Chapter 3

OECD Workers in the Global Economy: Increasingly Vulnerable?

Have OECD workers become increasingly vulnerable due to the impact of globalisation? There is no simple, yes or no, answer to this question. While the expansion of trade and FDI continues to be a powerful force for raising living standards, the evidence presented in this chapter shows that the expansion of trade is a potentially important source of vulnerability for workers. This is particularly true for the labour force groups most exposed to import competition or least prepared to navigate in labour markets characterised by intensive restructuring, rising skill requirements and employers who are increasingly sensitive to differences in labour costs. Despite the potential of trade-deepening to render workers more vulnerable, recent experience shows that good domestic policies can assure that workers receive their fare share of the gains from globalisation, while also allowing firms the flexibility they need to seize new opportunities in the global economy.

Introduction[1]

Trade raises living standards by bringing about a more efficient international division of labour. Although it is difficult to estimate the gains from trade precisely, numerous empirical studies confirm that these gains are sizeable. The OECD Growth Study estimated that a 10 percentage point increase in trade openness translates over time into an increase of around 4% in per capita income in the OECD area (OECD, 2003a).[2] The recent dynamism of China and India demonstrates how trade and investment liberalisation can make a major contribution to raising incomes in developing countries, while also providing new opportunities for further gains from trade for OECD countries (see Chapter 1).

But, even as trade increases aggregate income and welfare, some workers may lose from globalisation. The reallocation of factor inputs toward more productive uses, which underlies the gains from trade, also causes some workers to be displaced from declining sectors, thereby experiencing spells of unemployment or inactivity. Furthermore, the market adjustments that bring about trade specialisation may also drive down the wages of certain groups of workers (*e.g.* low-skill workers). Even after taking account of these costs, the existing research points to substantial net welfare gains from trade.[3] Therefore, the OECD has consistently endorsed open trade and foreign direct investment (FDI) policies, while also recommending reforms to lower worker adjustment costs and upgrade labour force skills (*e.g.* OECD, 2005b).

The overwhelmingly positive judgement of economists towards open trade and investment policies stands in marked contrast to the ambivalence revealed by public opinion polling. For example, a German Marshall Fund (GMF) poll released at the end of 2006 finds that a substantial majority of the respondents in seven OECD countries agree that freer trade yields benefits to business and consumers, but approximately one-half of them also believe that "freer trade costs more jobs than it creates" (GMF, 2006). Similarly, a 2005 Eurobarometer opinion poll showed that more people had a negative than a positive view of globalisation (46% *versus* 37%), while "the relocation of jobs to countries where wages are lower" was the most frequently cited consequence of globalisation (European Commission, 2005). Comparing responses across countries reveals considerable differences in the share of the public who doubt that deepening trade benefits workers. For example, French and American respondents were the most concerned about a negative impact of trade on jobs in the GMF poll, while this concern was less common in Poland, the Slovak Republic and the United Kingdom.[4] Popular doubts about whether workers are getting their fair share of the benefits from globalisation suggest that continuing political support for trade and investment liberalisation cannot be taken for granted.

This chapter reassesses the implications of trade for OECD workers, in light of the wedge between the optimistic assessment of professional economists and the much more sceptical view of the general public.[5] In part, the intention is to provide a reality check against possibly exaggerated fears about how globalisation is affecting OECD labour markets. However, public perceptions may also provide a useful reality check for economic

research and policy making. Accordingly, new empirical evidence is assembled and analysed about how fully workers are sharing in the gains from trade and whether recent changes in foreign competition – for example the rapid increase in Chinese exports or the increased prominence of so-called "offshoring" – are affecting labour-market functioning so as to create new vulnerabilities for workers. The analysis encompasses a number of channels through which trade may affect workers adversely. However, it does not provide a comprehensive assessment of the impact of globalisation, because the benefits from trade for OECD workers are not fully accounted for and important non-trade dimensions of globalisation are not addressed.[6] Nor does the chapter analyse the effects of trade on living standards in developing countries.[7]

The chapter uses cross-country data to assess a range of possible impacts of trade on OECD labour markets, emphasising potentially adverse impacts from import competition. Section 1 sets the stage by providing a descriptive overview of recent trends in trade and labour market outcomes. Section 2 then applies econometric techniques to assess whether increased foreign competition is, in fact, rendering certain groups of workers more vulnerable. New evidence is presented on how trade is shaping the structure of labour demand across industries and skill groups and the broader functioning of labour markets, using both industry-level data and data on individual workers. A concluding section discusses the policy implications of the analysis, suggesting how governments can assure that workers share fully in the benefits from trade.

Main findings

- *International economic integration continues to deepen.* Two key features of this process are: *i)* the rising importance of large emerging economies as trading nations – especially, China, which is now the world's third largest exporter; and *ii)* the increased prominence of international production networks, partly reflecting the growing use of offshoring, which occurs when different stages of a production process are performed at work sites in different countries. Although total trade in services has remained fairly stable at about 20% since 1970, business services represent a growing share of offshoring.

- *These developments have coincided with overall improvements in employment and unemployment rates, and continued real wage growth in the OECD area during the past decade.* However, trade deepening is also occurring in the context of rising earnings inequality and a declining wage share of national income in a large majority of OECD countries. By contrast, there has not been a clear trend in job stability.

- *The chapter provides new evidence about how import competition is changing employment patterns:*

  ❖ Foreign competition – especially, imports from non-OECD countries – tends to reduce employment in the most exposed industries. Since aggregate employment in the economy generally is not affected, this is consistent with globalisation changing the pattern of sectoral specialisation to better exploit comparative advantage.

  ❖ Offshoring has no effect or a positive effect on sectoral employment. While some jobs are lost when production activities are relocated abroad, offshoring also generates a similar number of news jobs because it tends to increase the scale of production by making firms more competitive. However, this does not mean that the jobs created require identical skills as those destroyed.

❖ Offshoring changes the skill structure of labour demand by reducing the demand for low-skill workers relative to medium- and high-skill workers. This suggests that some of the workers displaced by offshoring lack the qualifications required to move into the new jobs being created in the same industries. By raising skill demand, offshoring also contributes to the trend increase in earnings inequality observed in most OECD countries, although the relatively slow increase in the scale of offshoring means that this effect is unlikely to account for a large portion of the overall increase in earnings inequality. Import competition more generally does not appear to have an important impact on the skill composition of labour demand.

● *Rising foreign competition – together with technical change – may also be causing wages and employment to become more responsive to economic shocks* related to, for example, changes in business cycle conditions or foreign exchange rates:

❖ The wage elasticity of labour demand increased from about 0.2 to 0.5 in absolute value during the period 1980-2002, with the evidence for this increase being strongest for manufacturing industries. More elastic labour demand implies greater employment and/or wage volatility everything else equal and might also tend to reduce the ability of workers to bargain for higher wages.

❖ Offshoring may be one of the driving forces behind the increase in the elasticity of labour demand since 1980, because it allows firms to more flexibly respond to shocks via changes in the mix of production at home and abroad. To the extent that globalisation has led to an intensification of product market competition, this may have further reinforced the trend rise in the elasticity of labour demand. However, more research on the specific role of offshoring as well as that of other potentially important factors in increasing the elasticity of labour demand is needed.

❖ Foreign competition disproportionately affects low-skill workers by raising the probability of involuntary job loss and by making earnings of workers that stay in their jobs more sensitive to changing conditions in the external labour market. This suggests that foreign competition may induce qualitative changes in the employer-employee relationship by eroding the ability of firms to stabilise employment and wages. There is some evidence that increased foreign competition also stimulates higher job-to-job mobility among medium-skill workers, which may indicate that they can find comparable jobs more easily than other workers, when their employer experiences financial difficulties or they are displaced.

● *Overall, the chapter's analysis suggests that trade deepening – particularly, the rapid increase of imports from non-OECD countries and the expansion of international production networks – is a potentially important source of vulnerability for workers.* However, the actual impacts appear to have been quite modest to date. Most importantly, national policy settings and institutions continue to have a decisive influence on labour market performance, including the way globalisation affects labour markets.

● *A comprehensive policy strategy is required which enhances the benefits from globalisation while addressing some of the adjustment and distributional concerns.* There is no single correct policy recipe for governments to implement, but several broad priorities can be identified. In particular, the labour-market impacts of globalisation increase the urgency of implementing coherent packages of regulatory, employment and social protection policies that reconcile flexibility for firms, to respond to new opportunities and competitive pressures, with security for workers, even as they construct their careers in

highly dynamic labour markets. The Restated OECD Jobs Strategy provides a benchmark on how to achieve this (OECD, 2006a). Such a policy stance should also help maintain broad public support for open trade and investment policies.

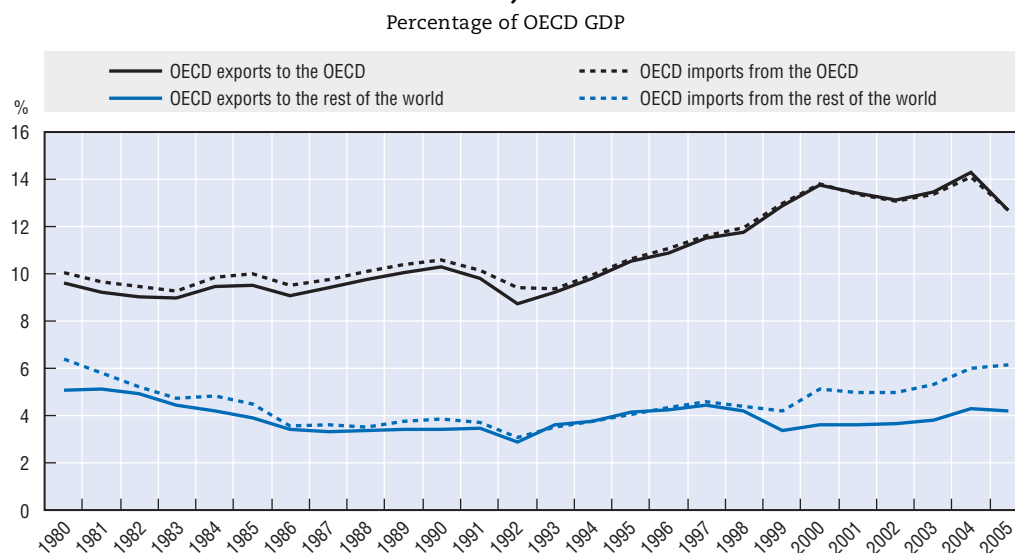# 1. Descriptive overview of recent trends in trade and labour market performance

This section sets the stage for the econometric analysis of the labour market impact of globalisation in Section 2, using descriptive statistics to highlight several recent developments in OECD trading patterns and labour market outcomes. The section concludes by presenting several hypotheses about how globalisation is affecting workers which are suggested by these data and the recent research literature.

1.1. Trends in the magnitude and composition of OECD trade

Aggregate trade flows

United Nations data on the direction of OECD trade indicate a continued deepening of international integration, with total goods trade rising from 31% of OECD GDP in 1980 to 35% in 2005, with trade between OECD countries continuing to represent the largest part of overall trade (Figure 3.1). After being relatively flat during the 1980s, intra-OECD goods trade has increased quite rapidly more recently. By contrast, OECD trade with the rest of the world trended downward during the 1980s (as a share of OECD GDP), in part due to the declining relative price of oil. More recently, OECD imports from non-OECD countries have risen rapidly, while OECD exports to these countries have been considerably less dynamic.

Figure 3.1. **Intra-OECD goods trade and OECD goods trade with the rest of the world, 1980-2005**

Percentage of OECD GDP

Source: United Nations, COMTRADE database.

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Sectors and trading partners

These aggregate measures of globalisation mask large differences across countries and sectors. Data from the World Bank indicate that OECD merchandise trade increased from 71

to 118% of value added in OECD goods-producing sectors since 1980. Contrary to popular perception, services trade is not more dynamic than merchandise trade. Indeed, the services share of total trade has remained fairly stable at about 20% since the 1970s, even as the services share of output and employment has steadily expanded. However, the ICT-enabled business services associated with offshoring have grown strongly since 1990, whereas transportation and tourism have declined as a share of total services trade.

The rapid rise of goods and services exports from large emerging economies has attracted much attention in recent years – in particular, Chinese manufactured goods and Indian business services.[8] Figure 3.2 shows the evolution of OECD goods trade with India and China over the past 25 years. In 1980, trade between the OECD and India and China was relatively small, representing in total only 2% of total OECD trade. These shares followed a relatively flat growth trajectory until the early 1990s. Since then, trade with China, has grown strongly, especially OECD imports from China. China's share of total OECD goods imports grew from 2% in 1990 to 10% in 2005, with more than half of that growth occurring since 2001.[9]

Figure 3.2. **OECD goods trade with China and India as a share of total OECD goods trade, 1980-2005**

Percentage

Source: United Nations, COMTRADE database.

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Goods trade with India has also increased since 1980, but its growth has been much more muted (Figure 3.2). However, to evaluate properly the impact of India on OECD trade patterns it is important to consider changes in services trade. India's services trade has grown at a rapid rate since 1995, albeit from a very low base, and India's share of world services exports was still only 2.3% in 2005. This is slightly less than half of China's share and much smaller that the 15% US export share. Furthermore, India's share of services imports nearly equals its export share. Even though the OECD share of world services trade fell from 78 to 75% between 1995 and 2005, OECD countries are still by far the largest exporters (and importers) of services.

International production networks and trade in intermediates

One of the distinguishing characteristics of the current stage of globalisation is the development of international production networks which distribute sequential stages in the production of a final good or service across production sites in different countries and reflects, in part, the growing practice of offshoring. These vertical trading chains can take many forms, involving both the foreign affiliates of multinational corporations and arms-length relationships with foreign suppliers (Antràs, 2003). The trend in the level of trade in intermediates (*e.g.* the importing of electronic components for assembly and the offshoring of call-centre operations) provides a useful summary indicator of the overall importance of offshoring.[10]

There is considerable evidence that offshoring has been increasing for several decades. Campa and Goldberg (1997) document offshoring, or more precisely, the foreign content of production using the ratio of imported intermediates to sales in manufacturing. They show that this measure of offshoring rose from 4% in 1974 to 8% in 1993 in the United States, from 16% to 20% in Canada and from 13% to 22% in the United Kingdom, but fell from 8% to 4% in Japan. Strauss-Kahn (2004) documents an increase from 10% in 1977 to 16% in 1993 for France. Hummels, Ishii and Yi (2001) focus on a narrower concept, which they refer to as "vertical specialisation", measured as the share of imported intermediates in exports. They find that vertical specialisation increased by 28% between 1970 and 1990 in 14 countries and that this increase accounted for 30% of total export growth for these countries.[11] Analogous calculations using OECD input-output tables for 1995 and 2000 for 20 countries (data not shown) suggest that this form of intermediates trade tended to grow somewhat more slowly during the second half of the 1990s than it had in the earlier period analysed by Hummels, Ishii and Yi (2001).

Figure 3.3 presents statistics for the foreign content of production in 1995 and 2000 for 17 OECD countries, applying a similar method as Campa and Goldberg (1997) to OECD Input-Output data.[12] Offshoring estimates are reported separately for materials and business services. The data on materials offshoring confirm that imported manufactured inputs constitute a prominent feature in production in OECD economies, although the degree of material offshoring varies significantly across these countries. Between 1995 and 2000, material offshoring grew in 13 out of 17 of those countries, but often by only a small amount. Although these estimates are not directly comparable to those in the earlier studies discussed above, they suggest that the rate of increase of material offshoring may have tended to slow during the second half of the 1990s in OECD countries.[13, 14] Comparing the two panels of Figure 3.3, it can be seen that intermediate goods continue to account for most of the trade in intermediates. The scale of services offshoring to date remains quite modest, typically at around 2% of sales. However, the data suggest that the growth of offshoring of business services during 1995-2000 was more widespread and somewhat more rapid than the growth of material offshoring. Improvements in IC technologies (*e.g.* the Internet) are making it increasingly feasible and profitable to offshore service activities and it is likely that this form of offshoring has been even more dynamic since 2000 (Van Welsum and Vickery, 2005).

The trade patterns surveyed in this section suggest the following conclusions concerning the recent evolution of globalisation:

● There has been a progressive internationalisation of all OECD countries.

Figure 3.3. **Offshoring in selected OECD countries, 1995 and 2000**[a]

Share of imported intermediates in the total output (percentage)
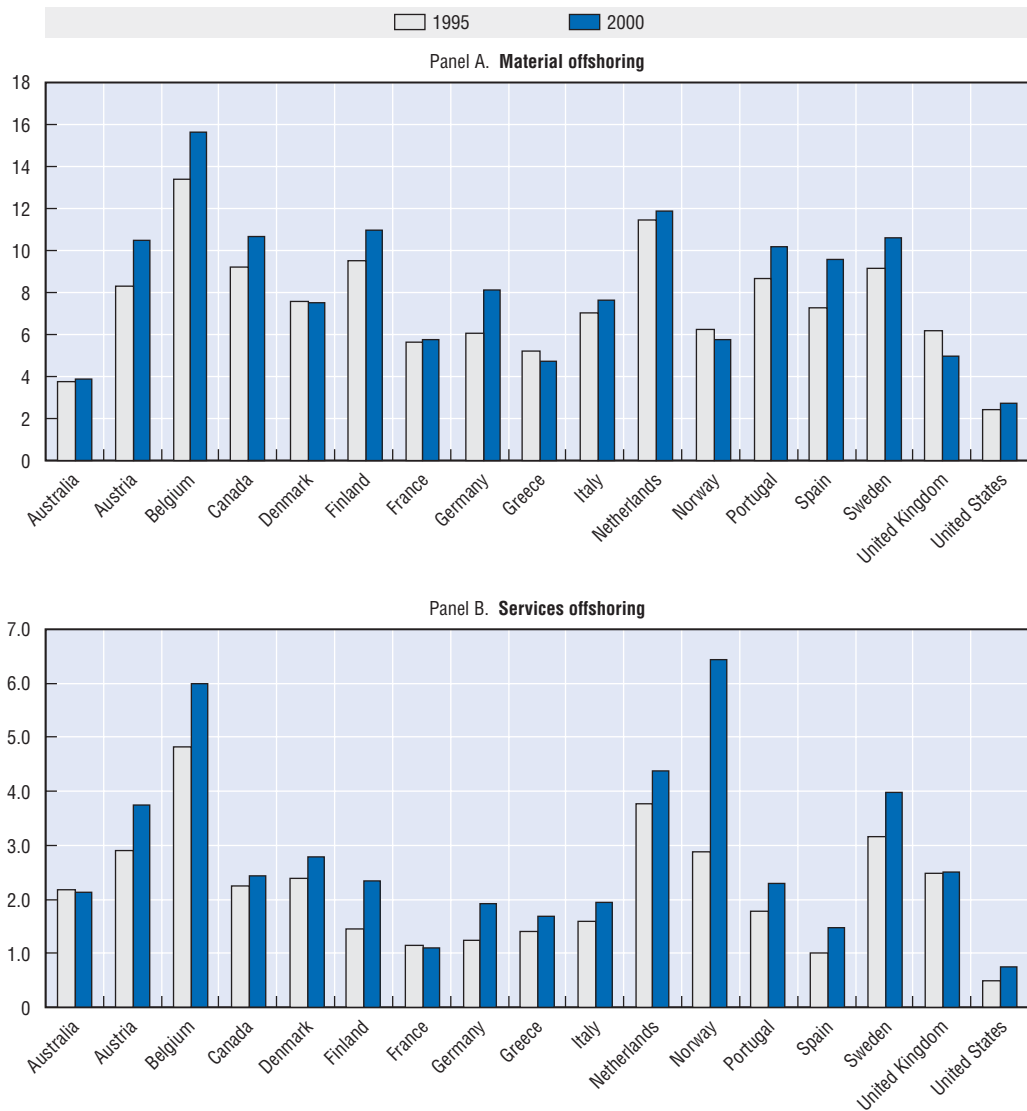
a) 1995 and 1999 for Greece and Portugal; 1997 and 2000 for Canada; and 1997 and 2001 for Norway.

Source: OECD estimates using OECD STAN Input-Output tables.

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● The relative importance of non-OECD countries, especially China, as trading partners for OECD countries is growing, but intra-OECD trade flows are still significantly larger than trade with the rest of the world.

● Intermediates trade is growing as a share of total trade and reflects the growing importance of international production networks, but the available evidence does not indicate a recent acceleration in the growth of offshoring for OECD economies.

● Services trade remains low relative to goods trade.

1.2. Labour market developments in OECD countries

Trends in employment and job security

Are offshoring and increased import competition from low-wage countries reducing employment opportunities in OECD countries, as much of the public appears to believe? Employment data do *not* suggest that globalisation has been a barrier to creating enough jobs to employ the available labour force. The share of the working-age population that is employed is essentially uncorrelated with how intensively countries engage in trade (Figure 3.4, Panel A). Indeed, the employment-population ratio has risen in a strong majority of the OECD countries during the past decade, even as trade openness continued to increase, and the OECD average unemployment rate fell from 7.8% in 1994 to 6.7% in 2005. There has been a weak tendency for employment rates to increase less in countries where trade openness increased most rapidly during the past decade (Figure 3.4, Panel B). However, the fact that countries with similar trade and FDI liberalisation patterns – even members of a common market – have widely different employment and unemployment rates, strongly supports the conclusion that the actual impact of globalisation on overall employment performance depends largely on domestic policy settings, such as those emphasised in the Restated OECD Jobs Strategy (OECD, 2006a).[15]
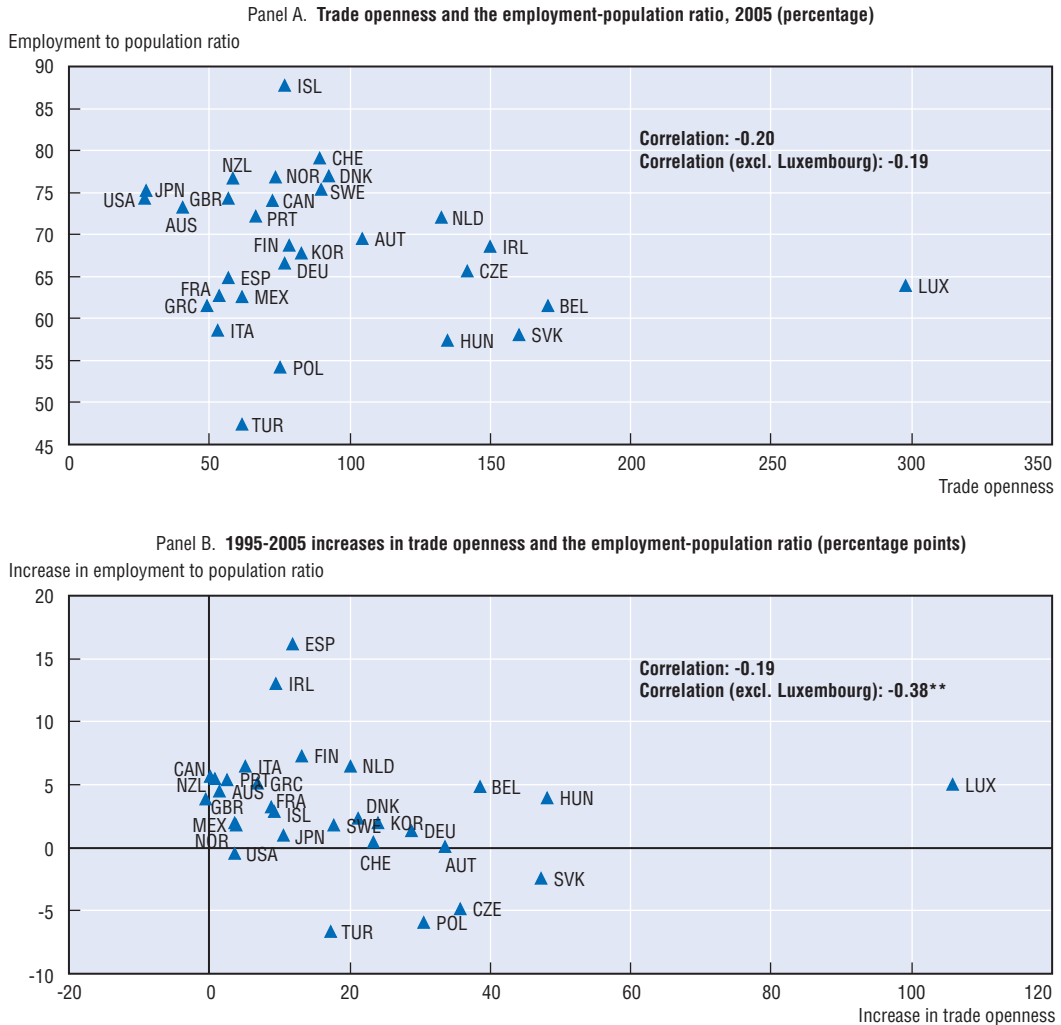
Even if the volume of employment available in OECD labour markets has not been reduced by foreign competition, it could still be the case that jobs have become less stable. Figure 3.5 presents two commonly-used indicators of labour turnover and job stability (the share of workers with less than a year of job tenure and average job tenure), neither of which indicates a clear trend in job stability during the past decade.[16] These data suggest that globalisation has not resulted in a generalised increase in instability for workers. However, it cannot be excluded that other factors – such as a dampening of business cycle fluctuations due to improved monetary policy (Blanchard and Simon, 2001; Clarida and Gertler, 2000) – have masked the role of deepening trade in increasing labour turnover. Another complication with the interpretation of the data on job stability is that they reflect both voluntary and involuntary turnover. Whereas voluntary separations ("quits") tend to dominate turnover, involuntary separations ("layoffs") are more closely related to concerns about globalisation being a source of insecurity.[17]

Trends in overall earnings and earnings inequality

Another commonly-expressed concern is that globalisation is eroding the bargaining power of workers. Most workers have managed to remain employed, but doing so might have required them to accept lower pay, longer hours or other conditions that they would not have agreed to in the absence of the threat that their employers would otherwise be unable to resist foreign competition or even offshore their jobs. Even if globalisation should have eroded workers' bargaining power, a negative relationship between trade openness and real wage growth need not be implied, because foreign competition and trade specialisation can be expected to raise productivity. Indeed, the aggregate data in Figure 3.6 demonstrate that average real wages continue to grow and that there has not been a systematic association between openness and real wage growth across OECD countries during the past decade.

The wage share of national income provides a potentially more informative indicator of how fully workers are sharing in the gains from globalisation. Figure 3.7 shows that the wage share of national income has declined quite sharply since 1980 in the EU15 and Japan, and more gently in the United States, implying that average wages have failed to keep pace with labour productivity. All of the 16 OECD countries for which this statistic can be

Figure 3.4. **Aggregate employment is not systematically related to trade openness**[a]

Panel A. **Trade openness and the employment-population ratio, 2005 (percentage)**

Panel B. **1995-2005 increases in trade openness and the employment-population ratio (percentage points)**

* significant at 10%; ** significant at 5%; *** significant at 1%.
a) Trade openness defined as the sum of exports and imports as a percentage of GDP.
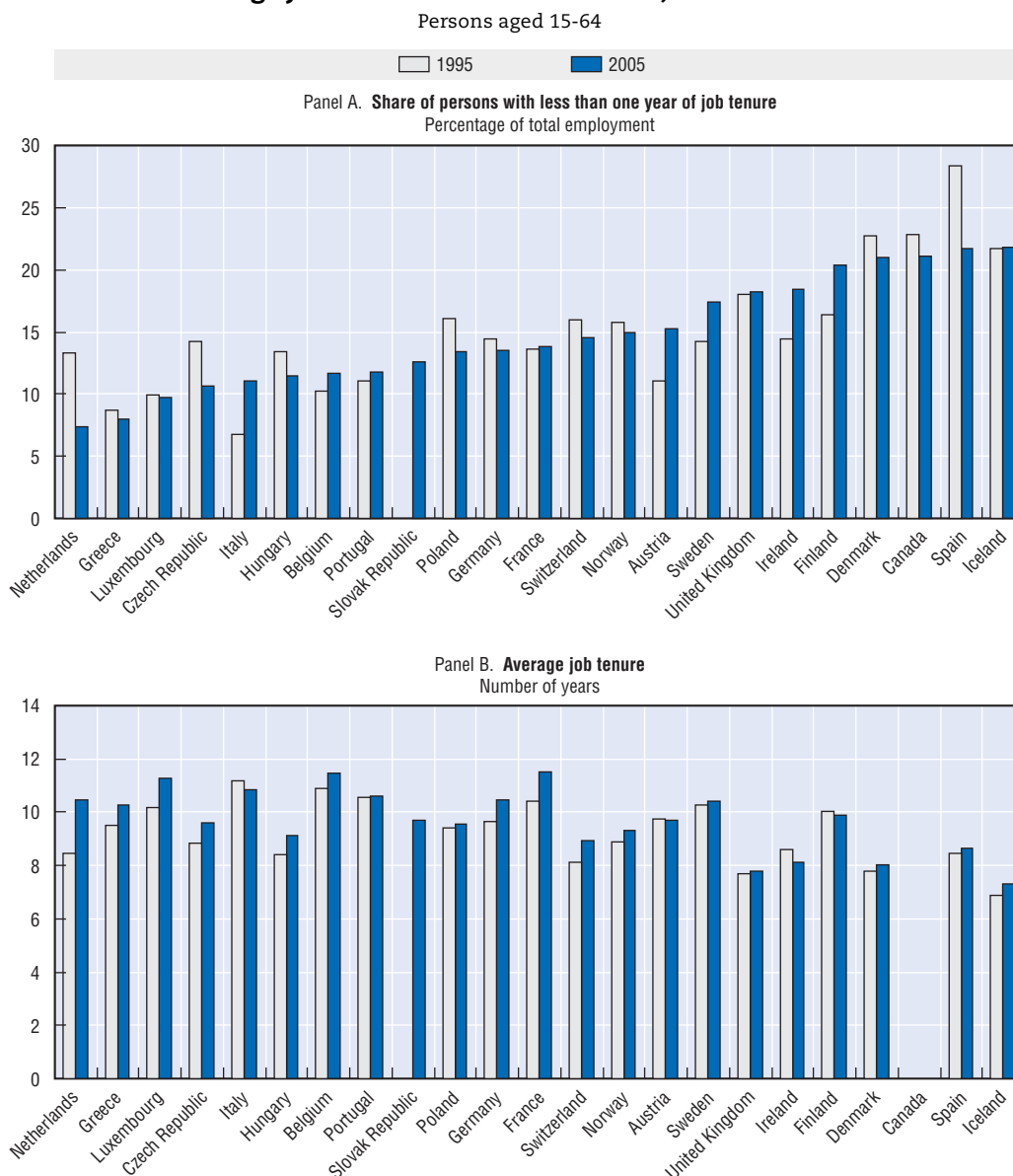*Source:* OECD Economic Outlook and Labour Market Statistics databases.

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calculated for the entire post-1990 period show some decline in the wage share, with the decline ranging from being barely perceptible to rather steep. Although the downward trend in wage shares has coincided with rapid growth in trade and FDI, many factors other than a decline in bargaining power caused by globalisation could have played a role. For example, factor-biased technical change, capital-deepening and changes in the industry mix of output can all cause the aggregate wage share to decline with no change in the bargaining power of workers (Bentolila and Saint-Paul, 2003; Serres, Scarpetta and de la Maisonneuve, 2002). However, the multivariate analysis in IMF (2007) suggests that trade and immigration both contributed to lowering wage shares in OECD countries.

There has also been much concern that trade is causing the wage distribution to become more unequal. In 17 of the 20 countries for which data are available, the earnings of workers at the 90th percentile of the earnings distribution have risen relative to those of

Figure 3.5. **Share of employed persons with less than one year of job tenure and average job tenure in OECD countries, 1995 and 2005**[a, b]

Persons aged 15-64

Panel A. **Share of persons with less than one year of job tenure**
Percentage of total employment

Panel B. **Average job tenure**
Number of years

a) 1996 and 2005 for Switzerland; 1997 and 2005 for the Czech Republic, Hungary and Poland.
b) Countries shown in ascending order of the share of employed persons with less than one year of job tenure in 2005.

Source: OECD Job Tenure database.

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workers at the 10th percentile since the early 1990s, although often by only a modest amount (OECD, 2006b). The Heckscher-Ohlin-Samuelson (HOS) trade model suggests that growing trade with developing countries, which have large supplies of low-skill workers, could increase earnings inequality in OECD countries by depressing the wage of low-skill workers. A number of empirical studies conclude that this has happened to some extent, but also emphasise how difficult it is to differentiate between the impacts of trade and other factors on relative wages.[18]

Figure 3.6. **Real wage growth is not systematically related to trade openness,**[a] **1995-2005**

Percentage points

Panel A. **2005**[b]

Panel B. **1995-2005**[c]
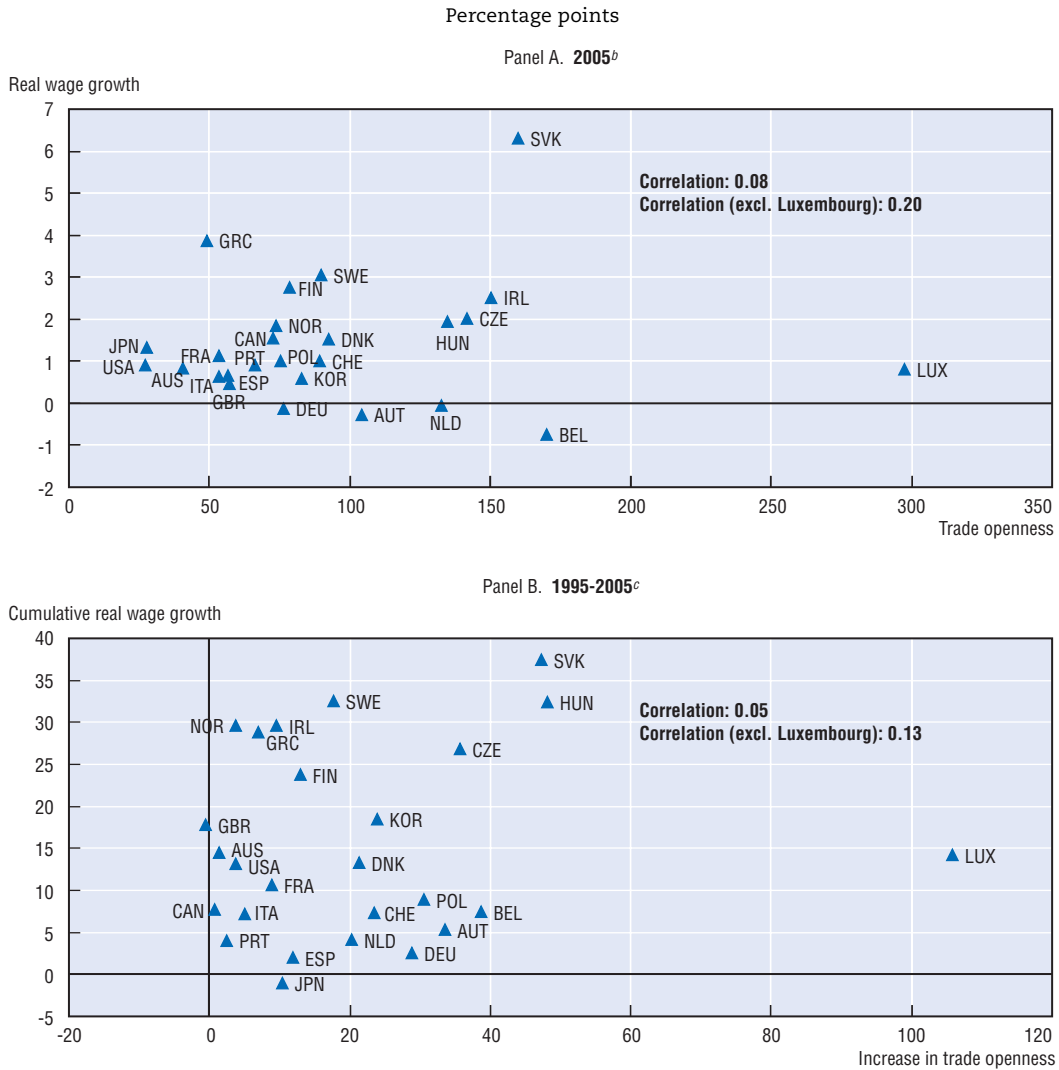
* significant at 10%; ** significant at 5%; *** significant at 1%.
a) Aggregate real wage defined as total wage and salary income of dependent employees per full-time equivalent worker. Trade openness defined as the sum of exports and imports as a percentage of GDP.
b) 2004 for Greece.
c) 1995-2004 for Greece; 1997-2005 for the Czech Republic; 1999-2005 for Portugal; 2000-05 for Hungary, Japan, Poland, Spain and Switzerland.

Source: OECD Economic Outlook and Labour Market Statistics databases.

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Figure 3.8 examines the evolution of earnings inequality for the ten OECD countries for which it is possible to track trends since 1980, decomposing the overall change into the contributions of increased dispersion in the upper and the lower halves of the distribution. As is well known, earnings inequality has tended to increase the past several decades.[19] What is less well known is that essentially all of the cumulative increase in earnings dispersion since 1990 has occurred in the top half of the earnings distribution (see the OECD10 lines in Figure 3.8). Significantly for this chapter's analysis, import competition from developing countries would be more likely to increase dispersion in the bottom half

Figure 3.7. **Wage share of national income in EU15, Japan and the United States, 1970-2005**

Share of total wages and salaries in total value added,[a] percentage
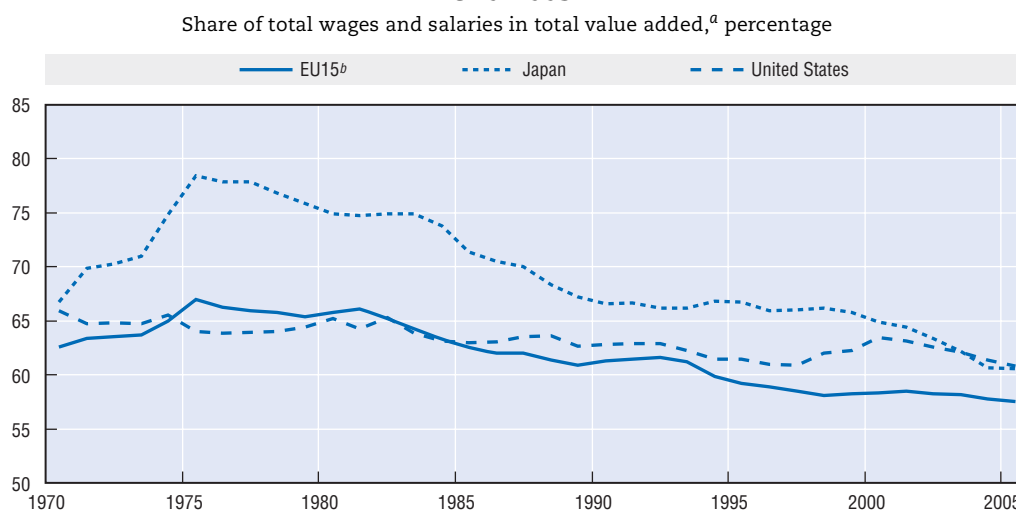
a) Total labour compensation, including employers' social security and pension contributions and imputed labour income for self-employed persons.
b) GDP-weighted average of the following countries: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom.

Source: OECD estimates using the OECD Economic Outlook database.

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of the earnings distribution, than in the top half.[20] In sum, globalisation is occurring in the context of rising earnings inequality in most OECD countries, but much of the increase has taken a form that is not easily attributed to trade.

Increased earnings inequality need not translate into increased income inequality. The two types of inequality can evolve differently because families may pool multiple sources of income (*e.g.* the earnings of multiple workers, self-employment earnings and investment income) and governments may make use of redistributive taxes and benefits to produce a distribution of final incomes that is less unequal than the distribution of market incomes. In fact, OECD income distribution statistics indicate that inequality in the market and final incomes of households has risen about as rapidly as earnings inequality since 1985, with most of the increase occurring before 1995.[21] However, these statistics do not capture developments at the very top of the income range.[22]

Using newly available data from tax records, Piketty and Saez (2006) provide an overview of the evolution of the income share accruing to the top 0.1% of the income distribution over most of the past century in five large OECD countries (Figure 3.9). Most of the 20th century was characterised by a sharp drop in this share, representing a significant reduction in income inequality at the very top. During the past several decades, however, the 0.1% income share has begun to grow again in Canada, the United Kingdom and, especially, the United States. The reasons for this reversal are only beginning to be studied, but this pattern is at least suggestive that globalisation is creating opportunities for a small elite of workers and investors to pull away from everyone else.[23] The fact that no such trend is evident for France and Japan suggests that differences in national policies and institutions also play an important role in determining the income share going to the top 0.1% and how it is affected by international economic integration.

Figure 3.8. **Earnings inequality in ten OECD countries since 1980**

Index, 1985 = 100
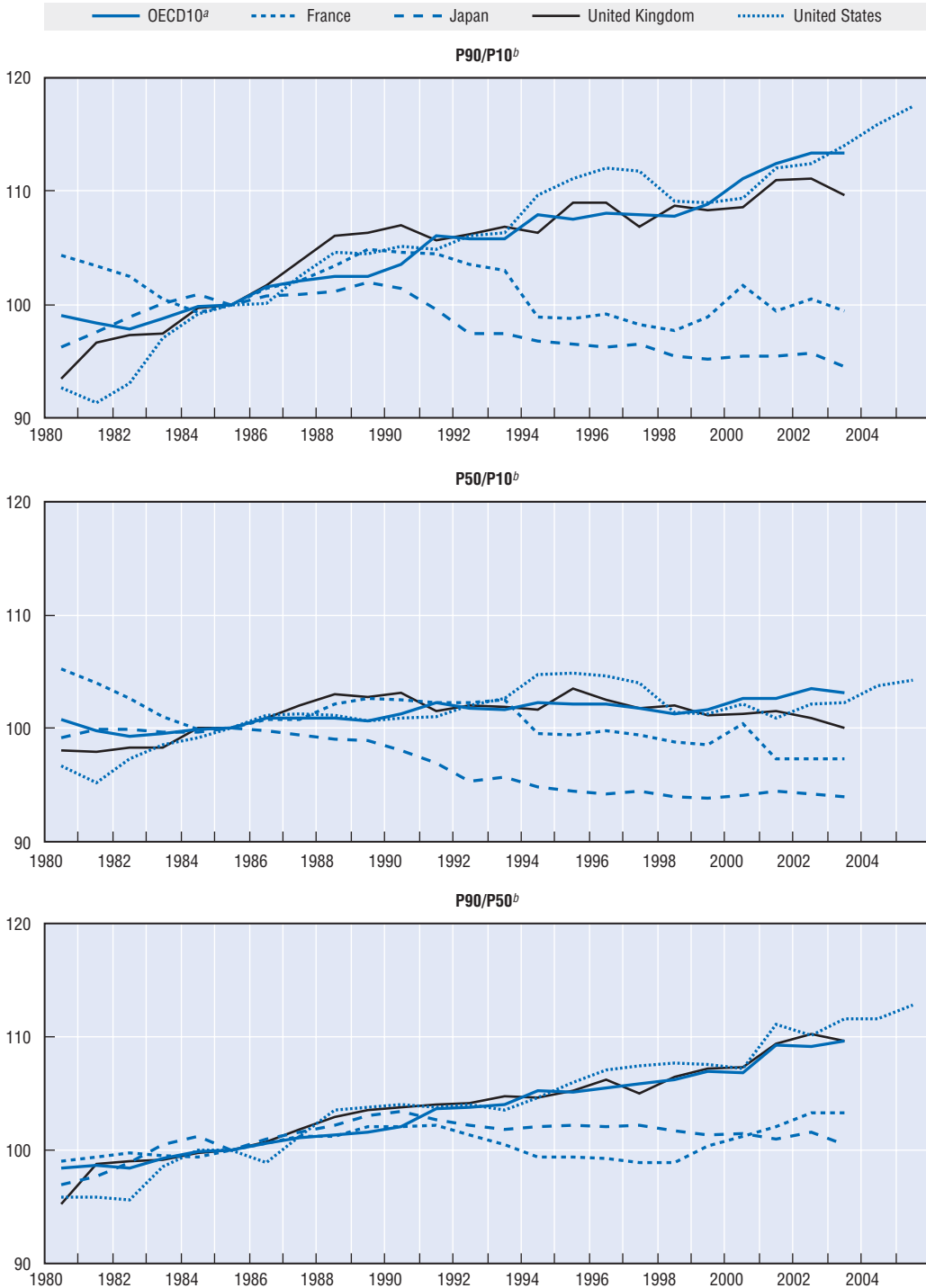

a) Unweighted average of the following countries: Australia, Denmark, Finland, France, Japan, the Netherlands, Poland, Sweden, the United Kingdom and the United States.

b) P90, P50 and P10 denote the 90th, 50th and 10th percentiles of the distribution of earnings for full-time employees.

Source: OECD Earnings Distribution database.

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Figure 3.9. **Top 0.1% income share in five OECD countries, 1913-2005**

Percentages
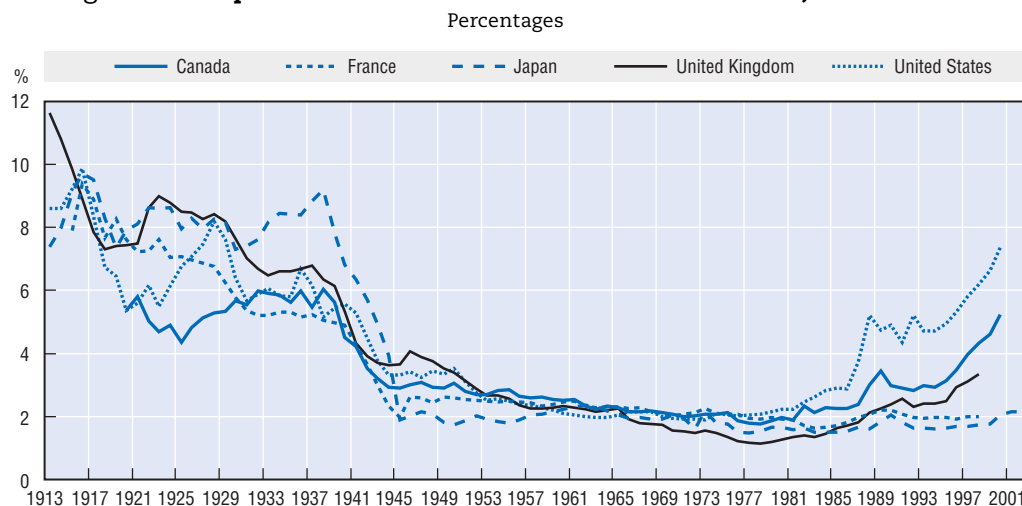
Source: Piketty and Saez (2006).

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In sum, globalisation is proceeding in a context of falling wage shares and rising earnings and income inequality in most OECD countries. However, the strength of these trends varies from country to country and much of the rise in inequality does not take the form of declining wages for low-skill workers.

1.3. *Some hypotheses about how globalisation is affecting OECD labour markets*

The econometric analysis in Section 2 brings together data on trade and labour market outcomes to analyse how globalisation – particularly, import competition – is affecting OECD labour markets, including whether foreign competition increases insecurity and inequality. The stylised facts presented above, together with the recent research literature, suggest several hypotheses about possible links between these two sets of facts which can help to motivate the empirical analysis that follows.

The continued increase in the openness of OECD countries to trade – along with the rising importance of trade with China and other developing economies and the continuing development of international production networks – suggest that there may have been an intensification of several links between trade and labour market outcomes which have already been the object of much research:

● The integration of China and other labour-rich developing countries into the world trading system creates potentially large gains from trade, since these emerging trading partners have very different factor endowments from those of most OECD countries. Similarly, the additional forms of vertical specialisation that have been made possible by the Internet and other technological advances also allow for a more efficient international division of labour (Grossman and Rossi-Hansberg, 2006).[24]

● While these dynamic forms of trade deepening represent potentially large efficiency gains, the reallocation of factor inputs required to exploit new opportunities for specialisation may also have intensified worker displacement due to trade. The rapid expansion of exports from China and other emerging economies may also be intensifying the downward pressure on the wages of low-skill workers, by pushing down the relative prices of products embodying relatively large amounts of low-skill labour.

● As production processes are increasingly fragmented, it is also possible that an ever-increasing share of the labour force, including many medium- and high-skill workers, will face direct competition from workers in developing countries where wages are much lower (Blinder, 2006). That is, an increasing share of the labour force may have reason to view trade as a potential threat to their job security and earnings, even if they have not been much affected by foreign competition in the past.

The econometric analysis of industry-level labour demand in Section 2.1 addresses some of these issues. In particular, it examines how foreign competition is affecting the industrial and skill compositions of labour demand. This analysis uses a number of indicators of foreign competition to clarify whether trade with developing countries or offshoring have different effects than other forms of trade. Similarly, the analysis of worker turnover in Section 2.3 examines whether foreign competition is resulting in higher rates of job loss or lower earnings for different groups within the labour force.

A more novel set of hypotheses concerns whether globalisation is having more pervasive impacts on employment relations, so as to reduce workers' economic security or bargaining power:

● Labour demand volatility could rise as industries become more open, because firms are increasingly exposed to international shocks, such as exchange-rate fluctuations. The result could be greater labour market churning and reduced job security. Any such added volatility would affect workers in industries with a comparative advantage, as well as their counter-parts in industries at a comparative disadvantage.[25]

● Globalisation could also reinforce the propagation of labour demand shocks. Rodrik (1997) argued that international economic integration increases the price elasticity of labour demand and that this has the effect of magnifying the impact of any given distribution of shocks to labour demand on employment and wages. Slaughter (2001) argues that international production networks are particularly likely to increase labour demand elasticities and provides evidence that elasticities have increased in the United States for production workers.

● If globalisation has the effect of permanently increasing the volatility of labour demand, this could make employers less willing or able to insulate the earnings of incumbent workers from changing conditions in the external labour market (Bertrand, 2004).

● Increased labour demand elasticity and intensified foreign competition more generally could tend to reduce workers' bargaining power. Traca (2005b), for example, finds that increased labour demand volatility leads to wage moderation. There is also some evidence that the rents previously accruing to workers are squeezed after trade liberalisation exposes their employers to increased import competition (Traca, 2005b; Boulhol, Dobbelaere and Maioli, 2006; Kramarz, 2006).

● By contrast, some trade theorists have argued that global market integration increases the bargaining power of workers and managers possessing highly-sought talents, so-called "superstars" (Anderson, Tang and Wood, 2006; Cuñat and Guadalupe, 2006; Manasse and Turrini, 2001).

The econometric analysis in this chapter provides an initial examination of some of these hypothesised links between globalisation and the overall functioning of the labour market. The possibility that foreign competition has increased the labour demand elasticity is analysed in Sub-section 2.2, using sectoral data. The extent to which foreign

competition increases job separations and how fully employers shield the earnings of their incumbent workforce from changing conditions in the external labour market is then examined in Sub-section 2.3, using panel data on individual workers.

2. Econometric analysis of the effects of foreign competition on labour markets

This section uses econometric techniques to assess some of the channels through which import competition may create vulnerabilities for workers. For reasons of tractability, a partial equilibrium approach is used to study the impact of globalisation on labour demand. This does not mean that the analysis presented here is inconsistent with general equilibrium models of international trade. In fact, a considerable part of the analysis focuses on measuring changes in sectoral labour demand without evaluating how the labour market adjusts in response to these changes. This analysis is compatible with a particular version of the Heckscher-Ohlin-Viner (HOV) trade model, where capital is assumed to be sector-specific and workers are perfectly mobile across sectors.[26] While such an approach is useful for highlighting potential vulnerabilities, a more comprehensive general equilibrium approach would be required to provide a full accounting of the costs and benefits of deepening global economic integration for workers.

2.1. *The impact of foreign competition on the structure of labour demand*

Import competition can affect industry-level labour demand through two distinct channels:

- *Technology effect*. Foreign competition may induce factor-biased technological change, thereby changing the input mix at the level of the industry, in three ways.[27] First, foreign competition may take the form of offshoring. In recent years, firms have increasingly chosen to move part of their production activities offshore, thereby substituting domestic workers for imported intermediate inputs (Jones and Kierzkowski, 1990; Feenstra and Hanson, 1996). Second, import competition may change the composition of firms in the industry. Recent trade models that account for firm heterogeneity have shown that trade liberalisation will typically induce the reallocation of resources *within* the industry, from less productive to more productive firms. To the extent that firms in the same industry also differ in their relative input requirements, this reallocation will change the average production technology of the industry (Melitz, 2003; Yeaple, 2005). Third, it has been argued that foreign competition may strengthen incentives for domestic firms to upgrade their production technologies and engage in innovative activities (Wood, 1994; Thoenig and Verdier, 2003).

- *Scale effect*. Foreign competition may also change sectoral employment patterns by changing industry output. Trade liberalisation is typically expected to lead to a reduction in the output price in import-competing industries, thus inducing the reallocation of resources from comparative disadvantaged sectors to those with comparative advantage. In the context of trade in intermediates, including offshoring, it is sectoral productivity that matters. As offshoring is normally undertaken in the expectation that it is profitable, the productivity gains from offshoring may be substantial. Increased profits will lead to an expansion in industry output, thereby dampening output prices and stimulating product demand and hence employment.

Since the technology and scale effects work in opposite directions, the overall impact of offshoring on employment is ultimately an empirical question (Amiti and Wei, 2006). This section presents new estimates of the impact of foreign competition on industry-level

labour demand, distinguishing between the technology and scale effects. Box 3.1 sets out the econometric methodology that is used in this section to estimate the impacts of several forms of import competition on sectoral employment.

Earlier studies have used a variety of measures to capture different aspects of how trade affects labour demand. Since the chapter's focus is on potential worker vulnerabilities, the different measures of trade adopted here concentrate on the import-side. Three different measures of foreign competition are used to analyse the technology and scale effects due to imports: *i)* the import penetration rate; *ii)* the share of imports of intermediate inputs in value-added; and *iii)* the industry-specific real exchange rate. Box 3.2 defines these measures of foreign competition, identifies the underlying data sources and discusses their interpretation. While in principle it would also be interesting to analyse the role of exporting on employment, this is not straightforward in practice.[28]

Sectoral labour demand

The estimated impacts of the three measures of globalisation on total sectoral employment are shown in Table 3.1.[29] Panel A presents estimates of the impacts of import penetration and industry-specific real exchange rates that were estimated using annual data for 1987-2003. The following results emerge:

- Most of the estimated coefficients for the control variables have their expected sign and are statistically significant, suggesting that the estimation strategy has been quite successful in identifying the labour demand curve. Nonetheless, estimation results for the unconditional demand curves are somewhat less satisfactory than those for the conditional demand curve and the following discussion emphasises results for conditional demand. Estimation results are also quite similar for the full economy and manufacturing – where the sectoral data are better.

- No significant association between the degree of *import penetration* and industry-level labour demand is indicated by the conditional labour-demand estimates.[30] However, the *composition of imports* by region of origin does appear to play a role, with a higher share of imports from non-OECD countries in total imports being associated with lower sectoral labour demand. This suggests that import competition from emerging economies, such as China and India, represents a stronger force towards structural change than import competition from other developed countries.[31]

- As was expected, an increase in the industry-specific exchange rate has a positive impact on employment in the conditional labour-demand model. In other words, employment tends to rise in industries where output prices fall relative to foreign competitors (industry-specific exchange rate depreciation) and fall in industries where price competitiveness deteriorates.[32]

Panel B of Table 3.1 presents cross-sectional estimates of the impact of offshoring on sectoral labour demand. *A priori*, offshoring should have a negative effect on the labour-intensity in an industry (the "technology effect"), but a positive effect on the level of output, due to the productivity gains from offshoring (the "scale effect"). The effect on labour-intensity is given by the offshoring coefficient in the conditional labour-demand estimates, while the total effect is given by the unconditional labour-demand estimates. The following results emerge:[33]

- In contrast to the panel estimation results in Panel A, both the conditional and unconditional labour demands estimated with the cross-section data and reported in

Box 3.1. **Estimating the effects of foreign competition on sectoral employment**

Two models of labour demand are used here to study the impact of foreign competition on sectoral employment: the conditional and unconditional labour-demand models. In the conditional model, the profit-maximising level of labour demand is determined by minimising the costs of production conditional on output. More specifically, industry i's production costs $C_i (w_i, x_i)$ are a function of factor prices w (for the variable factors), and output x. By Shephard's lemma, the partial derivative of the cost function with respect to the wage gives labour demand.

In the unconditional labour-demand model, it is assumed that firms maximise profits, $\Pi_i (w_i, p_i)$, by choosing the optimal mix of input quantities and the level of output for given input and output prices. The profit-maximising labour demand is the employment level at which the partial derivative of profits with respect to labour equals to zero, which corresponds to adjusting hiring so that the marginal value product of labour equals the wage.

In order to study total sectoral labour demand, the log-linear model of conditional and unconditional labour demand is employed (Hamermesh, 1993).[a] As is common in the literature, capital is treated as quasi-fixed (see for example Berman, Bound and Griliches, 1994). There are at least two reasons for doing so. First, this avoids problems related to the measurement of the user cost of capital. Second, to the extent that in the unconditional labour-demand model one may not be able to effectively control for the location of the labour demand curve, there is a risk of confounding shifts in the labour-demand schedule with changes in its slope. Including the capital stock rather than the cost of capital helps to control for this, while it leaves some scope for changes in output.[b]

Omitting country and time subscripts for ease of presentation, conditional labour demand in industry i is represented by:

$$\ln L_i = \alpha_o + \sum_{j=1}^{J} \alpha_j \ln w_{ij} + \beta_k \ln k_i + \beta_y \ln y_i + \sum_{i=l}^{L} \gamma_l z_{il} \qquad [3.1]$$

where L corresponds to industry-level labour demand; w to the nominal price of variable factors (i.e. the wage and the price of materials); k to the capital stock and y to gross output. The core model is augmented by a set of demand shifters, z, which are intended to capture factor-biased technological change (FBTC). These include a measure for the intensity of research and development and, most importantly for this chapter's analysis, various measures of foreign competition.

Similarly, unconditional (or "capital-constrained") labour demand in industry i is represented by:

$$\ln L_i = \alpha_o + \sum_{j=1}^{J} \alpha_j \ln w_{ij} + \beta_k \ln k_i + \beta_p \ln p_i + \sum_{i=l}^{L} \gamma_l z_{il} \qquad [3.2]$$

where L corresponds to industry-level labour demand; w to the price of variable factors; k to the capital stock, and p to the price of gross output. As in the conditional model, the core model is augmented with a set of variables z, which in addition to the capital stock, are intended to control for shifts in labour demand. Given the homogeneity properties of the cost and profit functions one ought to impose homogeneity in the empirical model. Clark and Freeman (1980) however argue that this may aggravate bias in the estimation when measurement error is important. Homogeneity was therefore only imposed when this could not be rejected by the data.

Box 3.1. **Estimating the effects of foreign competition on sectoral employment** (cont.)

Three measures of foreign competition are used when estimating these models (see Box 3.2 for detailed variable definitions and data sources). Due to the uneven availability of the different measures of foreign competition, two different datasets are used to estimate these labour-demand models. The first dataset represents a panel dataset of sectoral production data for the period 1987 to 2003. The dataset is complemented with two different measures of foreign competition: import penetration and industry-specific real exchange rates. The second dataset combines sectoral production data with input-output tables to study the impact of offshoring, the third measure of foreign competition used in this study, on labour demand. Due to the limited availability of the input-output tables, this dataset only covers the years 1995 and 2000.

The various labour-demand models are estimated using five-year differences. Differencing takes account of any time-invariant fixed effects. Long differences are used to account for lags in the adjustment of labour demand to shocks. Moreover, estimates based on long differences are less sensitive to bias due to measurement error than either fixed effects or first-differences (Griliches and Hausman, 1986). Where possible, a full set of time dummies is included to control for common trends in employment across countries and industries.

a) This has the advantage that the coefficients can be interpreted as elasticities.
b) This thus represents a compromise solution between identification of the labour-demand curve and the ability to capture scale effects in the unconditional labour-demand model. As such, one may alternatively like to refer to it as the capital-constrained model.

Panel B appear to be well identified. In particular, the unconditional elasticities are considerably larger than the conditional elasticities of labour demand, as predicted by economic theory. Measurement error may be less of a problem for the latter estimates, because a full set of input-output tables are available to impute the price of materials and output.[34]

● The *conditional* demand estimates indicate that there is a significant negative correlation between offshoring within the same industry (narrow offshoring) and labour-intensity (employment at given output). Given the actual increase in narrow offshoring during 1995-2000, the estimated coefficients imply that increased narrow offshoring was associated with a reduction in labour intensity of 0.12% (0.19% in manufacturing).[35] The coefficient for services offshoring is also negative and significant in manufacturing, but this form of offshoring did not increase during the period 1995-2000.[36] There is no association between total offshoring or offshoring of materials and labour intensity.[37]

● The *unconditional* labour demand-estimates do not indicate any impact of narrow offshoring on the level of sectoral employment, once the scale effect is taken into account. The difference between the conditional and unconditional estimates suggests that the productivity gains from offshoring in the same industry are sufficiently large for the jobs created by higher sales to completely offset the jobs lost by relocating certain production stages to foreign production sites. Consistent with this interpretation, total offshoring and offshoring from other industries – for which the employment losses in the offshoring industry are expected to be more limited, but the productivity gains similar – are found to increase industry-level labour demand.[38]

Box 3.2. **Measuring foreign competition**

Three measures of import competition are used to estimate the impact of trade on labour demand: *i)* the import penetration rate; *ii)* the share of imports of intermediate inputs in value-added; and *iii)* the industry-specific real exchange rate.

Import penetration

Import penetration is defined as the ratio of imports over domestic absorption in industry *i* and country *k*:

$$m_{ikt} = \frac{M_{ikt}}{Y_{ikt} + M_{ikt} - X_{ikt}} \qquad [3.3]$$

where *M* refers to the value of imports of industry *i* by country *k*, *X* to the value of exports of industry *i* in country *k* and *Y* to gross output. Import penetration provides an overall index of foreign competition in an industry.

Source: COMTRADE, OECD, WTO.

Offshoring

Total or "broad" offshoring is defined as the ratio of total imported intermediate purchases by industry *i* in country *k* to industry value added:

$$o_{ikt} = \frac{\sum_{j=1}^{J} O_{ijkt}}{V_{ikt}} \qquad [3.4]$$

where *O* refers to the imports of intermediates from industry *j* by industry *i*, and *V* refers to value-added in industry *i*. Given the recent interest in the offshoring of services specifically, a distinction is made between materials and services offshoring. Materials offshoring is calculated in a similar manner to broad offshoring, but only takes account of intermediate purchases from the manufacturing sector. Similarly, services offshoring represents the ratio of imported business services to value-added.[a] Intra-industry or "narrow" offshoring only takes account of imported intermediate purchases from the same industry *(i = j)*. Narrow offshoring may be more closely related to concerns about "delocalisation" and the jobs being "sent abroad" since it reflects activities that are closely related to the firm's core production process. Offshoring from other industries or "difference" offshoring is defined as the difference between broad and narrow offshoring.

Source: OECD STAN database and OECD Input-Output database.

Industry-specific real exchange rate

The industry-specific real exchange rate is defined as the import-weighted real exchange rate:

$$x_{ikt} = \sum_{i=1}^{I} \sum_{l=1}^{L} m_{iklt_0} e_{klt} p_{lt} / p_{kt} \qquad [3.5]$$

where *m* refers to the import share from country *l* in industry *i* of country *k* at the beginning of the sample at *t* = 0. The import weights thus vary across industries and countries but are constant in time. *e* refers to the nominal bilateral exchange rate between countries *k* and *l* at time *t*, which varies across partner countries and time, but not across industries. The *p* variables refer to price levels, as approximated by the GDP deflator, in countries *l* and *k* respectively. Within a country in a given year, the variation in industry-specific real exchange rates derives entirely from differences in the import pattern across industries. An increase in the industry-specific exchange rate represents a real depreciation in the price of output produced in industry *i* of country *k* relative to its trading partners (weighted by import

Box 3.2. **Measuring foreign competition** *(cont.)*

shares). Put differently, an increase in the industry-specific exchange rate represents an improvement in the terms of trade in industry *i* for country *k*. A depreciation is expected to have a positive effect on sectoral employment through: *i)* the technology effect, which involves substituting foreign inputs for domestic value-added; and *ii)* the scale effect due to reduced foreign competition in output markets.

The industry-specific real exchange rate may be more appropriate for the analysis of the causal impact of foreign competition on employment, than the import penetration and offshoring measures, because it is less subject to endogeneity bias. The industry-specific exchange rate is unlikely to be correlated with the unexplained components of changes in labour market outcomes, conditional on including time dummies (Bertrand, 2004). By contrast, the two globalisation measures based on import quantities are likely to be endogenous to changes in foreign and domestic demand conditions.[b] A second advantage of real exchange rates as a measure of foreign competition is that they are important determinants of cross-industry differences in how the relative intensity of foreign competition changes. Since trade patterns differ markedly across industries the impact of changes in the bilateral real exchange rate differs also importantly. Compared to tariff information – another proxy for foreign competition that may be considered exogenous – industry-specific exchange rates have the advantage of exhibiting substantially greater variation across time. Note that while changes in the industry-specific exchange rates *per se* do not provide an index of trade openness, the sensitivity of industries with respect to changes in industry-specific exchange rates depends crucially on it.

Source: COMTRADE, OECD, WTO, IMF's International Financial Statistics (IFS).

a) Business services include wholesale and retail trade; repairs; transportation services, post and communication services, financial services, real estate, rental, computer, R&D and other business services.
b) This has two important implications. First, estimation results will be biased. To the extent that imports and employment are positively correlated to unobserved changes in sectoral productivity this is likely to induce an upward bias of the estimated coefficient. Second, associations between these two measures of foreign competition and domestic employment are more appropriately interpreted as being correlations, rather than causal relationships.

● Even though offshoring does not appear to reduce sectoral employment, it does not follow that there are no adjustment costs for workers. The skill requirements for the jobs destroyed need not be the same as those for the jobs created.[39]

The results presented above for offshoring are robust to the exclusion of outliers and the way technological change is controlled for. The results consistently indicate that offshoring has a negative impact on employment conditional on output and no effect or a small positive effect on industry employment when allowing for both scale and technology effects. See OECD (2007b) for more details.

The skill structure of sectoral labour demand

The analysis of total industry employment is now extended by distinguishing between low-, medium- and high-skill workers, defined in terms of educational attainment. The aim of this exercise is to estimate how foreign competition has affected the skill composition of labour demand. The econometric methodology is described in Box 3.3. The main estimation results are reported in Table 3.2, in which Panel A reports the complete set of elasticities for the baseline model and Panel B estimated elasticities with respect to various

Table 3.1. **Foreign competition and sectoral labour demand**[a]

	Conditional			Unconditional		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. **Panel data, five-year difference variables, 1987-2003**						
All industries						
Log of wage/price of materials	–0.173***	–0.186***	–0.193***	–0.008**	–0.007*	–0.007
Log of capital stock	0.094	0.076	0.082	0.135	0.125	0.131
Log of price of output/price of materials				–0.011	–0.017	–0.031
Log of output	0.178***	0.192***	0.199***			
R&D intensity	–0.111	–0.110**	–0.126**	–0.127*	–0.128*	–0.174**
Import penetration	–0.002	–0.002		–0.006**	–0.006**	
Share of imports from non-OECD countries in total imports		–0.051**			–0.054**	
Log industry-specific exchange rate			0.034**			0.003
Observations	1 934	1 906	1 927	1 934	1 906	1 927
R-squared	0.22	0.23	0.23	0.10	0.10	0.09
Manufacturing industries						
Log of wage/price of materials	–0.187***	–0.187***	–0.192***	–0.007*	–0.007*	–0.006
Log of capital stock	0.075	0.082	0.068	0.124	0.131	0.119
Log of price of output/price of materials				–0.016	–0.015	–0.037
Log of output	0.193***	0.192***	0.198***			
R&D intensity	–0.112**	–0.113**	–0.128**	–0.130*	–0.131*	–0.177**
Import penetration	–0.002	–0.002		–0.006*	–0.006*	
Share of imports from non-OECD countries in total imports		–0.048			–0.050*	
Log industry-specific exchange rate			0.042**			0.006
Observations	1 770	1 768	1 770	1 770	1 768	1 770
R-squared	0.23	0.23	0.23	0.10	0.10	0.09
Panel B. **Cross-section data, five-year difference variables, 1995 and 2000**						
All industries						
Log of wage/price of materials	–0.396***	–0.242**	–0.372***	–0.543***	–0.420***	–0.542***
Log of capital stock	0.260***	0.202**	0.263***	0.297***	0.256***	0.297***
Log of price of output/price of materials				0.233	0.326	0.233
Log of output	0.159***	0.180***	0.191***			
R&D intensity	0.540*	0.500*	0.599**	0.349	0.321	0.348
Offshoring (broad)	0.006			0.039*		
Offshoring (narrow)		–0.082*			0.013	
Offshoring (difference)		–0.034			0.034*	
Materials offshoring			0.006			0.039
Services offshoring			–2.180			0.102
Observations	240	238	240	240	238	240
R-squared	0.44	0.47	0.45	0.39	0.41	0.39
Manufacturing industries						
Log of wage/price of materials	–0.440***	–0.222	–0.402***	–0.559***	–0.397***	–0.557***
Log of capital stock	0.169**	0.110*	0.177**	0.196**	0.157**	0.192**
Log of price of output/price of materials				0.157	0.110	0.143
Log of output	0.127***	0.150***	0.177***			
R&D intensity	0.950*	0.560	1.027**	0.690	0.243	0.694
Offshoring (broad)	0.000			0.029		
Offshoring (narrow)		–0.094**			–0.012	
Offshoring (difference)		–0.039			0.023	
Materials offshoring			0.001			0.027
Services offshoring			–3.598*			0.816
Observations	182	181	182	182	181	182
R-squared	0.42	0.50	0.43	0.37	0.44	0.38

* significant at 10%; ** significant at 5%; *** significant at 1%.
a)   OLS estimates in five-year differences of conditional and unconditional labour demands.
Source: OECD estimates. See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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Box 3.3. **Estimating the effects of globalisation on the skill structure of labour demand**

In order to analyse the effects of globalisation on the demand for workers in different skill groups, it is assumed that the industry-level variable cost functions can be approximated by a translog function, which is twice differentiable, linearly homogenous and concave in factor prices:[a]

$$\ln C_i(w,x,z) = \alpha_0 + \sum_{j=1}^{J} \alpha_j \ln w_{ij} + \sum_{k=1}^{K} \beta_k \ln x_{ik} + \sum_{l=1}^{L} \gamma_l z_{il} + \frac{1}{2} \sum_{j=1}^{J} \sum_{q=1}^{J} \alpha_{jq} \ln w_{ij} \ln w_{iq}$$

$$+ \frac{1}{2} \sum_{k=1}^{K} \sum_{r=1}^{K} \beta_{kr} \ln x_{ik} \ln x_{ir} + + \frac{1}{2} \sum_{l=1}^{L} \sum_{s=1}^{L} \gamma_{ls} z_{il} z_{is} + \frac{1}{2} \sum_{j=1}^{J} \sum_{k=1}^{K} \delta_{jk} \ln w_{ij} \ln x_{ik} + \frac{1}{2} \sum_{j=1}^{J} \sum_{l=1}^{L} \delta_{jl} \ln w_{ij} z_{il} \qquad [3.6]$$

$$+ \frac{1}{2} \sum_{k=1}^{K} \sum_{l=1}^{L} \delta_{kl} \ln x_{ik} z_{il}$$

where C represents total variable cost, which is a function of factor prices w for variable inputs, quantities x for fixed inputs and output, and technological change z.[b] Country and time subscripts are omitted for ease of presentation.

Symmetry implies that $\alpha_{jq} = \alpha_{qj}$, while constant returns to scale require that the variable cost function is linearly homogenous in variable factor prices:

$$\sum_{j=1}^{J} \alpha_j = 1 \text{ and } \sum_{j=1}^{J} \alpha_{jq} = \sum_{q=1}^{J} \alpha_{qj} = \sum_{j=1}^{J} \delta_{jk} = \sum_{j=1}^{J} \delta_{jl} = 0$$

Differentiating the translog cost function with respect to factor prices yields the cost share of factor j in total variable costs:

$$S_{ij} = \alpha_j + \sum_{q=1}^{J} \alpha_{jq} \ln w_{iq} + \sum_{k=1}^{K} \delta_{jk} \ln x_{ik} + \sum_{l=1}^{L} \delta_{jr} z_{il}, j = 1,..,q,.,J \qquad [3.7]$$

where $S_{ij} = \dfrac{\partial \ln C_i}{\partial \ln w_{ij}} = \dfrac{w_{ij} x_{ij}}{C_i}$ and $\sum_{j=1}^{J} S_{ij} = 1$

The complete system of share equations is estimated using iterated seemingly unrelated regression equations (ISUR).[c] The discussion of the results is based on the estimated elasticities (see OECD, 2007b, for details).

a) See Hijzen, Görg and Hine (2005), and Ekholm and Hakkala (2007) for studies that use a similar approach.
b) Since the output level is fixed, the estimation results for the analysis of the skill composition of labour demand are most comparable to the estimates for the conditional models of sectoral labour demand in Table 3.1.
c) Due to the adding up condition of the variable cost shares, the disturbance covariance matrix of the system will be singular and one equation needs to be dropped. The SUR estimates will normally not be invariant to the equation deleted. Invariance can be obtained by iterating SUR until the parameter estimates and residual covariance matrix converge.

measures of foreign competition, which were included (one or two at a time) in a series of alternative regression models. The following findings emerge:

● Consistent with economic theory, the own-price elasticities are negative and statistically significant for all three skill groups. An increase in the capital stock tends to increase the relative demand for medium-skill labour, whilst R&D intensity raises the relative demand for skilled labour. An increase in output has a negative effect on the demand for all skill groups relative to material inputs. However, the negative effect is considerably larger for unskilled workers than more skilled workers which suggests that output expansion tends to be associated with skill upgrading.

Table 3.2. **Foreign competition and the skill structure of sectoral labour demand, 1993-2003**

	Input demand[a]			
	Low-skill employees	Medium-skill employees	High-skill employees	Materials
	Panel A. **Elasticity estimates of baseline regression**[b]			
Input price				
Log low-skill employees	**−0.758*****	0.247**	0.073**	0.438***
Log medium-skill employees	0.115***	**−0.264*****	−0.043**	0.193***
Log high-skill employees	0.055**	−0.703**	**−0.413*****	0.428***
Log Materials	0.058***	0.055***	0.074***	**−0.187*****
Log capital stock	−0.004	0.078**	−0.043	−0.014
Log output	−0.523***	−0.194***	−0.096**	0.141***
R&D intensity	0.213	−0.006	0.186*	−0.059***
Import penetration	−0.046**	0.001	−0.030**	0.011***
Number of observations	670	670	670	n.a.
R-squared	0.198	0.485	0.143	n.a.
	Panel B. **Selected elasticities**			
Import penetration[b]	−0.046**	0.001	−0.030**	0.011***
Imports from non-OECD countries over total imports[b]	−0.032	0.038	0.018	−0.010
Offshoring (broad)[c]	0.021	0.001	0.012	−0.007
Offshoring (narrow)[c]	−0.214***	−0.025**	−0.065***	0.061***
Materials offshoring[c]	0.042	0.001	−0.194	−0.003
Services offshoring[c]	11.105***	−3.816***	−7.491**	1.114

n.a.: Not applicable.
* significant at 10%; ** significant at 5%; *** significant at 1%.
a) Panel data estimates using average annual differences. Regressions include time dummies, approximately 670 observations.
b) Factor demand system derived from translog cost function and estimated with iterated seemingly unrelated regression (SUR).
c) Cross-sectional estimates using five year differences, approximately 85 observations.
Source: OECD estimates. See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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- Import penetration has a negative effect on the relative demand for low- and high-skill workers – albeit, more strongly for low-skilled workers – and no effect on the demand for medium-skill workers. The composition of imports, defined as the share of non-OECD imports in total imports, has no impact on the skill structure of labour demand. These findings are somewhat at odds with those for aggregate labour demand in Table 3.1, which indicate that the composition of imports, rather than import penetration *per se*, is a significant determinant of sectoral labour demand.[40]

- Narrow offshoring has a negative effect on the relative demand for all skill groups, in favour of material inputs. However, the estimated impact is considerably larger for low-skill workers than for medium- and high-skill workers. Thus, narrow offshoring appears to shift relative labour demand away from low-skill workers.[41]

- By contrast, services offshoring has a tendency to shift relative labour demand away from medium- and high-skill workers and towards low-skill workers.[42] While services offshoring is still very small compared to the offshoring of materials, its bias against

relatively skilled workers may help explain some of the concerns expressed in the public debate.[43] This finding suggests that high-skill workers, heretofore a major beneficiary of globalisation, could be disadvantaged should services offshoring greatly expand as some have predicted.

● Total offshoring and the offshoring of materials are not associated with any changes in the skill structure of labour demand, similar to the results for aggregate labour demand.

The evidence presented in this section suggests that foreign competition has discernable impacts on sectoral employment patterns and the skill structure of labour demand in the OECD. These estimated impacts are largely consistent with the predictions of conventional trade theory and numerous previous empirical studies. Imports from non-OECD countries – including developing countries, such as China – tend to reduce overall employment in an industry, whereas the productivity effects from offshoring tend to offset the potentially negative impact on employment. While offshoring within the same industry has a moderate effect on shifting relative demand away from low-skill workers, services offshoring has a small effect in the opposite direction.

2.2. Globalisation and the functioning of the labour market

Globalisation may affect the vulnerability of workers through its impact on labour demand elasticity

Rodrik (1997) hypothesised that globalisation increases the responsiveness of employment and wages to economic shocks, by increasing the own-price elasticity of labour demand. As is explained in Box 3.4, the wage and employment effects of a given trade shock are amplified by an increase in the labour demand elasticity. A more elastic labour demand would also tend to reduce the bargaining power of workers relative to employers, which could help to explain falling wage shares (*cf.* Section 1). Increased labour demand elasticity might also reduce the scope for risk-sharing arrangements between workers and firms, for example when firms stabilise the earnings of long-term workers, insulating them from much of the fluctuation in external labour market conditions (Bertrand, 2004; Rosen, 1985). Finally, an increase in the elasticity of labour demand will make the wage and employment effects of non-wage costs more pronounced (Andersen, 2003), which can have important implications for the financing of social protection schemes (see Chapter 4 of this publication).

Globalisation may affect the elasticity of labour demand through two channels (see Box 3.4 for more details). First, it may do so by enhancing the substitutability of domestic labour with value-added abroad through offshoring. International production networks – in the form of either multinationals and/or arm's-length trading arrangements – allow firms to respond more flexibly to changes in relative factor prices by changing the mix of domestic and foreign value-added. Second, the elasticity of labour demand may further increase as a result of the pro-competitive effect of globalisation on output markets.

The analysis proceeds in three stages. First, the trend in labour demand elasticity is analysed and it is shown to have increased. Attention then turns to analysing whether offshoring has been a factor behind this increase. Some evidence is found for this having been the case, but this evidence is somewhat weaker than that for the increase in labour demand elasticity. The third stage of the analysis illustrates the potential contribution of offshoring to increased employment and wage volatility using simple numerical simulations.

Box 3.4. **Globalisation and the elasticity of labour demand**

Formally, the price elasticity of labour demand η_{LL} is defined as the weighted average of two components: *i)* the constant-output elasticity of substitution, σ; and *ii)* the price elasticity of product demand, η (Hamermesh, 1993):

$$\eta_{LL} = -(1 - s)\sigma - s\eta \qquad [3.8]$$

The first component captures the substitution effect, which reflects the extent to which a firm substitutes away from labour when faced with an increase in its price, for a given level of output. The second component captures the scale effect, which represents the reduction in employment due to the reduction in output that occurs to the extent that the increase in labour costs leads to higher output prices and therefore lower sales. For a given change in wages, the scale and substitution effects work in the same direction. The cost share of labour (*s*) acts as a weighting factor when combining the substitution and scale effects into the total elasticity of labour demand.

Globalisation may affect the elasticity of labour demand through both the substitution and the scale effect. Globalisation may increase the constant-output elasticity of substitution between labour and other factors (σ) by enhancing the substitutability of domestic labour with value-added abroad. The establishment of international production networks – in the form of either multinationals and/or arm's-length trading arrangements – allows firms to respond more flexibly to changes in relative factor prices by changing the mix of domestic and foreign value-added. To the extent that these practices also reduce the cost share of domestic labour (*s*) this will generally reinforce the elasticity of substitution.

The elasticity of labour demand may further increase as a result of the pro-competitive effect of globalisation on imperfectly competitive output markets.* Trade liberalisation in markets characterised by imperfect competition may increase the elasticity of product and therefore labour demand by increasing the number of available varieties (Slaughter, 2001; Hasan, Mitra and Ramaswamy, 2007) and reducing mark-ups (Bernard *et al.*, 2003; Melitz and Ottaviano, 2005).

A standard diagram of labour demand and supply can be used to explain the effects of an increased demand elasticity on employment and wage volatility (see figure below). Under initial labour demand and supply, the labour market clears in point 1. An increase in the elasticity of labour demand rotates the labour-demand curve anti-clockwise, making the labour-demand curve flatter without changing the labour market equilibrium.

Labour demand shocks and the elasticity of labour demand
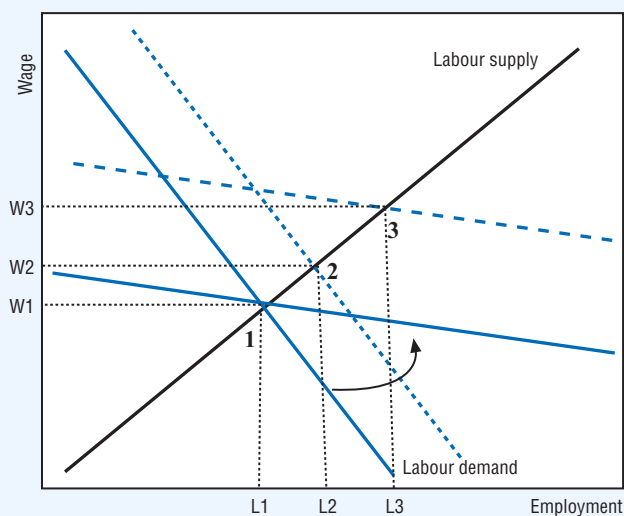
Box 3.4. **Globalisation and the elasticity of labour demand** (*cont.*)

When labour demand is relatively inelastic, *i.e.* the labour demand curve is relatively steep, a given trade shock (shown as a vertical shift in labour demand) shifts labour market equilibrium from point 1 to point 2. When labour demand is more elastic, the same trade shock shifts labour market equilibrium to point 3. Thus, both the wage and employments responses to a given (trade) shock tend to be larger, the more elastic is labour demand.

The relative magnitude of employment and wage changes depends on the elasticity of labour supply (*i.e.* the slope of the labour supply curve). When labour supply is perfectly elastic, *i.e.* the labour supply curve is horizontal, as is commonly assumed in firm-based theories, a more elastic labour demand results in higher employment volatility, but has no impact on wages. When labour supply is perfectly inelastic, labour demand shocks only affect the wage and an increase in demand elasticity does not affect the volatility of either employment or wages. However, this is an unlikely case for firm or industry-level analysis. Intermediate values for the labour supply elasticity imply that an increase in labour demand elasticity increases both employment and wage volatility for a given distribution of demand shocks, as illustrated in the figure above.

The elasticity of labour demand defined here applies for a single firm. Assuming all firms in an industry are identical, aggregating individual firm responses to the level of the industry does not affect the estimation of the elasticity of labour demand (Hasan, Mitra and Ramaswamy, 2007). Note further that the elasticity of labour demand at the industry-level, which is analysed here, is very different from the national labour demand elasticity in a general equilibrium trade model: the former is explicitly defined over a single sector and the latter over multiple sectors (Slaughter, 1999). As a result of general equilibrium effects, the former cannot be easily aggregated to obtain the national labour demand elasticity, except under very restrictive conditions.

* In perfectly competitive markets, product demand at the firm level is infinitely elastic.

Prior evidence is mixed

Evidence that globalisation has increased the elasticity of labour demand in OECD countries is mixed. Similar to the analysis in this chapter, most studies have used industry-level data to address this question. Slaughter (2001) finds limited evidence for the United States, while Bruno, Falzoni and Helg (2004), who estimate dynamic labour demands for a set of major OECD countries for the period 1976-96, find that import penetration raised the elasticity of labour demand in the United Kingdom, but had no such impact elsewhere. Molnar, Pain and Taglioni (2007) estimate similar models for a number of OECD countries and find that outward foreign direct investment appears to have increased labour demand elasticity in the manufacturing sector, but that the opposite may have happened in the services sector.[44]

A number of recent studies have used firm-level data. Fabbri, Haskel and Slaughter (2003) look at the probability of plant shutdown across domestic and multinational firms providing some evidence that multinationals have a higher elasticity of labour demand than domestic firms. Similarly, Görg *et al.* (2006) find that multinationals in Ireland have more elastic labour demands than domestic firms, although that this difference narrows the more integrated multinationals are in the local economy through supplier linkages. By contrast, Barba-Navaretti (2003) provides evidence for a number of European countries that multinationals have less elastic labour demands than domestic firms in the long-run. He explains this finding by pointing out that multinationals tend to have higher levels of skill-intensity and that the elasticity of labour demand declines in the average level of

skills (due to the greater importance of firm-specific human capital).[45] Finally, Senses (2006) looks at the effects of offshoring on the elasticity of labour demand and finds that offshoring initially increases the elasticity of labour demand but may decrease it when offshoring surpasses a certain threshold. Overall, these findings provide some evidence that international economic integration may increase the substitutability of domestic workers by foreign factors, but also suggest that the relationship is complex.

New evidence suggests that the elasticity of labour demand increased significantly during 1980-2002

This section analyses whether the elasticity of labour demand changed during 1980-2002 using data for 11 OECD countries and 20 industries.[46] Since many of the countries under consideration witnessed significant development of international production networks during this period (*cf.* Section 1), a second stage of the analysis examines whether higher offshoring is associated with more elastic labour demand. In the light of the debate on services offshoring, both manufacturing and services industries are included in the analysis.

Figure 3.10 shows that the estimated conditional wage elasticities of labour demand have significantly increased (in absolute values) since 1980.[47] The estimated elasticities range from about 0.2, in absolute value, at the beginning of the sample to around 0.5 towards the end of the period, *i.e.* close to the usual range found in other studies of between 0.15 and 0.7 (Hamermesh, 1993).[48] When the elasticity of labour demand is estimated separately for the manufacturing and the services sector, a very similar pattern is found for the manufacturing sector, as for the overall economy, but there is no clear evidence of an increase in the elasticity of labour demand in the services sector.[49]

Figure 3.10. **Labour demand has become more responsive to shocks**

Trend in the conditional wage elasticity of labour demand,*ª* 1980-2002
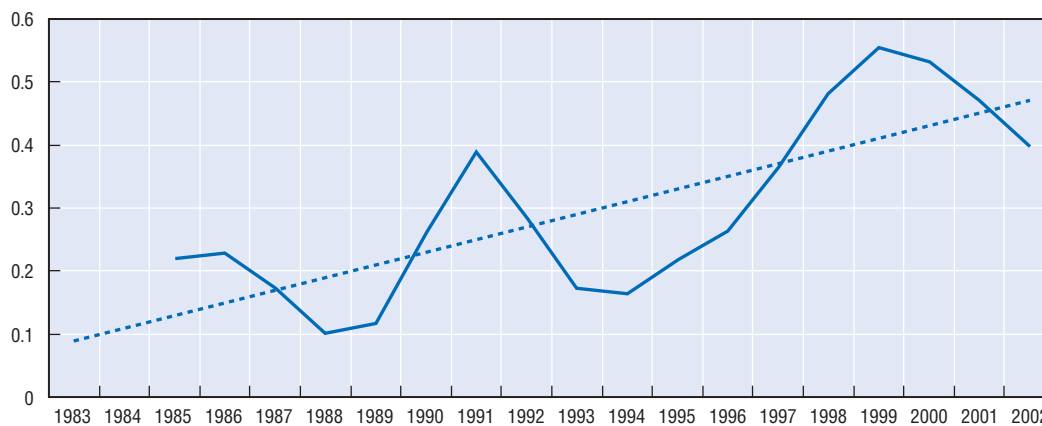
a) OLS estimates using five-year differences. See OECD (2007b) for the full regression results and results obtained using alternative estimation methods.

Source: OECD estimates. See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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The available data do not provide a sufficiently long time-series to analyse how the elasticity of labour demand has changed for different skill groups, but they do allow the average elasticity of labour demand during 1993-2003 to be compared across the three skill groups (see Table 3.2). The results suggest that the elasticity of labour demand is considerably

higher in absolute value for low-skill workers (0.76) than for either medium- or high-skill workers (0.26 and 0.41 respectively). This may reflect the greater relative importance of firm-specific skills for more skilled workers.[50]

The elasticities of labour demand displayed in Figure 3.10 correspond to conditional (or "constant output") elasticities, and therefore do not capture the effect of any increase in market competition on the elasticity of labour demand. In order to estimate the total elasticity of labour demand, which takes account of both substitution and scale effects, unconditional labour-demand models were also estimated over time. These results suggest that the unconditional labour demand has also become more elastic, but the estimated elasticities are typically smaller in absolute value than those obtained from the conditional model (see OECD, 2007b, for more details), which is inconsistent with the theory of labour demand set out in Box 3.4.[51] For this reason, the focus in the remainder of this section will be on conditional elasticities, rather than the total elasticity of labour demand. The estimates of the conditional elasticity of labour demand should be interpreted as providing a lower bound of the total elasticity of labour demand. However, it need not follow that the trend increase in the total elasticity of labour demand would also be understated.

The estimated increase in labour demand elasticity does not appear to be spurious

An important question is whether the upward trend in the estimated elasticity of labour demand in Figure 3.10 could result from problems with the empirical specification that was used and thus be spurious. Two key identifying assumptions were relied upon in estimating these elasticities: i) that the data on sectoral employment reflect the long-term level of labour demand; and ii) that labour supply responds very strongly to changes in wages. Since it is not possible to directly verify the validity of either of these assumptions, it is important to assess the robustness of the estimation results to alternative estimation strategies.

In terms of the first identifying assumption, one worry would be that Figure 3.10 is picking up an increase in the speed with which labour demand reacts to changes in wages, rather than an increase in the total response, once a new equilibrium level of employment is reached. In recent decades, many OECD governments have implemented structural reforms, such as relaxing employment protection legislation or encouraging more vigorous product market competition, which may have had the effect of speeding up the response of employment to changes in the economic environment (OECD, 2006b). In order to ensure that the estimated trend in the labour-demand elasticity captures the long-term relationship between wages and labour demand, the estimations were conducted in five-year differences, thereby removing much of the variation due to changes in short-term dynamics. As a robustness check, a dynamic model of labour was also specified to explicitly account for short-term dynamics. The results suggest that structural reform may have contributed, but is unlikely to fully account for the increase presented in Figure 3.10. The specification of the dynamic model, the various estimations methods used, and the results, are discussed in detail in OECD (2007b).

As is standard in the trade literature, the labour demand elasticity was estimated on the assumption that labour supply is perfectly elastic.[52] While such an assumption may be reasonable when using firm-level data, it is of questionable validity at the industry level.[53] To the extent that this identifying assumption is violated, the elasticity of labour demand will be upward biased due to the positive correlation between wages and labour supply. However, the extent to which such an assumption affects the estimated change in demand elasticity *over time* is unclear. Should the correlation between the wage variable and labour supply have increased over time, then the estimation results probably would be biased towards finding a

spurious increase in the (absolute) elasticity of labour demand. The trend increase in the labour market participation of women or the rising proportion of immigrants may have tended to raise labour supply elasticity, and created such a bias. The results presented in Figure 3.10 account for this kind of bias to the extent that it only concerns the correlation in the wage variable and the *time-invariant* component of the error term. As a robustness check, a dynamic model with difference GMM was estimated, which treats the wage variable as endogenous. The qualitative results are not affected (see OECD, 2007b, for details).[54]

In sum, it appears unlikely that changes in the speed of labour demand adjustment or the composition of labour supply can fully account for the observed increase in the elasticity of labour demand.

The spreading practice of offshoring may have contributed to the rise in the elasticity of labour demand by making it easier to substitute between domestic workers and their foreign counterparts

Has higher labour demand elasticity resulted, at least in part, from the fact that substitution opportunities between domestic labour and imported intermediates have increased? Panel A of Figure 3.10 shows that there is positive association across sectors between the labour demand elasticity and the share of imported intermediate inputs in value added: the larger the recourse to offshoring, the greater the (absolute) elasticity.[55] For instance, the textiles industry, which is known for the relative importance of offshoring, has the most elastic labour demand. By contrast, labour demand is relatively inelastic in most services industries, where offshoring is more limited and often difficult or even impossible.

Increased product market competition – the second main channel through which globalisation may have contributed to the observed increase in the absolute elasticity of labour demand – does not appear to play as important of a role. Panel B of Figure 3.11 suggests that the labour demand elasticity is greater in industries where mark-ups are lower, but this correlation is not statistically significant.[56]

These findings are confirmed by econometric estimates of augmented labour demand models containing interaction terms between the wage variable and a binary indicator variable measuring exposure to foreign competition (Table 3.3). Three different indicator variables are used: *i)* high *versus* low import penetration; *ii)* high *versus* low offshoring intensity (two indicators based, respectively on narrow and broad offshoring); and *iii)* depreciating *versus* appreciating industry-specific exchange rates.[57]

Consistent with the descriptive statistics presented in Figure 3.11 greater offshoring is associated with more elastic labour-demand. In the full sample, industries characterised by relatively high levels of offshoring (broad or narrow) have significantly more elastic labour demand than industries where offshoring is less prevalent, as indicated by the positive and significant values reported in the columns labelled "difference". The differential effect between high and low offshoring industries is weaker when services industries are dropped from the sample, with the differential effect falling from 0.41 to 0.20 for narrow offshoring, but remains statistically significant, while the differential effect for broad offshoring becomes insignificant. This suggests that greater offshoring intensity, particularly intra-industry offshoring, may help to account for the growing wedge in labour demand elasticity between services and manufacturing industries, and that differences in offshoring intensity may also explain some of the differences in the elasticity of labour demand across manufacturing industries.[58] By contrast, the results for import penetration and the industry-specific exchange rates are mixed and statistically insignificant in most cases.[59]

Figure 3.11. **Globalisation and the elasticity of labour demand:**
the role of substitution and scale effects

Panel A. **Substitution effect**   Panel B. **Scale effect**
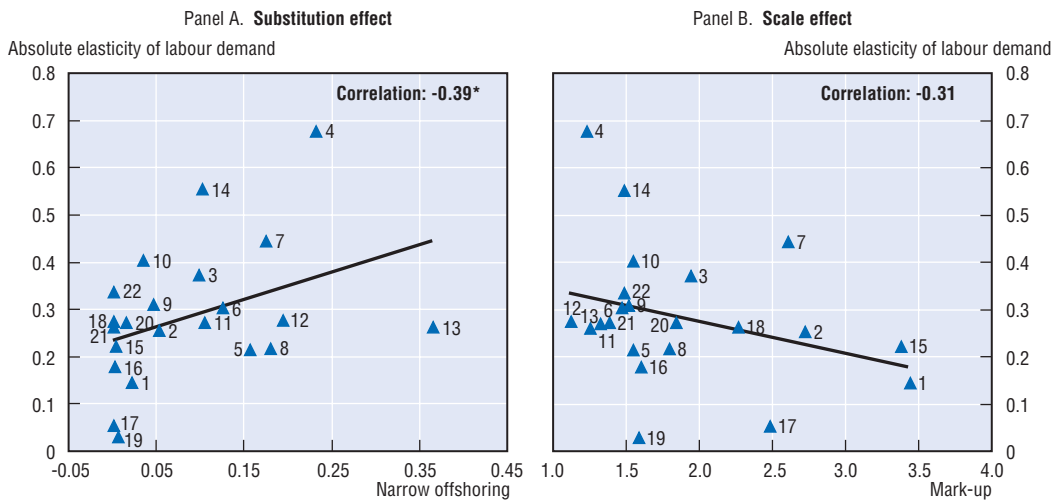
* significant at 10%.

1. Agriculture, hunting, forestry and fishing (01-05).
2. Mining and quarrying (10-14).
3. Food products, beverages and tobacco (15-16).
4. Textiles, textile products, leather and footwear (17-19).
5. Wood and products of wood and cork (20).
6. Pulp, paper, paper products, printing and publishing (21-22).
7. Coke, refined petroleum products and nuclear fuel (23).
8. Chemicals (24).
9. Rubber and plastics products (25).
10. Other non-metallic mineral products (26).
11. Basic metals and fabricated metal products (27-28).
12. Machinery and equipment (29-33).
13. Transport equipment (34-35).
14. Manufacturing nec; recycling (36-37).
15. Electricity, gas and water supply (40-41).
16. Construction (45).
17. Wholesale and retail trade; repairs; real estate and business activities; excl. computer and related activities (50-52; 70-71; 73-74).
18. Hotels and restaurants (55).
19. Transport and communication (60-64).
20. Finance and insurance (65-67).
21. Public admin. and defence; compulsory social security (75).
22. Education; health and social work; other community and personal services (80-99).

Source: OECD estimates. See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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In sum, the evidence suggests that the establishment of international production networks may indeed have expanded the flexibility of firms and, thereby, have contributed to the trend increase in the elasticity of labour demand. Increased product market competition due to rising trade exposure may also have tended to increase labour demand elasticity, but it was not possible to obtain robust estimates of that possible channel.

Easier offshoring of production may have significantly raised the volatility of employment and wages

This section presents simple numerical simulations illustrating the potential impact of higher offshoring on the volatility of employment and wages, via its effect in raising labour demand elasticity and, thus, magnifying the propagation of labour demand shocks. Two sets

Table 3.3. **Globalisation and the absolute elasticity of labour demand**

Differences in absolute elasticities between industries facing high and low levels of foreign competition, 1987-2003[a]

	Import penetration			Industry-specific exchange rate		
	Low	High	Difference	Depreciation	Appreciation	Difference
All industries	0.264***	0.110**	−0.154**	0.218***	0.254***	0.035
Manufacturing	0.306***	0.211***	−0.095	0.219***	0.228***	0.008

	Narrow offshoring			Broad offshoring		
	Low	High	Difference	Low	High	Difference
All industries	0.198	0.611***	0.413***	0.259*	0.475***	0.216*
Manufacturing	0.188	0.384**	0.196**	0.488**	0.353*	−0.135

* significant at 10%; ** significant at 5%; *** significant at 1%.

a) OLS estimates of conditional labour demand models which include an interaction term between an indicator variable of foreign competition, which equals one if competition is high and zero otherwise, and the wage variable (see main text for further details).

Source: OECD estimates. See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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of wage and employment responses are calculated for a hypothetical trade shock that shifts the labour demand curve down by 1%: one for industries characterised with low levels of narrow offshoring and one for industries with high levels of narrow offshoring, using the estimated labour demand elasticities reported in Table 3.3 (0.20 and 0.61 respectively).[60] These hypothetical shocks and the two estimated labour demand elasticities are combined with four possible values for the elasticity of labour supply, in order to obtain an overview of the range of possibilities.[61]

As presented in Table 3.4, the main results from this exercise are as follows:

- Under the assumption of perfectly elastic labour supply ($\eta^S = \infty$), wages are exogenous and a demand shock only affects employment. In a low-offshoring industry, a 1% negative trade shock reduces employment approximately 0.2%, whereas the response is three times larger in a high-offshoring industry (0.6%).

- When the labour supply elasticity is finite, the negative demand shock lowers both employment and wages, with the decline in wages dampening the fall in employment. Taking the example of a unitary labour supply elasticity, the employment losses become 0.17% in a low-outsourcing industry and 0.38% in a high-outsourcing industry, with wages falling by an equal amount in both cases.

In sum, labour demand shocks lead to considerably more volatility of both wages and employment when labour demand is more elastic. Furthermore, the estimated impact of offshoring on labour demand elasticity is large enough to suggest that a further expansion of international production networks might contribute to significantly increasing employment and earnings volatility. However, this analysis represents a first cut at a complex issue and further research is required to clarify whether offshoring is, in fact, having a magnification effect on the propagation of labour demand shocks by raising the elasticity of labour demand and what other factors play a role.

2.3. *The impact of foreign competition on individual workers*

In this section, the effects of foreign competition on individual workers are studied using individual panel data for 1994-2001 in 13 European countries.[62] The data used are

Table 3.4. **Implications of offshoring for employment and wage volatility**

Simulated impacts of a negative shock to labour demand[a]

Elasticities of labour supply	Labour-demand elasticities[b]			
	Low offshoring (0.20)		High offshoring (0.61)	
	dlnW/dlnA	dlnL/dlnA	dlnW/dlnA	dlnL/dlnA
0	−1.000	0.000	−1.000	0.000
1	−0.165	−0.165	−0.379	−0.379
2	−0.071	−0.180	−0.137	−0.468
∞	0.000	−0.198	0.000	−0.611

a) Data values shown are estimates of the percentage changes in wages (W) and employment (L) from a trade shock (A) shifting labour demand down by 1%.
b) The price elasticities of labour demand in parentheses correspond to the elasticity estimates in Table 3.3 for narrow offshoring.

Source: OECD estimates. See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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from the European Community Household Panel (ECHP). This is a harmonised longitudinal survey of households and individuals conducted by Eurostat, which allows individual workers to be tracked through time.[63]

The analysis proceeds in two stages. In the first stage of the analysis, the impact of foreign competition on individual job separations (worker movements) is analysed using quarterly data. The analysis distinguishes three types of separations which differ in terms of the worker's economic status directly after leaving his or her job: a worker can be employed (in another job), unemployed or inactive (out of the labour force). These three types of transitions provide an indication of the nature of the separation and its consequences for the worker. It is likely that job-to-job transitions predominantly reflect voluntary movements, while transitions into unemployment are predominantly involuntary. Transitions out of the labour force are not so easily classified as being either voluntary or involuntary. The analysis of job separations can thus shed light on the effect of foreign competition on overall job stability (*i.e.* the rate at which workers separate from their jobs) as well as on job security (*i.e.* the risk of involuntary job loss).[64]

In the second stage of the analysis, the impact of foreign competition on individual wages is analysed using annual data.[65] Foreign competition may affect the wages of both job stayers and job changers, but the present analysis focuses exclusively on workers who stay in the same job.[66] In a competitive labour market, the earnings of all workers, job changers and stayers alike, adjust instantaneously to changes in market conditions, so as to equal marginal revenue product. However, workers frequently stay with the same employer for many years and, in that context, there can be good reasons for employers to stabilise the wages of incumbent workers. For example, these types of "implicit contracts" may help to share risks more efficiently or ameliorate hold-up problems associated with firm-specific human capital (Bils, 1985; Malcolmson, 1999). The finding in the previous sub-section, that labour demand elasticity has increased raises the question whether employers are becoming either less able or less willing to invest in long-run employment relations, including by shielding incumbent workers from earnings fluctuations.[67] The analysis of wage dynamics tests whether greater foreign competition is, in fact, associated with greater wage volatility for job stayers with relatively stable jobs.

Foreign competition increases job instability…

Job security (and job stability more generally) is analysed here using quarterly hazard rates (i.*e.* the probability that a worker will separate from his or her job within a given quarter conditional on having stayed in the job up to that point). Separate proportional hazards models are estimated for each of the three destination states: another job, unemployment and inactivity. The baseline hazard is nonparametric, being approximated by a piece-wise constant function. The regressors used include a rich set of controls for individual characteristics, including age, gender, having a child, living in a couple, education level, and occupation categories. Additional regressors include an indicator variable for public sector jobs and a complete set of industry, country and time dummies. Most importantly, foreign competition is measured using the industry-specific exchange rate.[68]

Table 3.5 reports separate estimation results for these proportional hazard models based on the full sample and five sub-samples: low- and high-tenure workers, and workers in low-, medium- and high-skill occupations. The following findings emerge:

● The large majority of job separators in the sample are workers who move directly to another job (79%). Transitions into unemployment represent just 12% of total separations and those into inactivity only 9%.

● The determinants of job-to-job transitions are very different from those for transitions out of employment, confirming the importance of distinguishing between alternative destination states.[69]

● A depreciation of the industry-specific exchange rate reduces the probability of moving out of a job for all workers and all destination states, although this effect is not statistically significant for job-to-job transitions in the full sample. This is consistent with the analysis in Section 2.1, which shows that an increase in foreign competition tends to reduce sectoral labour demand, while also suggesting that an important share of trade-induced reductions in sectoral employment take the form of involuntary separations (i.*e.* trade displacement).

● The impact of foreign competition on individual worker movements differs across sub-groups within the workforce. Foreign competition increases the job-to-unemployment hazard for workers with relatively low job tenure (less than five years) and increases the job-to-job hazard for low-tenure workers and those in medium-skill occupations. This latter finding may indicate that medium-skill workers can more easily find comparable alternative employment than other workers, when their employer experiences financial difficulties or they are displaced. Finally, foreign competition increases transitions out of the labour force, particularly among high-tenure and low-skill workers, suggesting that increased foreign competition induces some low-skill workers to retire early.

The analysis suggests that an intensification of foreign competition makes jobs less stable by increasing the probability of job separations. Since transitions to all three destinations increase, it appears that import competition is a stimulus to both voluntary and involuntary mobility. The analysis also highlights the heterogeneity of the impact of foreign competition on different groups in the workforce, with low-tenure and low-skill workers experiencing the biggest increase in transitions out of employment and workers in medium-skill occupations showing the largest increase in job-to-job transitions.

Table 3.5. **The impact of foreign competition on individual job separations, 1993Q1-2001Q4**[a]

	All	Job tenure[b]		Skill (occupation)[c]		
		Low tenure	High tenure	Low	Medium	High
Panel A. **Job-to-job transitions**						
Age	0.001	0.001	−0.004**	0.000	0.002	0.001
Age square	0.000***	0.000*	0.000	0.000**	0.000**	0.000*
Male	0.189***	0.224***	0.096	0.208***	0.220***	0.044
Household with child(ren)	0.057*	0.053	0.071	0.027	0.064	0.017
Couples	−0.118***	−0.120***	−0.121**	−0.039	−0.169***	−0.164**
Upper secondary education	−0.025	0.032	−0.192***	0.042	−0.030	−0.076
Less than upper secondary education	−0.051	−0.012	−0.182***	0.023	−0.066	−0.098
Medium-skill occupations[c]	−0.028	−0.004	−0.131*			
Low-skill occupations[c]	0.029	0.108*	−0.265***			
Public sector	−0.329***	−0.211*	−0.639***	−0.344**	−0.229	−0.399
Industry-specific exchange rate[d]	−0.228	−0.290*	−0.045	−0.198	−0.434**	0.103
Observations	431 321	161 445	270 559	201 275	150 591	78 822
Panel B. **Job-to-unemployment transitions**						
Age	0.002	0.002	0.004	0.006**	−0.003	−0.001
Age square	0.000	0.000	0.000	−0.001**	0.000	0.000
Male	−0.227***	−0.221**	−0.277*	−0.118	−0.354***	−0.452**
Household with child(ren)	0.189***	0.230***	0.082	0.247***	0.156	−0.170
Couples	−0.226***	−0.181*	−0.271*	−0.278**	−0.261*	0.283
Upper secondary education	0.061	0.055	−0.004	0.249	−0.047	−0.133
Less than upper secondary education	0.197	0.178	0.161	0.404**	0.064	0.033
Medium-skill occupations[c]	0.527***	0.764***	0.175			
Low-skill occupations[c]	0.611***	0.843***	0.253			
Public sector	0.610***	0.820***	−0.129	0.667***	0.297	0.233
Industry-specific exchange rate[d]	−0.772***	−0.842**	−0.664	−0.754*	−0.648	−1.143
Observations	458 454	165 321	278 247	207 709	155 297	71 304
Panel C. **Job-to-inactivity transitions**						
Age	−0.028***	−0.025***	−0.024***	−0.026***	−0.029***	−0.044***
Age square	0.003***	0.003***	0.003***	0.003***	0.003***	0.005***
Male	−0.643***	−0.666***	−0.667***	−0.604***	−0.864***	−0.134
Household with child(ren)	0.013	0.253**	−0.212*	0.032	0.017	0.178
Couples	0.252**	0.236	0.257	0.164	0.375*	0.006
Upper secondary education	−0.078	−0.045	−0.099	−0.153	−0.415	0.413
Less than upper secondary education	0.137	0.328	−0.091	0.000	−0.012	0.062
Medium-skill occupations[c]	0.228	0.097	0.361*			
Low-skill occupations[c]	0.335**	0.046	0.643***			
Public sector	0.845***	0.543*	1.046***	0.971***	0.423	1.556***
Industry-specific exchange rate[d]	−0.721**	−0.609	−0.791*	−1.048***	−0.221	0.232
Observations	416 859	152 785	260 650	194 411	140 806	56 672

* significant at 10%; ** significant at 5%; *** significant at 1%.

a) Proportional hazard estimates by destination status. The baseline hazard is approximated by a piece-wise constant function. The models were estimated using an unbalanced panel of agriculture and manufacturing industries. The hazard models include a complete set of industry, country and time dummies. Error terms are clustered by industry and country groups.

b) Low job tenure is defined as less or equal to 60 months and high tenure as more than 60 months.

c) High-skill occupations include: legislators, senior officials and managers; professionals; technicians and associate professionals; medium-skill occupations include: clerks; services workers and shop and market sales workers; craft and related trades workers; low-skill occupations include: skilled agricultural and fishery workers; plant and machine operators and assemblers; and elementary occupations.

d) Three-quarter moving average of the log of the change in industry-specific exchange rate.

Source: OECD estimates based on the European Community Household Panel (ECHP). See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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... and also wage instability

Does foreign competition also increase the volatility of wage stability among job stayers? In order to analyse the wage dynamics of job stayers, a standard wage equation is augmented to include a measure of foreign competition, the industry-specific real exchange rate, and two measures of conditions on the external labour market, industry-level multi-factor productivity (MFP) and the national unemployment rate. In order to evaluate how foreign competition affects the sensitivity of wages to industry-specific shocks, the industry-specific exchange rate is interacted with MFP. The analysis is restricted to job stayers with stable jobs that have been in their job for at least 12 months and have a permanent contract.

Table 3.6 reports estimation results for the full sample and five sub-samples: low- and high-tenure workers, and low-, medium- and high-skill workers. The following findings emerge:

● The wages of job stayers with stable jobs are relatively insensitive to market conditions as reflected by the less than proportional response in earnings to changes in multi-factor productivity. More specifically, a 1 percentage point increase in multi-factor productivity leads to an increase in average annual earnings of 0.12%. However, substantial differences exist across different subgroups of the workforce. The wages of low-tenure workers (one to five years) and workers with less than upper secondary education exhibit greater responsiveness to MFP, whereas the wages of workers with medium and high levels of skill appear to be relatively isolated from market conditions.

● Foreign competition, as proxied by the industry-specific exchange rate, has only a small direct effect on wages after controlling for MFP. A depreciation of the industry-specific exchange rate of 1% increases average annual earnings by about 0.01%. This effect is however somewhat stronger for high-tenure and low-skill workers.

● The intensification of foreign competition via an appreciation of the exchange rate tends to amplify the sensitivity of wages to industry-specific shocks, as is indicated by the negative and significant sign on the interaction term between the industry-specific exchange rate and MFP. However, the small size of the estimated coefficient means that its economic impact is modest. The effect is relatively more important for low-tenure and low-skill workers, than for other groups in the workforce.

Table 3.6. **The impact of foreign competition on individual wages, 1994 and 1999[a]**

	All	Job tenure[b]		Skill (occupation)[c]		
		Low tenure	High tenure	Low	Medium	High
Unemployment	−0.006***	−0.006	−0.005**	−0.003	−0.012***	0.002
Multi-factor productivity (MFP)	0.115***	0.190**	0.093**	0.198***	0.060	0.065
MFP * Log industry-specific exchange rate	−0.012**	−0.026**	−0.006	−0.022***	−0.006	−0.007
Log industry-specific exchange rate	0.014*	−0.011	0.024***	0.031**	0.010	0.013
Number of observations	26 023	7 731	18 252	8 395	11 221	6 379
Number of groups	8 657	3 862	5 821	2 862	3 786	2 096
R-squared	0.03	0.05	0.02	0.02	0.03	0.04

* significant at 10%; ** significant at 5%; *** significant at 1%.
a) Fixed effects estimates. Regressions include controls for age, age square and full set of time dummies.
b) Low job tenure is defined as less or equal to 60 months and high tenure as more than 60 months.
c) High-skill occupations include: legislators, senior officials and managers; professionals; technicians and associate professionals; medium-skill occupations include: clerks; services workers and shop and market sales workers; craft and related trades workers; low-skill occupations include: skilled agricultural and fishery workers; plant and machine operators and assemblers; and elementary occupations.
Source: OECD estimates based on the European Community Household Panel (ECHP). See Annex 3.A1 for detailed information on data sources, variable definitions and sample coverage.

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The wage analysis suggests that foreign competition has both direct and indirect effects on individual earnings. Most novel, there is some evidence that foreign competition increases wage volatility by reducing the ability or willingness of employers to insulate wages of continuing workers from changing market conditions. By contrast, no evidence is found that wage volatility rises for workers with at least a medium level of skill or more than five years of job tenure.[70]

Conclusion

Have OECD workers become increasingly vulnerable due to the impact of globalisation? There is no simple, yes or no, answer to this question. The evidence presented in this chapter shows that the expansion of trade is a potentially important source of vulnerability for workers. This is particularly true for the labour force groups most exposed to import competition or least prepared to navigate in labour markets characterised by intensive restructuring, rising skill requirements and employers who are increasingly sensitive to differences in labour costs. Popular concerns about how foreign competition is affecting workers deserve to be taken seriously, but they also appear to be exaggerated in many cases. Indeed, trade appears to have made only a modest contribution to the upward trend in inequality in recent decades, while evidence is lacking for a general increase in insecurity. Perhaps of greatest importance, recent experience confirms that the right mix of domestic policies can generate strong labour market performance, even in very open economies. The bottom line lesson would seem to be that the impacts of globalisation on labour markets are manageable, but international economic integration increases the urgency of enacting pro-growth and pro-employment policies which also ensure that political support for open trade and investment will not be eroded by excessively high levels of insecurity or inequality.

Which types of labour-market policies are required in response to globalisation? While the empirical analysis in this chapter provides a useful first step to answering this question it certainly does not provide a definitive answer. Nonetheless, several broad policy orientations do emerge:

- Trade deepening – especially the rapid integration of large developing economies into the global trading system and the expansion of international production networks – is constantly generating new opportunities for specialisation in production (and undermining old specialisations). A first prerequisite for workers to benefit from globalisation is that businesses seize these opportunities. Policies that facilitate innovation and business formation are crucial in this context.

- Policies to enhance mobility in the labour market can also help individuals and firms to seize emerging opportunities in the world economy. Measures ensuring that workers flow from declining to expanding activities, as the economy restructures itself, are likely to be particularly important. Well-designed employment protection legislation is one of the policies that can contribute to efficient labour reallocation. It is counterproductive to defend jobs that have become uncompetitive, but moderate advance notice requirements and severance pay, structured so as to avoid penalising voluntary mobility (*cf.* the Austrian system of individual savings accounts described in OECD, 2006b), can play a positive role. Since foreign competition is continually changing the structure of labour demand, it is also important that wage setting institutions allow relative wages to adjust to changing market conditions.

● Employment-oriented social policies can help to reconcile security for workers with efficient mobility in the labour market. As is emphasised in the Restated OECD Jobs Strategy (OECD, 2006a, b), relatively generous welfare benefits can be consistent with high employment rates and efficient worker mobility. What is required is that these benefits be combined with mutual-obligations/activation policies which increase re-employment opportunities while mitigating work dis-incentive effects embodied in generous welfare systems. "Make work pay" measures may also be required to make sure that globalisation does not push low-skill workers into working poverty. While in-work benefits *cum* moderate minimum wages can shore up the incomes of low-skill workers, they do not improve longer-term career prospects. Skill development opportunities for low-educated workers are also required to limit low-pay traps and the rise in earnings inequality, as skill requirements rise.

● Governments can help to sustain political support for international economic integration by fostering an open and well-informed discussion of the benefits and costs of globalisation. To be credible, such a discussion needs to frankly acknowledge the costs of globalisation and also take account of wider concerns about economic insecurity and inequality. Most importantly, governments need to explain how their policies are addressing those concerns while also supporting international economic integration. Further research clarifying how globalisation is affecting workers' well-being would contribute to the success of these discussions, by helping to ground them in fact rather than unfounded fears or unrealistic hopes.

Notes

1. This chapter presents results from Part 3 of the OECD's horizontal project on globalisation and structural adjustment, which is a collaborative study undertaken by the Directorate of Employment, Labour and Social Affairs and the Directorate for Trade and Agriculture.

2. Berg and Krueger (2003) and Lewer and Van den Berg (2003) provide alternative estimates of the overall gains from trade which confirm that they are substantial. The evidence is more mixed concerning whether trade openness leads to a sustained increase in growth rates (Baldwin, 2003; Nordås, Miroudot and Kowalski, 2006). There is also growing evidence – which is surveyed in World Bank (2005) – that the potential contribution of trade to stronger economic growth is unlikely to be realised in the absence of an appropriate institutional environment, (*e.g.* an effective legal system which secures property rights). These preconditions have yet to be established in a number of developing economies.

3. A number of recent studies have analysed the adjustment costs borne by trade-displaced workers and concluded that these costs are substantial (Kletzer, 2002; OECD, 2005a). The possibility that import competition from developing countries has reduced the wages of low-skill workers has also received much attention from economists (Slaughter, 2000; Feenstra, 2007). Overall, these studies suggest that trade has been a factor behind the declining position of less skilled workers in OECD labour markets, but that skill-biased technical change probably has played a larger role. For a comprehensive overview of the literature on globalisation and labour markets see ILO/WTO (2007).

4. The seven countries included in the GMF poll are France, Germany, Italy, Poland, the Slovak Republic, the United Kingdom and the United States. The Eurobarometer data reflect public opinion in all EU member and candidate countries at the date of the survey (May 2005), except Latvia.

5. Whereas 87% of the American Ph.D. economists surveyed by Whaples (2006) supported "the elimination of all remaining tariffs and barriers to trade", 76% of Americans in a World Public Opinion/Chicago Council on Global Affairs poll in 2006 believed that "protecting the jobs of American workers" was a very important foreign policy goal for the United States (WPO/CCGA, 2007).

6. The chapter does not explicitly analyse the impact of FDI on labour market outcomes. However, the labour market effects of FDI should be reflected in the empirical results to a considerable extent. The trade statistics which are analysed include trade within multinational firms which is closely related

to FDI. The specific impact of FDI on employment is analysed in a complementary OECD study (Molnar, Pain and Taglioni, 2007). International migration also lies outside of the scope of the chapter. See Hijzen and Nelson (2007) for a recent overview of the labour market effects of immigration.

7. See Goldberg and Pavcnik (2007) for an overview of the distributional effects of trade liberalisation in developing countries.

8. Brazil, Russia, India and China (the so-called "BRICs") account for 45% of the world labour and are increasingly open to trade and investment supply (see Chapter 1 of this publication). Over the past 15 years, total trade grew by over 50% as a proportion of GDP in Russia, it nearly doubled in China and more than doubled in Brazil and India.

9. This growth reflects the emergence of China as an important manufacturing hub for multinational companies from all over the world. China now ranks third, after Germany and the United States, among the world's exporters, with foreign companies accounting for 60% of its trade. The composition of Chinese exports has also shifted rapidly toward products of increasing technological sophistication (Rodrik, 2007).

10. The rapid growth in FDI provides an alternative indicator of the development of international production networks (Molnar, Pain and Taglioni, 2007).

11. The sample includes 13 OECD countries and Chinese Taipei.

12. See OECD (2007a) for a detailed discussion of alternative ways to measure offshoring.

13. The data values reported here tend to be quite a bit lower than those reported by Campa and Goldberg (1997), because the primary sector is excluded.

14. By contrast, Ahn, Fukao and Ito (2007) show that international production networks and trade in intermediates has grown very rapidly during the past decade in East Asia countries, including China.

15. There is not a significant cross-country correlation between openness and unemployment performance in either levels or first differences (data not shown).

16. Both measures are likely to be affected by the demographic structure of the labour force. However, re-calculating these two indicators for prime-age men also indicated no clear trend in job stability.

17. OECD (1997) showed that workers' subjective perceptions of job security deteriorated in many OECD between the mid-1980s and mid-1990s, even in the absence of a general rising trend in labour turnover rates. That study concluded that the rise in perceived insecurity probably reflected an increase in the perceived cost of being laid-off (*e.g.* due to a rising incidence of long-term unemployment). The very fragmentary data available for more recent years suggest that the increasing trend in perceived insecurity may have stopped or even reversed during the past decade in many countries, consistent with the downward trend in long-term unemployment since the mid-1990s. (For trends in long-term unemployment, see the Statistical Annex to this publication.)

18. See Slaughter (2000) and Feenstra (2007) for good surveys of the empirical literature on trade and wages.

19. France and Japan are notable exceptions to the trend increase in earnings inequality. However, the OECD data on earnings inequality presented here only reflect trends in the dispersion of earnings among *full-time* workers. In both France and Japan, there is considerable concern about the possibility that labour market inequality is rising along other dimensions (*e.g.* between permanent and temporary workers or between full- and part-time workers).

20. For developed countries, which are relatively well endowed with medium- and high-skill workers, the HOS trade model predicts that trade with developing countries would drive down the wages of low-skill production workers in OECD countries. This suggests that 10th percentile earnings should fall relative to the median, rather than that 90th percentile earnings should pull away from median earnings. It is possible, however, to identify offshoring scenarios where unconventional distributional effects could result, since the results depend in part on locational complementarities across different production tasks, about which little is known (Antràs, 2003; Markusen, 2007). Similarly, some analyses of ICT-enabled offshoring – as well as the impact of computerisation more generally – suggest that the demand for medium-skill workers is most affected by these developments, because their job tasks are most easily assimilated to the algorithmic logic used by computers (Levy and Murnane, 2004; Autor, Levy and Murnane, 2006).

21. For trends through 2000, see Förster and Mira d'Ecole (2005). The OECD Secretariat is in the process of updating that analysis through 2005 and the text draws upon preliminary results from that updating.

22. For reasons of practicality and privacy, the incomes of the richest households are not accurately reflected in statistics on income inequality which are based on household survey data.

23. Both non-labour income and the redistributive impact of taxes are likely to be particularly important at the top of the income range. Nonetheless, it appears that a large share of the recent increase in very high incomes in the United Kingdom and the United States has resulted from increased labour earnings for the best paid workers (Dew-Becker and Gordon, 2006; Piketty and Saez, 2006).

24. As expressed by Grossman and Rossi-Hansberg (2006), "trade in tasks" deepens the impact of trade on the international division of labour, by allowing Ricardo's logic of trade according to comparative advantage to be applied separately to each of the individual production tasks in Adam Smith's pin factory.

25. The recent literature analysing trade with heterogeneous firms emphasises the pervasive impact of trade on the intensity of job reallocation across firms and, hence, potential worker dislocation (Bernard, Redding and Schott, 2006).

26. Interpreted this way, the industry-level wage variable in the sectoral labour-demand models controls for nation-wide changes in the wage conditional on inter-industry differences in the composition of the workforce.

27. This may take the form of changing the relative demand for different types of labour within industries or the total demand for labour relative to other factors of production.

28. As concerns the technology effect, it is *a priori* unclear whether and how the share of output that is exported should affect employment after controlling for output. The export share would be expected to matter for conditional labour demand only in the case when output destined for the domestic and export markets are produced using different technologies. Since exports (being part of output), are endogenous in the unconditional labour demand model, they cannot be included as an explanatory variable in this model.

29. Homogeneity was imposed on all models.

30. The unconditional labour-demand estimates suggest that import penetration is associated with a decline in the scale of production. However, the results from unconditional labour demand need to be interpreted with caution, since identification of the unconditional demand curve is somewhat problematic (see discussion in Box 3.1).

31. The conditional demand model was also estimated adding the export share as an additional regressor (results not shown). The estimated coefficient for the export share is positively signed, while the import share continues to enter negatively. When these two variables are replaced by the industry trade balance, defined as the difference between the export and the import share, this variable has a negative sign. However, the latter specification imposes the restriction that the impacts of the import and export shares on employment are identical in size but with opposite sign, which is rejected by the data. Indeed, the coefficient on trade balance largely reflects the impact of import penetration on conditional demand. This should not be taken as evidence that exporting does not much affect industry employment. It merely suggests that after controlling for output the export share in production does not matter much for employment.

32. No such a relationship is found in the unconditional labour-demand model. At face value, this suggests that increased foreign competition is associated with an increase in the scale of production. In principle, this could reflect the presence of productivity gains due to for example cheaper offshoring. However, this may also reflect poor identification of the unconditional labour-demand curve.

33. The analysis of offshoring presented here complements and extends the analysis provided by OECD (2007a), which only examines total offshoring. That study finds that total offshoring has a negative effect on employment, conditional on output, particularly in the manufacturing sector.

34. However, R&D intensity does have a positive effect on labour demand in the cross-section estimates, contrary to what one would expect. This is probably due to the high positive correlation between this variable and the offshoring variables. As excluding R&D might amplify the coefficient on offshoring, due to omitted variable bias, it was decided to leave R&D in the regressions. See OECD (2007b) for further details.

35. Narrow offshoring increased by about 1.5 percentage points (recorded in the data as 0.015) on average over the period 1995-2000 in the whole economy and by 2 percentage points in manufacturing.

36. More precisely, the unweighted average of 1995-2000 changes in services offshoring intensity in manufacturing did not increase. However, the sector size-weighted average did increase, consistent with Figure 3.3.

37. To the extent that all or some imported intermediate inputs from industries other than one's own were previously purchased from domestic suppliers, one would expect a larger coefficient on narrow than broad offshoring, as is observed. Ideally, one would also like to estimate the job losses that arise when firms substitute domestic suppliers in other industries by suppliers located abroad. However, this is not straightforward in the present setting.

38. Amiti and Wei (2006) provide empirical support for the prediction that offshoring generates substantial productivity gains. See Olsen (2006) for a survey of the literature on offshoring and productivity.

39. As is discussed below, the newly jobs created tend to be more skill-intensive than those destroyed.

40. The results in Tables 3.1 and 3.2 may be sample specific, rather than strictly inconsistent. The sensitivity of the estimation results to sample coverage (over countries, sectors and years) suggests that the impact of foreign competition of labour demand may be quite heterogeneous, varying with the nature of the trade flows and the national economic environment.

41. In other words, narrow offshoring has been characterised by a tendency to relocate abroad production tasks intensive in low-skill labour. Another way that OECD firms can access low-skill foreign workers is via international migration. Although offshoring and migration are to some extent substitutes, Grossman and Rossi-Hansberg (2006) emphasise that the distribution of the resulting efficiency gains differs. In the case of immigration, the gains are largely captured by the migrants, since they are employed at domestic factor prices (*i.e.* OECD wage levels). In the case of offshoring, the efficiency gains accrue to domestic factors of production.

42. R&D intensity had to be excluded from the regressions for broad offshoring due to the high level of co-linearity between the two variables (pair-wise correlation above 0.9).

43. Although the estimated semi-elasticities are large, the implied impact is dampened by the fact that the offshoring of business services is very small relative to value-added (1.5%). The coefficient on services offshoring corresponds to the impact of a one percentage point increase in the offshoring intensity of services, which would represent a 67% increase in this form of offshoring.

44. Fajnzylber and Maloney (2000), Krishna, Mitra and Chinoy (2001) and Hasan, Mitra and Ramaswamy (2007) analyse the elasticity of labour demand in the context of rapid trade liberalisations in various developing countries. Fajnzylber and Maloney (2000) do not detect a systematic relationship between the elasticity of labour demand and trade reform in Chile, Colombia or Mexico. Similarly, Krishna, Mitra and Chinoy (2001) find no relationship for Turkey. By contrast, Hasan, Mitra and Ramaswamy (2007) find that trade reform in India increased the elasticity of labour demand and that the increase is more pronounced in states with relatively flexible labour regulations.

45. However, he also finds that multinationals have a larger short-run elasticity indicating they adjust their employment levels more quickly in response to shocks, than do domestic firms.

46. A somewhat more aggregated industrial classification has been used for this part of the analysis, in order to achieve full coverage of the manufacturing sector. See Annex 3.A1 for a detailed description of the sample.

47. As in the previous section, all specifications are estimated in five-year differences using OLS. In order to ensure that the results are not driven by changes in the composition of industries and countries over the estimation period, a balanced panel is used. Using an unbalanced panel, instead, does not alter the message of the results, although changes over time in the estimated elasticities tend to be larger due to differences in the sample. In order to remove some of the volatility in the estimated elasticities of labour demand the estimates are based on a three-year moving averages rather than data for a single year. Once again, this change does not have an important effect on the results.

48. Re-estimating the elasticity of labour demand using the total number of hours instead of the total number of employees produces qualitatively similar results.

49. Due to limited data availability for individual services industries, the estimates for the services sector have to be interpreted with caution.

50. Accordingly, one would expect that the gradual skill upgrading of the labour force would have reduced the elasticity of labour over time everything else equal.

51. Slaughter (2001), who experiences similar problems using data for the United States, suggests that this problem arises because shifts in labour demand cannot be adequately accounted for with the available data. Including the capital stock, import penetration and the industry-specific exchange rate to control for the location of the demand curve did not solve this problem.

52. As a result, shifts in labour supply, as captured in our regression model by changes in the wage variable, trace out the labour demand curve (Slaughter, 2001). The location of the conditional labour demand schedule is pinned down by controlling for output and capital. Note that the regressions do not explicitly control for labour productivity, which may also lead to shifts in the labour demand curve. R&D intensity, a standard proxy used in this context, is only available from 1987 onwards. In

an effort to control for factor-biased technological change, import penetration and the industry-specific exchange rate were included as a robustness check. This did not change the results in any significant way. See OECD (2007b) for details.

53. The assumption of perfectly elastic labour supply may be less problematic over relatively long time horizons, in so far as workers change sectors in response to inter-industry wage differentials in the long-run as in the HOV trade model. This is another reason for estimating the model in five-year differences.

54. An alternative estimation strategy is to make use of instruments for female labour supply when estimating the labour demand system. A number of instrumental variables have been tried, but the results have been inconclusive. See OECD (2007b) for further details.

55. Figure 3.11 displays data for narrow offshoring, but results are similar when using total offshoring.

56. One reason for finding only a weak relationship here may be that product market competition is being juxtaposed with the conditional elasticity of labour demand, which in theory is independent of product market competition.

57. The indicator variable equals one for industries with high rates of import penetration, high offshoring intensity and industries that witnessed a depreciation. As there is no natural cut-off for the import penetration and the offshoring indicators, the indicator variables were defined so as to split the sample approximately in half. The coefficient on the wage variable in the regressions represents the labour demand elasticity for industries where the indicator variable equals zero and the coefficient on the interaction term gives the difference in labour demand elasticities between industries with an indicator variable equal to one and industries with an indicator variable equal to zero. Since the indicator variables are time-invariant, there is no need to include them separately in the estimating equations: their independent effects drop out of the estimation model after differencing.

58. These results are consistent with previous findings for the US provided by Senses (2006), who finds that since 1985 the elasticity of labour demand in heavy offshoring industries exceeded that in other industries.

59. Industries with high levels of import penetration have less elastic labour demand, contrary to expectations. This may reflect the fact that industries with high import penetration also tend to have experienced a depreciation in the industry-specific exchange rate, which would tend to reduce the elasticity of labour demand.

60. These simulations make use of the methodology as described in Hasan, Mitra and Ramaswamy (2007).

61. Since the elasticities in Table 3.3 were estimated assuming perfectly elastic labour supply, the simulations based on finite supply elasticities are not fully consistent. To the extent that this assumption is violated the demand elasticity estimates are upward biased, with the size of the bias depending on the actual elasticity of labour supply. In principle, it is possible to back out the actual elasticity of labour demand using the estimated elasticity of labour demand in conjunction with the actual value of the elasticity of labour supply. The bias-corrected elasticity of labour demand would be larger in absolute value than the estimated elasticities. Moreover, given that the actual elasticity of labour supply is not known a bias-corrected elasticity of labour demand has to be calculated for each assumed value of the elasticity of labour supply. However, the purpose of the simulations is to illustrate the qualitative implications of trade shocks for different values of labour demand and supply elasticities, which can more clearly be done on the basis of the uncorrected elasticity of labour demand.

62. The EU15 minus Luxembourg and Sweden.

63. The analysis is restricted to the manufacturing sector.

64. Previous studies adopting an individual-level approach to analyse the impact of globalisation on job security include Goldberg, Tracy and Aaronson (1999), Kletzer (2002), Munch (2005), Egger, Pfaffermayer and Weber (2007) and Geishecker (2007).

65. Previous studies that have explicitly looked at the impact of foreign competition on individual wages are Goldberg and Tracy (2003), Geishecker and Görg (2003), and Munch and Shaksen (2005).

66. OECD (2005a) provides a detailed analysis of the wage losses of trade-displaced workers.

67. Traca (2005a) proposes a model in which wage volatility depends on the degree of openness in an industry. International economic integration reduces the price-dampening effect of variations in industry output, thereby increasing the elasticity of product and labour demand. Using industry-level data for the United States, he finds that wage volatility increases with trade exposure. Bertrand (2004) finds that foreign competition reduces the influence of market conditions at the

time workers are hired on their future earnings and increases the influence of current market condition, consistent with foreign competition reducing the ability or willingness of firms to provide stable wages.

68. It is not straightforward to link the information in the ECHP to external data on market conditions in specific industries as most information in the ECHP relates to the date of the interview and interviews are not conducted at regular time intervals. In order to link the information in the ECHP with industry-level data, the ECHP data had to be re-organized in calendar time. See OECD (2007b) for details.

69. In particular, male workers are less likely to become unemployed or inactive than their female counterparts, but are more likely to move into another job. Employees with children appear more likely to separate from their jobs than employees that have no dependants. Individuals who are part of a couple are less likely to move to another job or become unemployed, but are more likely to leave the labour force. The level of education does not appear to have an impact on the job separation hazard, which may reflect problems in comparing education levels across countries. Workers in less skilled occupations tend to have a higher probability to become unemployed or inactive. Workers in a public firm are less likely to make a job-to-job transition, but more likely to become unemployed or inactive.

70. In the spirit of Bertrand (2004), the model was augmented to include the level with MFP at the start of a job and its interaction with the industry-specific exchange rate. To the extent that job stayers are relatively insulated from market conditions, whereas job changers are not, one would expect that the market conditions at the time of hiring ("the ports of entry") continue to exert an effect on future wages, so long as the worker remains with the same firm. As in Bertrand (2004), foreign competition appears to reduce the role of ports of entry on future wages, but this effect is not statistically significant (results not shown).

ANNEX 3.A1

Background Information for the Econometric Analysis

This annex presents background information for the econometric analysis in Section 2 of the main text. Data sources and variable definitions are reported in Table 3.A1.1 while country, industry and year coverage for the various parts of the analysis are reported in Table 3.A1.2.

Table 3.A1.1. **Variable definitions**

Panel A. **Industry-level controls**

Variable	Definition	Source
Employment	Log of total persons engaged.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database.
Hours	Log of total hours worked.	Groningen Growth and Development Centre, 60-Industry database.
Wage	Log of total labour costs divided by the number of employees.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database.
Materials[a]	Log volume of materials at 2000 constant prices.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database and OECD's Input-Output database.
Price of materials[b]	Log price index of materials.	OECD STAN database (current and previous editions), Groningen Growth and Development Centre, 60-Industry database, OECD STAN Input-Output database.
Capital stock[c]	Log volume of capital stock at 2000 constant prices.	OECD STAN database (current and previous editions).
Value-added	Log volume of value added at 2000 constant prices.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database.
Price of value-added	Log value-added price index.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database.
Output[d]	Log volume of output at 2000 constant prices.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database and OECD STAN Input-Output database.
Price of output[e]	Log price index of output.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database and OECD STAN Input-Output database.
R&D intensity	Ratio of real expenditure on research and development over real value-added.	OECD Analytical Business Enterprise Research and Development (ANBERD) database.
Unemployment rate	Unemployment rate of persons aged 15-64.	OECD database on Labour Force Statistics.
MFP	Multi-factor productivity measured with Tornqvist index based on value-added production function.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database.
Mark up	Value added over the wage bill.	OECD STAN database, Groningen Growth and Development Centre, 60-Industry database.

Table 3.A1.1. **Variable definitions** (*cont.*)

Panel B. **Worker-level controls**

Variable	Definition	Source
Gender	Gender of person interviewed (PD004).	European Community Household Panel (ECHP).
Age	Age at the date of interview (PD003).	European Community Household Panel (ECHP).
Living in a couple	Person is living in consensual union (PD007).	European Community Household Panel (ECHP).
Household with child(ren)	Number of children aged less than 16 in the household calculated as the difference between the household size (HD001) and the number of adults in the household (16 years or more) (HD002).	European Community Household Panel (ECHP).
Educational attainment	Highest level of general or higher education completed (PT022), corresponding to the three main groups of the ISCED classification (*i.e.* 0/1/2 Less than upper secondary education; 3/4 Upper secondary education and tertiary education).	European Community Household Panel (ECHP).
Occupational level	Skill requirements of occupation based on three categories: high-skilled, medium-, and low-skilled. This variable is based on the occupation in the current job, *i.e.* principal activity performed (PE006C) corresponding to the nine 1-digit occupations of the ISCO-88 classification (*i.e.* Legislators, senior officials and managers; professionals; technicians and associate professionals; clerks; services workers and shop and market sales workers; skilled agricultural and fishery workers; craft and related trades workers; plant and machine operators and assemblers; and elementary occupations). Skilled occupations include: legislators, senior officials and managers; professionals; technicians and associate professionals; medium-skilled occupations include: clerks; services workers and shop and market sales workers; craft and related trades workers; low-skilled occupations include: skilled agricultural and fishery workers; plant and machine operators and assemblers; and elementary occupations.	European Community Household Panel (ECHP).
Public status	Current job in private or public sector (PE009). Private sector includes non-profit private organisations and the public sector includes para-statal firms.	European Community Household Panel (ECHP).
Individual wage	Log average hourly wage and salary earnings (PI111).	European Community Household Panel (ECHP).

a) For observations for which information on the volume of materials was not available, the volume of materials was imputed by dividing the current value of materials, if available, or otherwise the difference between the current value of output and value-added, by the price index of materials (see below).

b) For observations for which information on the price of materials was not available, the price of materials was imputed using the input-output tables. The price index of materials was imputed by multiplying the share of total purchases (domestic plus imported) by industry *i* from supplying industry *j* in total intermediate purchases (domestic plus imported) by industry *i* with the price of value-added of industry *j*. For the panel data analysis this involves making the assumption that the composition of inputs is fixed over time and corresponds to that in 2000.

c) For countries for which the capital stock was not available or industry coverage was insufficient, capital stocks were reconstructed from gross fixed capital formation using a perpetual- inventory method based on an assumed depreciation rate of 10%.

d) For observations for which information on the volume of output was not available, the volume of output was imputed by adding the volume of materials and the volume of value-added (see for more details the price of materials).

e) For observations for which information on the price of output was not available, the price of output was imputed by taking the sum of the share of value-added in output times the price of value-added and the share of materials in output times the price of materials (see for more details the price of materials).

Table 3.A1.2. **Sample coverage used in the chapter**

Documents	Period covered	Country coverage	Industry coverage (ISIC Rev. 3)
Table 3.1. Panel A	1987–2003 (unbalanced)	Austria, Belgium and Luxembourg, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36-37, 45, 50-52;70-71; 73-74, 55, 60-63, 72
Table 3.1. Panel B	1995 and 2005 (balanced)	Australia, Austria, Belgium and Luxembourg, Canada, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36-37, 45, 50-52; 70-71; 73-74, 55, 60-63, 72
Table 3.2. Import penetration	1994–2003 (unbalanced)	Belgium and Luxembourg, Canada, Finland, Norway, Portugal, Sweden, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36-37, 45, 50-52;70-71; 73-74, 60-63, 64, 65-67, 72
Table 3.2. Offshoring	1993–2003 (unbalanced)	Canada, Finland, Portugal, Sweden, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36-37, 45, 50-52, 60-63, 64, 70-71, 73-74, 65-67, 72
Table 3.3. Import penetration and industry-specific exchange rate	1987–2003 (unbalanced)	Austria, Belgium and Luxembourg, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Japan, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36-37, 45, 50-52;70-71; 73-74, 55, 60-63, 72
Table 3.3. Offshoring	1995, 2000 (balanced)	Australia, Austria, Belgium and Luxembourg, Canada, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36-37, 45, 50-52;70-71; 73-74, 55, 60-63, 72
Table 3.5	1993-2001 (unbalanced)	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom.	ECHP industry codes for agriculture and manufacturing only.
Table 3.6	1994 and 1999 (unbalanced)	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain and the United Kingdom.	ECHP industry codes for agriculture and manufacturing only.
Figure 3.11 and Figure 3.12	1980-2002 (balanced)	Austria, Belgium and Luxembourg, Denmark, Finland, France, Italy, the Netherlands, Norway, Spain, the United Kingdom and the United States.	15-16, 17-19, 20, 21-22, 23, 24, 25, 26, 27-28, 29-33, 34-35, 36-37, 40-41, 45, 50-52; 70, 55, 60-64, 65-67, 75, 80-99

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