international trade statistics is largely complementary to the above approach, but has the specific advantage of providing measures that are often easier to compare across countries. They also permit the identification of specific trading partner relationships. The measures of international outsourcing used in Section 2 of the current study belong to this category, focusing specifically on relevant trade shares in various categories of intermediate goods imported by a specific country or group of countries from specific trading partners and regions. Such measures are "narrow" measures of international outsourcing, according to the classification of measures used in Feenstra and Hanson (2000).

102. Important limitations of this approach are that the measures relate only to trade in goods, and also omit four particular types of outsourcing: imports of final goods used in domestic production; imports of final goods that are sold under the brand-name of a domestic firm; imports of final goods that could potentially be produced domestically but are not; and imports of goods that could potentially be produced domestically for export purposes, but are produced abroad and exported to third markets. The relevant data set, as described below, nonetheless provides a useful basis for monitoring the direction and composition of relevant trade flows consistently over time and across countries, and thereby gives some useful insights into the general trends in trade in intermediate and final goods.

### *A1.2 Construction of trade based measures of the international outsourcing*

103. The various measures used in the study have been constructed by carefully grouping the 6-digit import flows reported in the United Nations COMTRADE database into two main categories: "intermediate goods, parts and components" and "final goods". The list of commodities entering the intermediate goods category are reported in Table A1. The source data, which were originally expressed in value terms, have been transformed into constant price series using sectoral import price indices from the CEPII BACI database.[50]

50. COMTRADE does include some quantity data, expressed in metric units, but the coverage is uneven. For this reason, trade values from COMTRADE have been deflated for the present study using corresponding import price indices from the CEPII BACI data base. While BACI essentially draws on COMTRADE, it also fills in some important gaps and makes the data set more consistent by checking and reconciling information reported by the exporting and importing countries (when available). This harmonisation of mirror flows is done for values and quantities. BACI also converts the volume statistics from the various units of measure provided to COMTRADE into tons, to permit the computation of homogeneous unit values.

104. The COMTRADE database covers annual trade flows disaggregated by commodity and partner country, up to a 6-digit level. Commodities are classified according to three nomenclatures: the Harmonised System (HS) classification, the Broad Economic Categories (BEC) classification and, the Standard International Trade Classification (SITC). The most suitable nomenclature for current purpose is the latter.[51] The SITC commodity groupings provide a basis for grouping trade according to several criteria including the processing stage of the product. Use of appropriate concordance tables allows the constructed SITC data in constant prices to be matched with corresponding production and employment data from the OECD STAN database; the latter are classified according to the International Standard Industrial Classification of economic activities (ISIC).

105. For most countries relevant data series can be constructed from 1962 to 2004 inclusive. The subset of data considered here covers data included in the third revision of the SITC classification. This limits the data coverage to the last 15 years but provides a closer representation of current economic reality, and enables a more detailed measure of trade in intermediates to be assembled.

### *A1.3 Specific measures of trade in intermediates*

106. The resulting trade volume data are used to compute a range of measures of intermediates trade for each year $t$ , importing country or region $i$ and exporting partner $j$ and in sector $k$ of the following form:

- Imports of intermediate goods, parts and components (*ipc*) from $j_1$ = "OECD" and $j_2$ = "Rest of the World"

$$M_{ipc}^{j-share} = \frac{M_{ipc}^{ijk}}{\sum_j M_{ipc}^{ijk}}$$

- Share of imports in intermediate goods in sector k over total imports in sector k

$$M_{ipc-share}^{ij} = \frac{M_{ipc}^{ijk}}{\sum_j M_{tot}^{ijk}}$$

- Share of imports in intermediate goods in sector k over total usage of intermediates ($Q_{\text{int}\,i}$) in sector $k$ and country $i$.

$$M_{ipc-share}^{ij} = \frac{M_{ipc}^{ijk}}{\sum_j Q_{\text{int}\,i}^{ijk}}$$

where all data are in year 2000 constant prices. The main features of the resulting measures are summarised in Figures 10 and 11 in the main paper, Figures A1 to A4 in this Annex and in the following paragraphs.

51. While the HS is a multi-purpose goods nomenclature and the BEC is intended to classify trade statistics into large economic classes of commodities, the SITC is expressly designed for compiling internationally comparable merchandise trade statistics.

### *A1.4 Aggregate and cross-country developments in trade in intermediates*

107. Over the period 1992 to 2004, OECD country imports of intermediate goods increased in value terms by about 20%. While most of this trade took, and is still taking, place between OECD countries, the share of intermediates imports from non-OECD countries rose from 15% to 25% of the total over the same period (Figure A1). China and the ASEAN countries appear to account for the largest part of this increase (Figure 10 in the main text).

108. More detailed data for 11 OECD countries (the G7 countries plus Austria, Finland, the Netherlands and Republic of Korea) confirm the above trends for imports of both final goods and intermediates. The process of substitution away from goods (final and intermediates) originating in the OECD, has been more pronounced for the non-European OECD members, most notably for Japan and Korea where since 2000 they exceed or are close to those coming from OECD countries. Such a trend is almost entirely absent for OECD Europe, but for many of these countries import shares for intermediates coming from OECD member countries in Central and Eastern Europe have become increasingly important (Figure 11 in the main text).

109. In 2004, imported intermediate goods ranged between 8-16% of the total domestic use of intermediates at current prices for most OECD countries. Important exceptions are Japan and the United States for which imports of intermediates are equal to only 3-4% of domestic use of intermediates. Contrary to some perceptions, most of these shares have remained broadly stable or have increased only moderately over the period, except for the United Kingdom and Italy, where they have actually decreased in relative terms.

110. In spite of comparatively small changes in the relative volume shares in manufacturing trade over the period, the geographical composition of trade has changed significantly, with the share of intermediate imports coming from non-OECD countries increasing quite significantly for most countries, albeit from a very low base. Note, however, that once allowance is made for trade with the lower-income OECD member countries,[52] the trend in substitution away from higher-income OECD trading partners is clearer, particularly for the subset of larger OECD European countries.

## A2. Cross-industry differences

111. For the G7 countries, sectoral differences in imports of six main sub-groups of intermediate products (Chemicals, Rubber and Plastics; Machinery and Equipment; Metals and Metal Products; Textiles, Leather and Footwear; Transport Equipment; and Wood and Paper Products) are illustrated in Figures A3 and A4. Relatively strong trends in substitution between imports originating in OECD countries and those from the rest of the world can be identified in three sectors: Textiles, Leather and Footwear; Transport Equipment; and Machinery and Equipment. As before, these trends tend to be stronger when lower-income OECD countries are included in the "rest of the world" group, reflecting patterns of regional developments.

## A3. Summary points

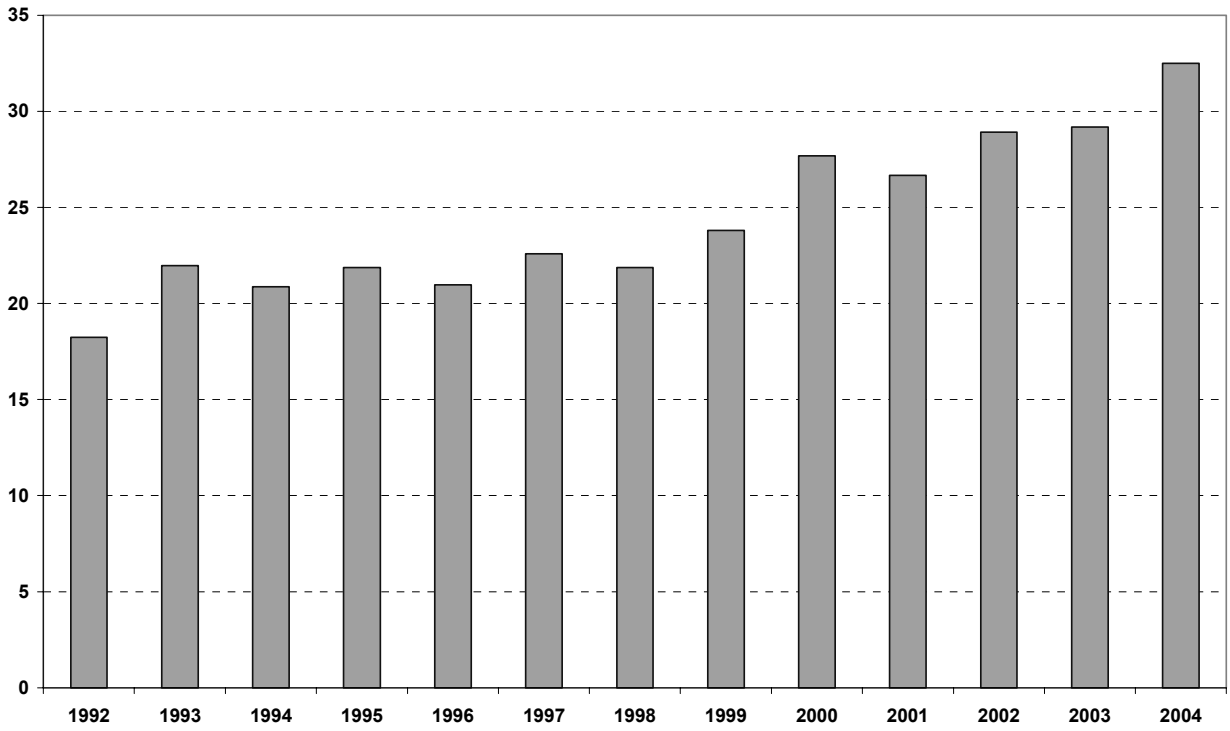
112. Despite common perceptions, the relative shares of trade in intermediate products and final goods have changed relatively little over the period 1992 to 2004. Most OECD countries still import the majority of final and, to an even greater extent, intermediate goods from other OECD countries. There are some

52. For current purposes the lower-income OECD countries are defined as those currently with per capita incomes less than 70% of the OECD average, namely the Czech Republic, Hungary, Mexico, Poland, Slovakia and Turkey.

notable exceptions such as Japan and Korea, where imports from China and ASEAN countries have risen more significantly reflecting patterns of regional development. There are also some important sectoral differences in the relative importance of non-OECD and lower-income OECD countries as sources of intermediate imports, which have increased in general. Nonetheless, the higher-income OECD countries remain the predominate source of intermediates at the broad sectoral level.

Figure A1. **OECD imports of intermediate goods, parts and components from non-OECD countries**

Per cent of total OECD imports of intermediate goods, parts and components, US$, 2000 prices




Source: United Nations COMTRADE database and CEPII BACI database.

Figure A2. **The ratio of imported intermediate goods, parts and components to the total domestic use of intermediates**

Per cent, current prices

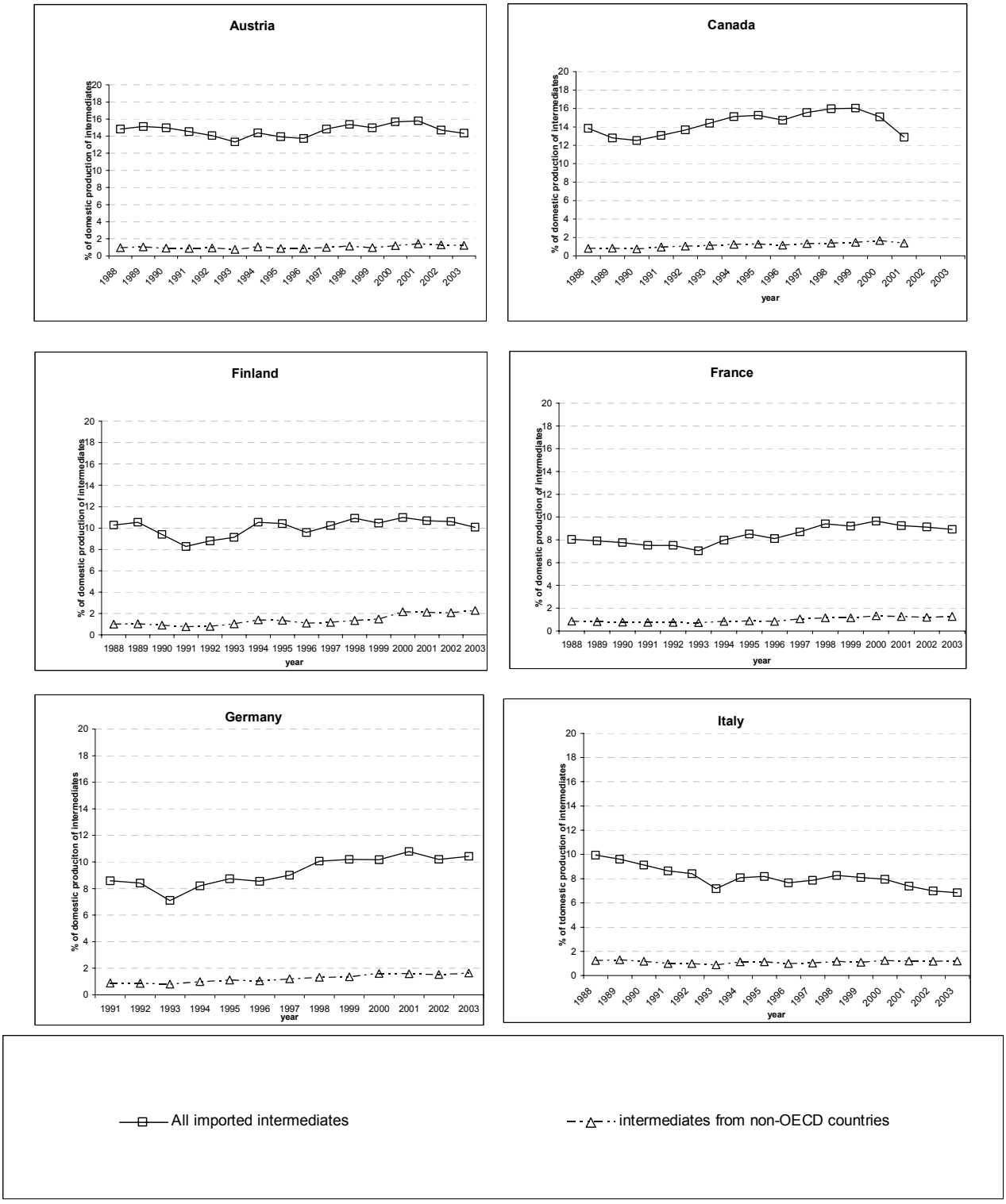


Figure A2. **The ratio of imported intermediate goods, parts and components to the total domestic use of intermediates** (cont'd)

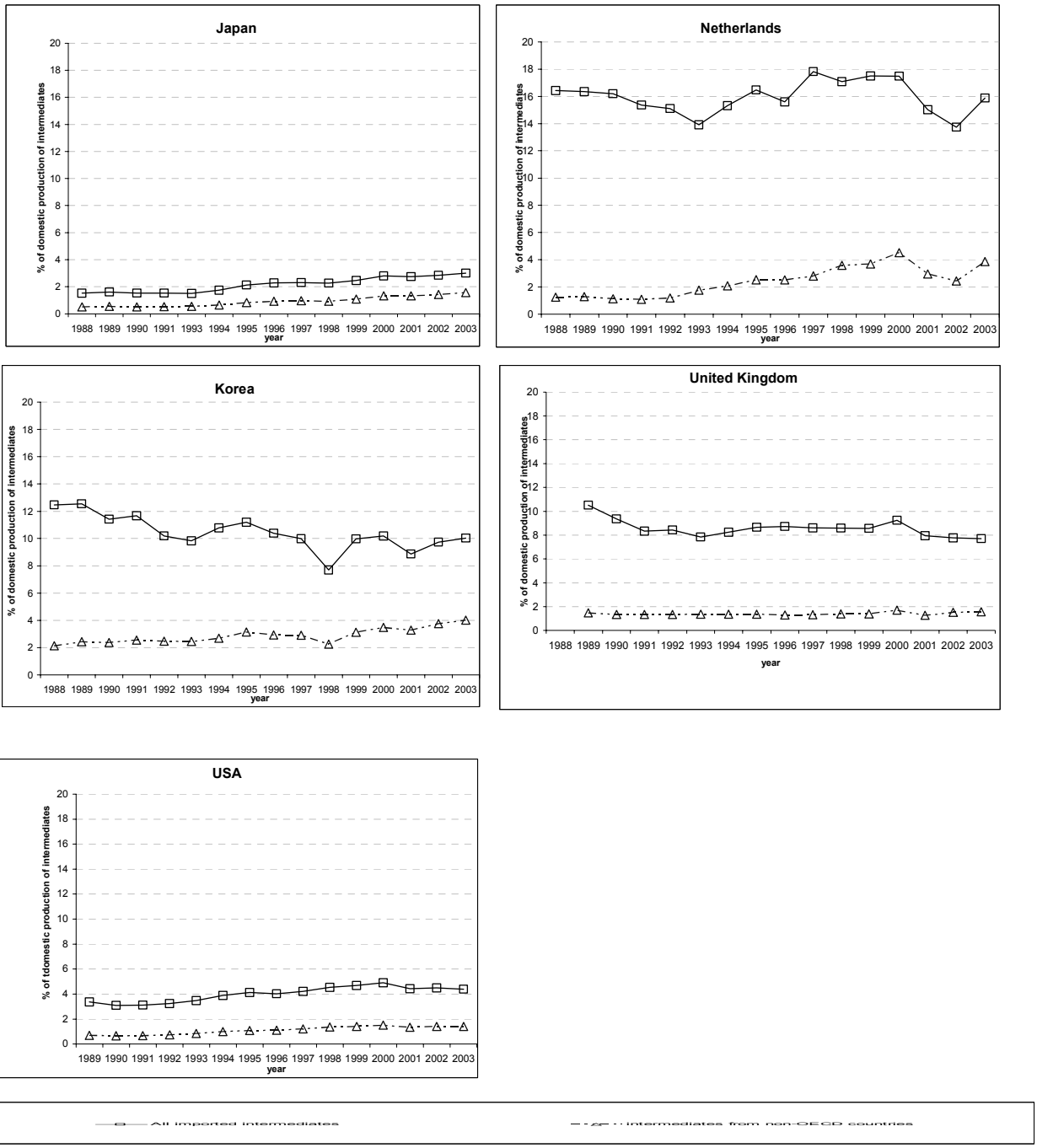


Figure A3. **G7 imports of final and intermediate goods by origin (OECD and the rest of the world)**

Volume shares

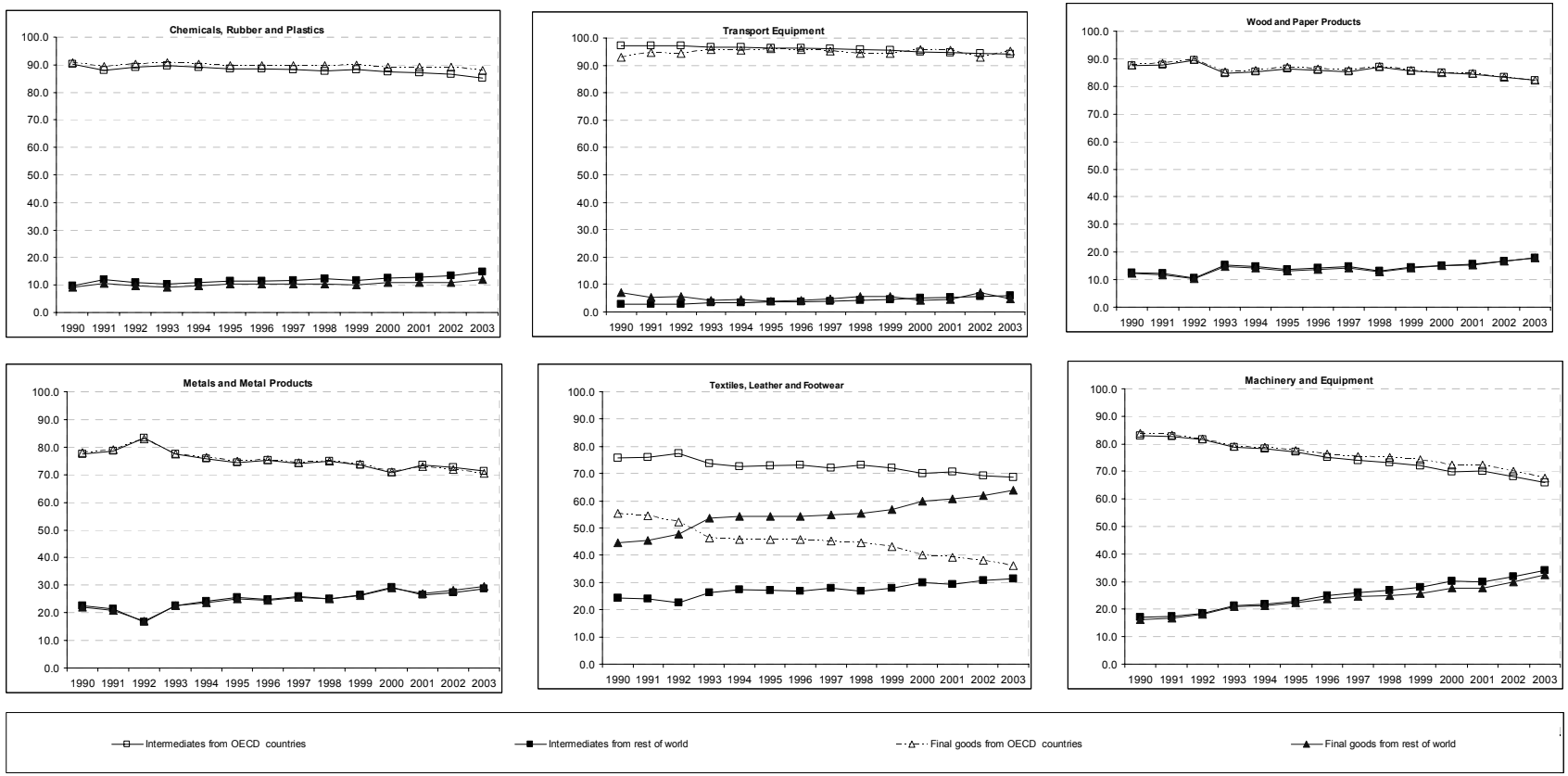
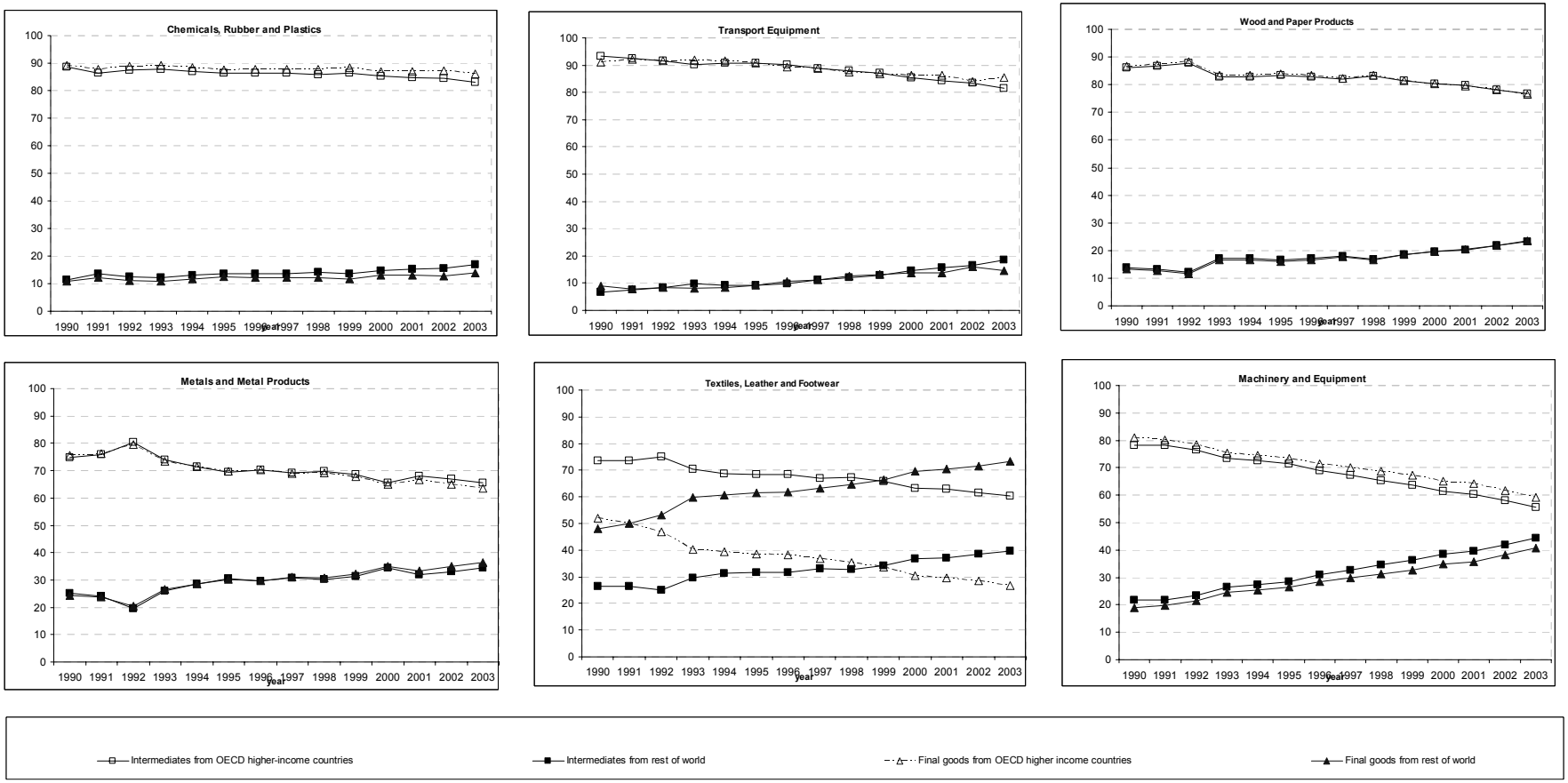


**Figure A4. G7 imports of final and intermediate goods by origin (higher income OECD and the rest of the world)[1]**

Volume shares




1. The OECD "higher income" group excludes those manufacturing countries with a per-capita GDP lower than 70% of the OECD average: namely, Czech Republic, Hungary, Mexico, Poland, Slovakia and Turkey.

Table A1. **List of products entering the outsourcing index, classified according to SITC3 rev.3**[1]

51 - Organic chemicals
52 - Inorganic chemicals
53 - Dyeing, tanning and colouring materials
541 - Medicinal and pharmaceutical products, other than medicaments of group 542 less 541.9
Pharmaceutical goods, other than medicaments
551 - Essential oils, perfume and flavour materials
57 - Plastics in primary forms
581 - Tubes, pipes and hoses, and fittings thereof, of plastics
583 - Monofilament of which any cross-sectional dimension exceeds 1 mm, rods, sticks and profile shapes, whether or not surface-worked but not otherwise worked, of plastics
59 - Chemical materials and products, n.e.s.

611 – Leather (unassembled)
612.1 - Articles of leather or of composition leather, of a kind used in machinery or mechanical appliances or for other technical uses
613 - Furskins, tanned or dressed (including heads, tails, paws and other pieces or cuttings), unassembled, or assembled (without the addition of other materials), other than those of heading 848.31
62 - Rubber manufactures, n.e.s.
63 - Cork and wood manufactures (excluding furniture)
641 - Paper and paperboard
651 - Textile yarn
652 - Cotton fabrics, woven (not including narrow or special fabrics)
653 - Fabrics, woven, of man-made textile materials (not including narrow or special fabrics)
654 - Other textile fabrics, woven
655 - Knitted or crocheted fabrics (including tubular knit fabrics, n.e.s., pile fabrics and openwork fabrics), n.e.s.
656 - Tulles, lace, embroidery, ribbons, trimmings and other smallwares
657 - Special yarns, special textile fabrics and related products
661 - Lime, cement, and fabricated construction materials (except glass and clay materials)
662 - Clay construction materials and refractory construction materials
663 - Mineral manufactures, n.e.s.
664 - Glass
667 - Pearls and precious or semiprecious stones, unworked or worked
67 - Iron and steel
68 - Non-ferrous metals
691 - Structures and parts of structures, n.e.s., of iron, steel or aluminium
692 - Metal containers for storage or transport
693 - Wire products (excluding insulated electrical wiring) and fencing grills
694 - Nails, screws, nuts, bolts, rivets and the like, of iron, steel, copper or aluminium
695 - Tools for use in the hand or in machines

711.9 - Parts for the boilers and auxiliary plant of subgroups 711.1 and 711.2
712.8 - Parts for the turbines of subgroup 712.1
713 - Internal combustion piston engines, and parts thereof, n.e.s.
714.9 - Parts of the engines and motors of heading 714.41 and subgroup 714.8
716.9 - Parts, n.e.s., suitable for use solely or principally with the machines falling within group 716
718 - Power-generating machinery, and parts thereof, n.e.s.
721.19 - Parts of the machinery of subgroup 721.1
721.29 - Parts of the machines of headings 721.21 through 721.26
721.39 - Parts for milking machines and dairy machinery
721.98 - Parts of the machinery of heading 721.91
721.99 - Parts of the machinery and appliances of headings 721.95 and 721.96
723.9 - Parts, n.e.s., of the machinery of group 723 (excluding heading 723.48) and of subgroup 744.3
724.39 - Sewing-machine needles; furniture, bases and covers specially designed for sewing-machines; parts of the machines and furniture of subgroup 724.3
724.49 - Parts and accessories of machines of subgroup 724.4 or heading 724.54 or of their auxiliary machinery
724.6 - Auxiliary machinery for use with machines of headings 724.41 through 724.53; parts and accessories suitable for use solely or principally with the machines of headings 724.51 through 724.53 or with their auxiliary machinery
724.88 - Parts for the machinery of subgroup 724.8
725.9 - Parts of the machines of group 725
726.35 - Printing type, blocks, plates, cylinders and other printing components; blocks, plates, cylinders and lithographic stones, prepared for printing purposes (e.g., planed, grained or polished)
726.89 - Parts for bookbinding machinery
726.9 - Parts for the machines of heading 726.31 and subgroups 726.5 and 726.6
727.2 - Other food-processing machinery, and parts thereof, n.e.s.
728.19 - Parts and accessories suitable for use solely or principally with the machine tools of subgroup 728.1
728.39 - Parts of the machinery of subgroup 728.3
728.5 - Parts, n.e.s., of the machines and mechanical appliances of headings 723.48, 727.21 and 728.41 through 728.49
735 - Parts, n.e.s., and accessories suitable for use solely or principally with the machines falling within groups 731 and 733 (including work or tool holders, self-opening die-heads, dividing heads and other special attachments for machine tools); tool holders for any type of tool for working in the hand

1. In electronic form this list includes a hyperlink to the UN webpage reporting the SITC rev. 3 detailed structure and explanatory notes.

Table A1. **List of products entering the outsourcing index, classified according to SITC3 rev.3**[1](cont'd)

737.19 - Parts
737.29 - Rolls and other parts for metal-rolling mills
737.39 - Parts for the machines and apparatus of subgroup 737.3
737.49 - Parts for the machinery and apparatus of subgroup 737.4
741.28 - Parts for the burners and other articles of subgroup 741.2
741.39 - Parts for the furnaces and ovens of headings 741.36 through 741.38
741.49 - Parts of refrigerators, freezers and other refrigerating or freezing equipment (electric or other)
741.59 - Parts for the air-conditioning machines of subgroup 741.5
741.72 - Parts for the generators of heading 741.71
741.74 - Heat-exchange units
741.9 - Parts, n.e.s., for the machinery of headings 741.73 through 741.89
742.9 - Parts of the pumps and liquid elevators of group 742
743.8 - Parts for the pumps, compressors, fans and hoods of subgroups 743.1 and 743.4
743.9 - Parts of the machines and apparatus of subgroups 743.5 and 743.6
744.9 - Parts suitable for use solely or principally with the machinery of headings 744.11, 744.12, 744.13 and subgroups 744.2, 744.4, 744.7 and 744.8
745.19 - Parts of the tools of subgroup 745.1
745.29 - Parts of the machinery of subgroup 745.2 and heading 775.3
745.39 - Weighing-machine weights of all kinds; parts of the weighing machinery of subgroup 745.3
745.68 - Parts of the appliances of subgroup 745.6
745.93 - Cylinders and other parts for the machines of heading 745.91
745.97 - Parts for the machines of heading 745.95
746.9 - Parts of ball- and roller bearings
747.9 - Parts for the appliances of group 747
748.9 - Parts, n.e.s., for the articles of group 748
749 - Non-electric parts and accessories of machinery, n.e.s.
759 - Parts and accessories (other than covers, carrying cases and the like) suitable for use solely or principally with machines falling within groups 751 and 752
764 - Telecommunications equipment, n.e.s., and parts, n.e.s., and accessories of apparatus falling within division 76
77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)
784 - Parts and accessories of the motor vehicles of groups 722, 781, 782 and 783
791.9 - Railway or tramway track fixtures and fittings; mechanical (including electromechanical) signalling, safety or traffic control equipment for railways, tramways, roads, inland waterways, parking facilities, port installations or airfields; parts of the locomotives, rolling-stock, fixtures, fittings and equipment of group 791
792.9 - Parts, n.e.s. (not including tyres, engines and electrical parts), of the goods of group 792

812.19 - Parts for the boilers of heading 812.17
821.19 - Parts of the seats of subgroup 821.1
821.8 - Parts of the furniture of subgroups 821.3, 821.5 and 821.7
851.9 - Parts of footwear (including uppers, whether or not attached to soles other than outer soles); removable insoles, heel cushions and similar articles; gaiters, leggings and similar articles, and parts thereof
871.19 - Parts and accessories (including mountings) of Binoculars, monoculars, other optical telescopes, and mountings thereof; other astronomical instruments and mountings thereof (excluding instruments for radio astronomy)
871.39 - Parts and accessories of Microscopes (other than optical microscopes); diffraction apparatus; parts and accessories thereof, n.e.s.
871.49 - Parts and accessories of Compound optical microscopes (including those for photomicrography, cinephotomicrography or microprojection)
871.99 - Parts and accessories of the articles of subgroup 871.9
873.19 - Parts and accessories of gas, liquid or electricity meters
873.29 - Parts and accessories of the articles of subgroup 873.2
874.14 - Parts and accessories for the articles of heading 874.13
874.39 - Parts and accessories
881.14 - Parts and accessories for the photographic cameras of heading 881.11
881.15 - Parts and accessories for photographic flashlight apparatus
881.23 - Parts and accessories for the cinematographic cameras of heading 821.21
881.24 - Parts and accessories for cinematographic projectors
881.34 - Parts and accessories for the equipment of headings 881.31 through 881.33
881.36 - Parts and accessories for the apparatus and equipment of heading 881.35
884.19 - Optical fibres and optical fibre bundles and cables; sheets and plates of polarizing material; unmounted optical elements, n.e.s.
884.21 - Frames and mountings for spectacles, goggles or the like
884.22 - Parts for frames and mountings of spectacles, goggles or the like
884.3 - Lenses, prisms, mirrors and other optical elements, of any material, mounted, being parts of or fittings for instruments or apparatus, other than such elements of glass not optically worked
885.9 - Time-measuring equipment and accessories, n.e.s.; parts and accessories for clocks and watches
891.9 - Parts and accessories of articles of headings 891.12, 891.14 and subgroup 891
894.23 - Parts and accessories of dolls representing only human beings

1. In electronic form, this list includes a hyperlink to the UN webpage reporting the SITC rev. 3 detailed structure and explanatory notes.

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