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New trends in globalisation and the international division of labour: Consequences for Europe ?

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The views expressed in this paper are those of the authors and do not necessarily represent those of the DGTPE. The paper is issued with a view to encouraging discussion and comment.

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Abstract

A new trend in globalisation has occurred since the end of the 1990s, linked to the emergence of China, namely the revival of inter-industry trade. This paper seeks to assess the long-term effects of this new trend in the skill structure of labour demand in Europe. We conduct a comparative analysis, estimating extrapolations for labour demand and supply in manufacturing industry to 2020, taking the skill structure of labour demand into account. We estimate the impact of the growth in inter-industry trade on skill demand, together with the impact of technological change induced by increased inter-industry trade.

Our findings suggest that this trend may significantly modify the industry structure of manufacturing in the EU, entailing the displacement of workers of all skill levels from certain sectors to others. It ought also to depress overall demand for low and medium-skilled workers. Once the services sector and the natural evolution of skill supply are taken into account, however, it looks as if the medium-skilled could be the group most vulnerable to globalisation. But the low-skilled too could also come under pressure by contagion.

RESUME

Depuis la fin des années 1990, notamment avec l'émergence de la Chine, la mondialisation est entrée dans une phase nouvelle marquée par la hausse de la part du commerce inter-branche. Ce document de travail a pour objet d'estimer les effets de long terme de cette nouvelle tendance sur la structure de qualification de la demande de travail en Europe. A partir d'une analyse comparative, il réalise des projections de la structure de l'offre et la demande de travail par qualification à l'horizon 2020, pour l'industrie manufacturière. Nous estimons l'impact de la hausse du commerce inter-branche sur la structure de la demande, ainsi que l'incidence du progrès technologique induit par la reprise de l'inter-branche.

Nos résultats suggèrent que cette tendance devrait modifier significativement, la structure de l'industrie européenne manufacturière, impliquant le transfert entre secteurs de travailleurs, quelque soit leur niveau de qualification. Elle devrait également réduire la demande de travail des peu et des moyennement qualifiés. Cependant, lorsque nous prenons en compte les tendances d'évolution dans le secteur de services et l'évolution naturelle de l'offre de travail par qualification, il apparait que la catégorie de population qui pourrait être la plus vulnérable serait les moyennement qualifiés. Ces pressions sur les moyennement qualifiés pourraient néanmoins également avoir des répercussions sur la situation des moins qualifiés par effet de contagion.

SYNTHESIS

Objectives and methodology

Rising trade flows driven by globalisation have prompted discussion of the consequences of an increased international division of production and labour. World trade is expanding, but relative factor endowments across trading partners are also diverging due to the emergence of countries such as China and India[1]. This phenomenon is expected to play a key role in the specialisation of European countries by industry, and to feed back into demand for labour and capital in each country.

The existing literature on globalisation and employment analyses the impact of globalisation on labour markets and in particular on the skill structure of labour demand. Thus it explains the relative inequality in terms of unemployment rates and wages, distinguishing skill-biased technological change and the international trade.

The originality of our methodology is that it analyses the effects of a recent trend in globalisation - the revival of inter-industry trade i.e. trade in different goods - on the projected skill structure of labour demand. We conduct a comparative analysis at the European level, estimating extrapolations for labour demand and supply in manufacturing industry to 2020 taking the skill structure into account. This extrapolation is also extended to the economy as a whole, including services notably. We estimate the impact on skill demand of the growth in inter-industry trade and of technological change arising from globalisation.

More precisely this document proposes a projection aimed at providing some insight into the following questions:

- How will globalisation affect various industries in the EU countries?
- Will demand for different categories of workers be affected significantly between now and 2020, and by which channels?
- What is the likelihood of current trends in the skill structure of labour supply mitigating changes in the structure of labour demand between now and 2020?

The paper starts with a short survey of standard analysis of labour markets in the context of globalisation (Part I). It is followed by a discussion of a new trend in globalisation, based on recent literature and the distinction between inter- and intra-industry trade flows (Part II). Part III first identifies correlations between production trends by industry in the EU and exposure to inter-industry trade flows; it then identifies correlations between technological change and exposure to inter-industry trade flows. These correlations are then used to project the effects of an increase in inter-industry trade and globalisation-induced technological change on manufacturing production and on skill demand in Member States by 2020 (Part IV). The order of magnitude of these effects stemming from the manufacturing sector's increased exposure to globalisation is then compared with projections of the skill structure of labour supply in EU countries (Part V).

Main findings

Increasing openness to trade in the developed countries is nothing new. It has been steadily growing for several decades. Existing literature shows it has had no significant effect on the global level of employment and a small but significant effect on low-skilled employment and inequality in developed countries.

What is new is that the share of inter-industry trade in total trade, which declined sharply in both the EU and the US between 1981 and the late 1990s (by up to 40 %), has now been increasing again in the US since 1998 (by about 30%), and in the EU since 1999. Part of this can be attributed to the growth

[1] See the European Commission's Occasional Paper on 'Responding to the Challenges of Globalisation', December 2005

in raw materials trade (oil imports in particular), but the change is also significant in manufacturing alone. It seems to reflect a change in the factors driving trade: whereas trade used to take place among similarly endowed developed countries, it now takes place more and more between developed countries and less developed ones, with greater emphasis on gains from specialisation by industry and from differences in factor endowments and prices. This potentially has a strong impact on skill demand: in developed countries, specialisation in sectors enjoying a comparative advantage can boost demand for skilled labour and depress demand for low-skilled workers.

Industries that are more exposed to inter-industry trade (either through imports or exports) are more likely to experience changes in their output levels, reflecting a new division of production. An extrapolation from the increase in inter-industry trade allows us to project the structure of output by manufacturing industry to 2020. Similarly, industries that are more exposed to inter-industry trade are more likely to modify their production function, for example through capital deepening. From this we can derive an impact of globalisation-induced technological change. Assuming a constant share of low-skilled, medium-skilled and high-skilled workers in each industry, we can also project the skill structure of labour demand to 2020. These estimations use the skill composition by sector observed in France, assuming that the same technology is available all over Europe and using the previous production projections.

At the EU level, according to these projections, machinery and equipment, chemicals and transport equipment are all likely to receive a boost from external trade, whereas textiles and food products are more likely to experience downward pressures. Results are also derived and presented by country. Needless to say this is only illustrative of a specific methodology and makes no claim to predict the future course of any sector or country, which depends on much more than globalisation pressures.

The consequences of inter-industry trade expansion on labour demand are significant but not overwhelming: demand for low-skilled workers in manufacturing industry could fall by about 2% by 2020, whereas demand for higher skilled workers could increase by about the same.[2] The integration of globalisation-induced technological change reinforces the shift in the structure of labour demand, leading to a slight increase in the demand for high-skilled workers. By 2020 inter-industry trade and globalisation-induced technological change is forecast to boost demand for high-skilled labour by about 3%, compared with a fall of around 2% in demand for low-skilled workers. The benign nature of these results stems from the weak correlation between the improvement in comparative advantage and the skill distribution of workers in manufacturing industry. It must be emphasized that this is likely to be sensitive to nomenclature: a more refined taxonomy of manufacturing industries would certainly increase the estimated effects on skill demand.

Whereas the overall impact on demand by skill is forecast to remain low, the international division of labour will trigger significant labour turnover in manufacturing at all skill levels: about 9% of the labour force may have to move from one industry to another between 2002 and 2020. The turnover rate will be roughly the same at all skill levels.
In most countries, the effects of globalisation on labour demand in manufacturing industry are likely to be counterbalanced for the most part by general trends in the supply of skills. Building on current educational attainment for a given cohort, the proportion of low-skilled workers in the EU labour supply will fall by around 17% to 2020, while those of medium and high skilled workers will rise by 5% and 14% respectively. This is due to the high proportion of lower skilled workers retiring, while younger cohorts entering the labour market are better educated. The trend will be further boosted by voluntary educational policies, and notably lifelong training, as evidenced by some country-specific studies.

All in all, according to these projections, pressure on the labour market is more likely to stem from shifts in labour supply than from labour demand in manufacturing industry. The fall in the supply of low-skilled workers will outpace the fall in demand. Meanwhile, demand for high-skilled workers will grow less than overall supply, but this will happen in a labour market that usually clears whatever

[2] These demand shifts conventionally assume a constant overall employment level in manufacturing. They should be interpreted as changes in the proportion of each skill demanded.

happens. Probably the most vulnerable population will be the medium-skilled, who are likely simultaneously to experience a small drop in demand and a rise in total supply.

The labour market impact of greater manufacturing industry globalisation is likely to be limited by comparison with current trends in services. Taking into account employment trends by skill level in agriculture and services (by conventionally extrapolating from observations of the recent past), variations in labour demand are wider. At the aggregate level, demand for low-skilled workers is forecast to remain unchanged overall, while supply is expected to fall by 6 percentage points. In contrast, demand for medium-skilled workers is expected to fall by 2.4 percentage points versus a 2.4 percentage point increase in total supply.
These projections suggest that the position of medium-skilled workers could deteriorate either through rising unemployment or from being compelled to accept jobs below their education attainments. If the latter were to occur, increased competition from medium-skilled workers could in turn jeopardise the position of low-skilled workers. The risk of this would rise if job requirements in terms of training and education were to rise over time.

Effects of globalisation on demand for skills in manufacturing in the EU

Level of skill	Impact of globalisation				
	Share	Change (%)		Share	
	2002	Exposure to inter-industry trade	Effect of globalisation-induced technological change	2020	*Turnover (%)*
Low-skilled	22.7	- 2	-0.7	22.1	9
Medium-skilled	41.9	- 1	-0.2	41.5	8
High-skilled	35.3	+2	+0.7	36.3	9
Total	**100**			**100**	**8**

Source : DGTPE

Changes in labour demand and supply for total economy by skill levels

Level of Skill	Demand			Supply		
	Share		Change (%)	Share		Change (%)
	2002	2020		2003	2023	
Low-skilled	22	22	0	34	27	-17
Medium-skilled	36	34	-7	43	46	+5
High-skilled	42	45	+6	23	27	+14
Total	**100**	**100**		**100**	**100**	

Source: DGTPE

To sum up:

- Recent years have seen an increase in pressure for a division of labour in manufacturing across countries.

- Pursuit of this trend could significantly modify the structure of manufacturing industry in the EU.

- This will in turn affect the labour market, mostly through displacement of labour demand for all skill levels, and more benignly through lower overall demand for lower skills and medium skills.

- This slightly lower demand for low-skilled workers in manufacturing industry reverses when trends in labour demand by skill level in agriculture and services are also taken into account, but the fall in demand for medium-skilled workers increases sharply.

- At the aggregate level, pressure on workers stemming from globalisation and technological change is likely to be met by ongoing changes in the structure of supply of low-skilled labour. As opposed to this, the supply of medium skills is forecast to rise while demand would decline.

- Difficulties encountered in the labour market by the medium-skilled, forcing them to accept jobs for which they are over-qualified, could impact on low-skilled workers.

These fairly complex and small effects on low-skilled workers may help to explain the difficulty empirical studies have encountered in documenting a clear impact of globalisation on relative wages and unemployment rates.

These findings lead to the following policy recommendations:

- The new trend in globalisation, linked to the emergence of China, does not entail a need for lifelong training to boost workers' average skills, since the trend in itself is likely to have only a minor impact on the skill structure of labour demand.
- However, the new trend in globalisation does call for lifelong training to help workers move from one employment sector to another. More broadly, labour market reforms should aim at helping workers change sectors and at developing bridges between activities.
- Special attention should be paid to medium-skilled workers, whose situation is likely to be undermined by the new trend in globalisation, at a time when the corresponding supply is expected to increase naturally. However, policy should not ignore low-skilled workers facing increased competition from the medium-skilled.

The labour demand projections presented here consider only the effects of the new trend in globalisation. However, many other effects are expected to affect the demand side in addition to this new trend; in particular, skills demand is expected to be influenced by the supply of skills and by skill-biased technological change, independently of the new trend in globalisation. These effects, for instance, will modify the production functions in each industry. Should this be insufficient to move demand and supply back into equilibrium, wage trends would permit demand and supply to adjust. To that extent, this could then lead to a relative decline in wages for the medium-skilled. This indeed already appears to be what has occurred since the onset of the new trend in globalisation[3].

[3] See figure B.1.2

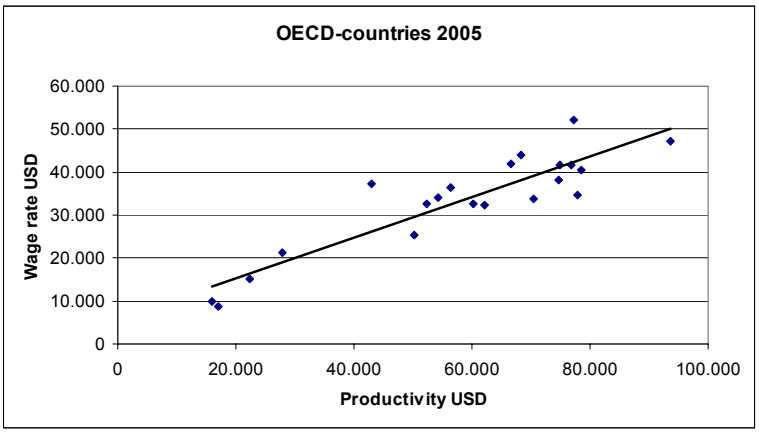
I - Recent labour market trends in the context of globalisation: some broad brush facts

Globalisation is often blamed for redundancies and layoffs, for rising unemployment and growing inequality. The sense of anxiety and insecurity it has bred has doubtless been amplified by the recent integration of major emerging countries into the global economy.

As far as the overall employment level is concerned, the evidence of the effects of globalisation is weak. Only a fraction of job losses recorded in OECD countries is so far likely to be directly attributable to trade and investment liberalisation[4]. There is little evidence to support the concern that globalisation has already had a marked impact on overall employment levels in Europe. At the aggregate level in particular, there is no evidence that countries that are more open to trade have suffered increased unemployment.

Admittedly, wages continue to be lower in the emerging countries. But, so far, overall unit labour costs have been kept broadly equal, because lower wages in emerging countries probably reflect lower productivity (see figure 1), while higher productivity growth in those countries is at least partly reflected in higher growth in real wages.

Figure 1. Aggregate differences in labour costs reflected in relative productivity

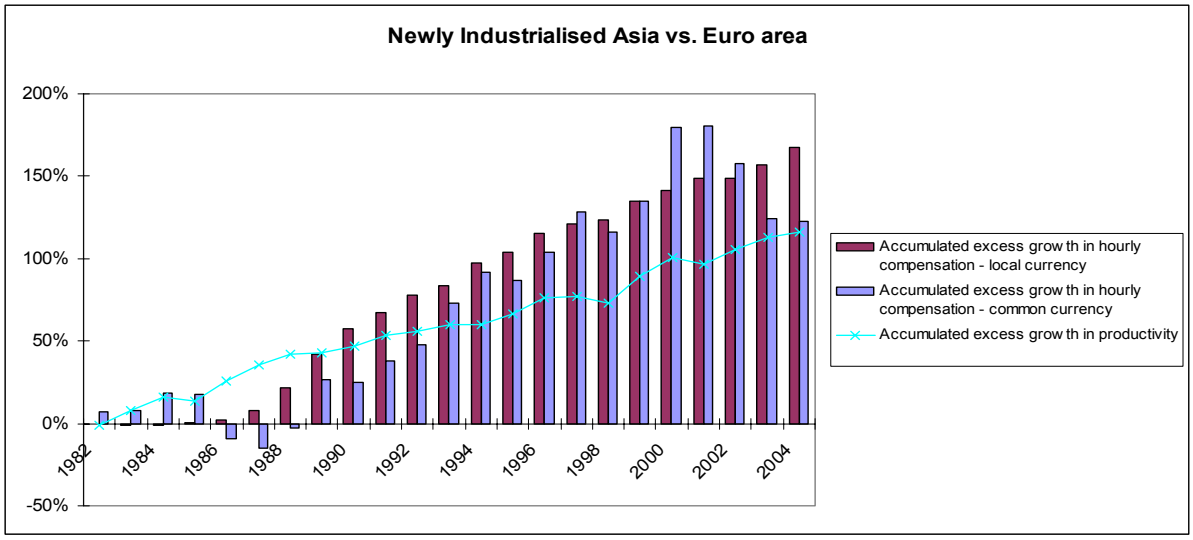


Source: OECD Economic Outlook 77

This is well-documented in the case of the experience of emerging Asian countries over the last 20 years (see figure 2): their productivity growth has exceeded Euro area performance, but exchange rate adjusted real wages have increased by roughly the same amount. Moreover, most recent estimates suggest that the competitiveness gap is narrowing. Some imbalances may, however, appear in the medium term, as is seemingly the case for China.

[4] See the European Commission's Occasional Paper on 'Responding to the Challenges of Globalisation', December 2005.

Figure 2. Higher productivity leads to higher real wages, not permanent cost advantages



Between 1982 and 2004, the accumulated growth in hourly compensation of Asian countries in Asian currency was about 160% higher than the accumulated growth in hourly compensation of European countries in euros. Yet, over the same period this accumulated excess growth in hourly compensation is only 110% if all hourly compensation is measured in euros; this is equal to the accumulated excess growth in productivity of Asian countries in relation to Europe over the period. All in all, therefore, unit labour costs in euros in Europe and in Asian have grown at the same pace between 1982 and 2004.
Source: IMF World Economic Outlook database. Federal Reserve Bank of St. Louis; calculations by DK ministry of finance

But globalisation is blamed not only for rising overall unemployment but also for rising inequality and low-skilled relative unemployment. The main driving force behind international trade is the existence of differences in relative factor endowments and relative factor prices across national borders. Each country specialises in sectors in which it enjoys a comparative advantage. Developed countries specialise in skill-intensive activities, while they are at a comparative disadvantage in low-skilled activities. As a consequence, trade between developed and less-developed countries raises the relative demand for skilled workers in developed countries (see box 1).

In this context, the emergence of China and India as leading players in international trade may depress demand for low-skilled labour in developed countries, thus pushing up low-skilled unemployment and leading to a fall in relative wages (Feenstra and Hanson, 2001). Low-skilled workers could be the first to be affected by increased vertical specialisation, as confirmed by empirical evidence. Hijzen et al. (2005) showed that in UK the impact of outsourcing on skilled and semi-skilled labour is statistically insignificant, whereas its impact on the demand for low-skilled workers is statistically significant[5]. In addition, V. Strauss-Kahn (2003) showed that international vertical specialisation has contributed between 11% and 15% of the decline in the share of low-skilled workers in manufacturing employment over the 1977-1985 period, and 25% of the decline between 1985 and 1993 in France. The acceleration of vertical specialisation may account for this increase in the contribution of outsourcing to the decline in the share of low-skilled workers.

Nevertheless, skilled-biased technological change also plays an important role in explaining the increase in wage inequality: some empirical studies concerning wage inequality in the United States and other developed economies consider that technological change contributes to changes in the wage structure whereas international trade does not (Katz and Autor (1999), Hijen, H. Görg and R.C. Hine (2003)).

[5] In their study, low-skilled workers consist mainly of industrial plant and machine operators. They concluded that outsourcing is an important component in explaining changes in the skill structure of manufacturing industries in the United Kingdom.

Box 1: Trade and inequalities between skilled and low-skilled workers

Globalisation can shift demand for labour towards more skilled labour and can affect the skill structure of labour demand in developed countries through two main channels:

- **A static effect on the structure of labour demand**: as trade opens up, each country specialises in the sectors in which it enjoys a comparative advantage. In the developed countries, specialisation in the high added-value sectors increases demand for skilled labour while depressing that for low-skilled workers.
- **A dynamic effect due to technological change**: growth in trade boosts competition durably and creates a need for continuous innovation. The resulting technological change benefits the economy as a whole. However, since new technologies demand greater skills, they further depress demand for low-skilled workers.

Thus, international trade theories suggest that globalisation can widen inequalities between low-skilled and skilled workers in developed countries, which have a relatively abundant supply of high-skilled workers. In developing countries, on the contrary, where the supply of high-skilled workers is limited, the two channels move in opposite directions and thus have no clear cut effect on labour demand.

In countries with an abundant supply of low-skilled labour and a correspondingly relative scarcity of high-skilled workers, domestic supply and demand factors ensure a wide differential between the wages of high-skilled and low-skilled workers. Indeed, data on real wage dispersion do indicate that an engineer in Mumbai in India earns 6.7 times more, on average, than a construction worker, while the corresponding figure for Poland is roughly 2 times more and even less for countries such as Denmark.

	Average hourly wage a)	*Construction worker b)*	*Skilled manufacturing worker b)*	*Engineer b)*	Ratio engineer to construction worker
India (Mumbai)	0.70	900	1,900	6,000	6.7
Indonesia (Jakarta)	1.50	1,200	3,300	6,700	5.6
Thailand (Bangkok)	1.70	1,500	4,200	9,800	6.5
Brazil (Rio d. J)	1.8	1,500	6,900	14,600	9.7
Poland (Warsaw)	2.20	5,200	6,900	11,300	2.2
China (Shanghai)	2.40	3,000	4,600	12,100	4.0
Malaysia (Kuala Lumpur)	3.10	4,200	11,100	15,900	3.8
Singapore	5.40	6,700	17,000	26,700	4.0
Hong Kong SAR	7.00	11,700	17,300	39,200	3.4
Denmark (Copenhagen)	14.40	44,300	47,700	63,500	1.4
US (New York)	15.20	40,500	47,000	75,000	1.9

a) Average for thirteen job categories, in USD per hour net.
b) Gross income per year, in USD

Source: Union Bank of Switzerland (2003), "Prices and Earnings – A Comparison of Purchasing Power Around the Globe".

This implies two impacts for developed countries[6]:
- A reduction of trade barriers such as transportation costs or tariffs, leading to an increase in trade, should lead to a reallocation of production and labour to the skilled labour-intensive export sectors, in order to exploit the relative price differential between low and high-skilled workers.
- This reallocation should lead to a relative fall in the wages of low-skilled workers in the most developed countries.

[6] MINEFI, DPAE No. 96, January 2006, "Globalisation and the labour market in the developed countries".

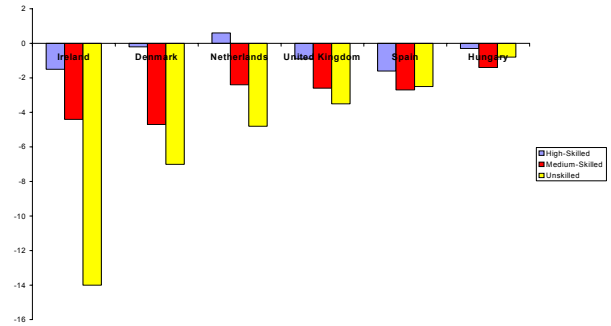
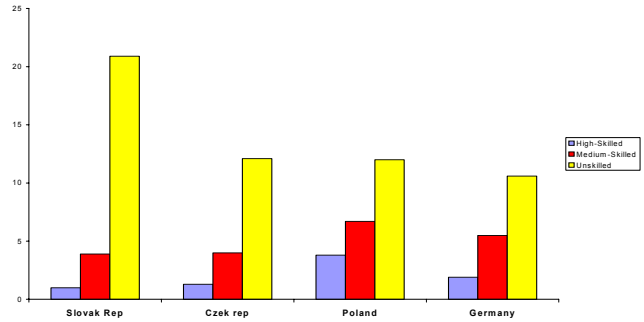
Box 2: Mixed evidence: labour market trends in selected European countries

Unemployment

Low-skilled unemployment is everywhere higher than high-skilled unemployment (see table A1 in annex), but trends in the relative position of low-skilled workers seem to vary across countries.

In Germany and some eastern European countries, for the period 1991-2003 (see Figure B.1.1), unemployment rates rose regardless of skill levels. Nevertheless, the position of low-skilled workers seems to have worsened more rapidly than that of medium and high-skilled workers. In contrast, Ireland, Denmark, Netherlands, Spain, Hungary and the United Kingdom experienced a significant reduction in unemployment. Unemployment has declined substantially especially in Ireland, Denmark, and in the Netherlands for medium and low-skilled workers. The Netherlands too has experienced a slight rise in high-skilled unemployment.

Figure B.1.1. Trends in high-skilled, medium-skilled and low-skilled unemployment rates in selected European countries between 1991 and 2003 (in % points)

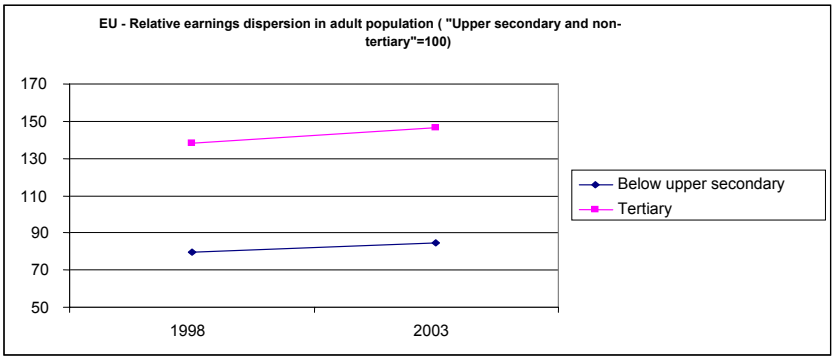
Countries that have experienced a drastic decline in low-skilled unemployment	Countries that have experienced a sizeable increase in low-skilled unemployment
	

Source: OECD, Education at a Glance 2005 and authors' calculation.

Wage inequality

According to OECD data, European countries display heterogeneous levels of wage inequality. Wage inequalities between skilled and low-skilled workers are low in the North of Europe and wider in the East. European countries also display heterogeneous trends in wage inequality. Inequalities have been increasing in Sweden and Netherlands since the mid-1990s and very rapidly in Hungary, Poland and the Czech Republic since the early-1990s. Meanwhile, wage inequalities have declined slightly in France since 1975, while they have increased in Germany since that time. Finally, inequalities have narrowed in Portugal and Greece. Yet a common feature in Europe since 1996 has been the relative deterioration in the position of medium-skilled workers compared to both high-skilled and low-skilled workers.

Figure B.1.2. Bottom earnings catching-up on median, top earnings outperforming median earnings, selected EU15 countries



Source: OECD Education at a Glance 2005. Note: Unweighted average for Denmark, Finland, France, Germany, Italy, Sweden, Netherlands and United Kingdom. Denmark, Finland, France, Italy, and Netherlands are 2002 not 2003. Netherlands is 1997 not 1998. Earnings here are before income tax.

Increasing trade with emerging countries may well worsen employment or relative wage prospects for low-skilled workers. In many European countries, the unemployment rate for low-skilled workers reached worrisome levels in the early-1990s and the incomes of low-skilled workers have declined in relative terms in some countries, particularly up to the mid-1990s. However, this has not been the case in all European countries (see figure B.1.2 in box 2).

As highlighted by a recent European Commission report[7], this mixed evidence may be linked to several factors that may have offset the impact of trade on labour structure demand and affected relative performance between countries:

- Educational and training attainments in Europe have steadily reduced the relative supply of low-skilled labour[8], limiting pressure on this labour category.
- Until very recently, globalisation has mainly taken place between developed countries with similar factor endowments.
- With the expansion of education in Asia the share of goods produced by low-skilled workers (textiles, shoes, etc) in imports from China and India has fallen since the mid-1990s.
- Labour market reforms have explicitly or implicitly targeted an improvement in the employment prospects of low-skilled workers. However countries have made uneven progress in making their labour markets more adaptable and reforming them.

To sum up, the impact of globalisation on overall employment seems to have been limited, while the effect of globalisation on inequality and relative unemployment through factor demand trends has been significant but small.

Even so, recent trends in globalisation (and in particular the rapid growth of the large emerging countries) may have triggered a discontinuity in its effect on employment and inequalities. The next section describes this new trend, and specifically the revival of inter-industry trade, while the third and fourth sections deal with its possible effects on labour markets.

2 - The revival of the international division of labour

The new international trade theory makes an important distinction between inter-industry and intra-industry trade. Intra-industry trade corresponds to the simultaneous imports and exports of similar products with gains in variety, increasing returns to scale and competitive pressures associated with international trade. In contrast, inter-industry trade is based on the traditional international division of labour corresponding to classical trade theory (see Box 3).

These different types of trade flows do not have the same impact on the labour market. Inter-industry trade leads to adjustment costs associated with the shift in resources from comparatively disadvantaged industries to industries where Europe enjoys a comparative advantage. In contrast, intra-industry trade may involve smaller adjustment costs, as demonstrated by several empirical studies[9].

[7] *Responding to the Challenges of Globalisation*, paper by the Economic Policy Committee, March 2006

[8] Identifying the impact of globalisation and technical progress on labour demand is difficult and current estimates should be viewed with caution. Most of the available empirical studies on skill bias use estimation techniques assuming that demand is independent of human capital supply, whereas a higher supply of high-skilled workers tends to expand over time the demand for skilled workers.

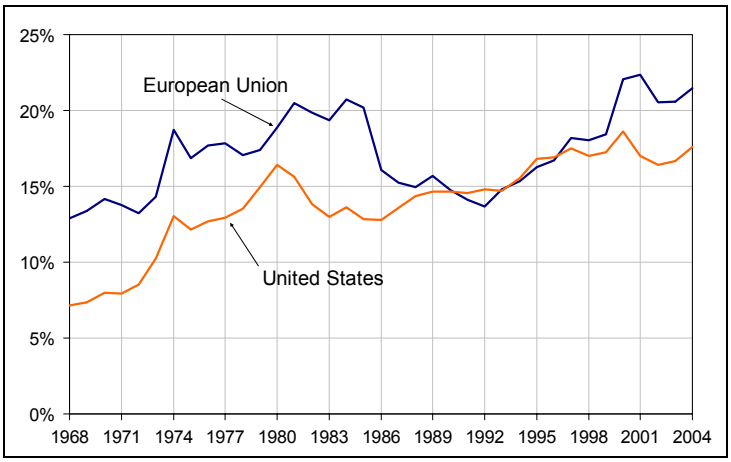
[9] See the bibliography in *Intra-industry Trade and Labour-Market Adjustments: a Reassessment using Data on Individual Workers*, Brülhart, Elliott, Lindley, September 2004.

2-1 The rapid expansion of international trade is accompanied by a revival of inter-industry trade

In order to assess globalisation trends qualitatively economists commonly turn to the usual indicator of trade openness, which is computed as the ratio of total external trade - measured as the sum of exports and imports - to GDP (see Figure 3). The trade openness ratios of the European Union and the United States have been rising steadily over the last 40 years.

The emergence of new players in the global economy appears to be reshaping globalisation, especially in the past decade: emerging countries have accounted for more than a half of the growth in world exports and already for more than 40% of the growth in world imports since 1999. For the United States and the EU, trade with non-OECD countries explains about three-quarters of the increase in trade openness between 1990 and 2003.

Figure 3. The European Union (15) and United States trade openness



Note: the indicator implemented here is $\frac{X + M}{Y}$ where X designates exports, M imports and Y the total GDP. For the European Union, only extra-Union trade is taken into account.
Source: Chelem data (73 different products in agriculture and industry).

During the 1990s to 1999, the share of inter-industry trade in world trade declined from 66% to 60%[10]. This fall has been balanced by a rise in vertical[11] intra-industry trade. These figures suggest that specialisation took place more within each industry than among industries. In that case, globalisation should lead to gains through a broader qualitative choice rather than gains through a broader varietal choice.

However this trade pattern appears to have changed at the end of the 1990s: inter-industry trade starts expanding globally from 1999 on. This is clear for the United States, which experienced a rise in inter-industry trade starting in 1996-1997. It is also true – though to a lesser extent - for the European Union: since 1999, the share of inter-industry trade carried on with third countries has shown signs of growing at a very disaggregated level of products.

[10] Fontagné L., M. Freudenberg and G. Gaulier (2005), Disentangling Horizontal and Vertical Intra-Industry Trade, *CEPII Working Paper* N°2005-10, July

[11] Vertical industry trade is trade in products of the same industry but of different quality, as opposed to horizontal trade, which is trade in products of the same quality and industry.

Box 3 : The theoretical foundations of trade patterns and measures of intra-industry trade

The different types of trade are governed by different trade theories[12]:

Inter-industry trade can be linked to classical international trade models (Ricardo and Hecksher Ohlin) in which each country specialises in sectors where it enjoys a comparative advantage. This trade should weigh on low-skilled workers through a number of channels:

- A static effect on the structure of demand (see box 1)
- A dynamic effect due to technological change (see box 1)
- A temporary adjustment effect: trade and specialisation shift factors from contested export-oriented industries to other sectors (those with a comparative advantage or sheltered ones). Workers in sectors suffering from a comparative disadvantage will have to move to other industries.

Intra-industry trade is explained by new international trade theory with monopolistic competition. It leads to increased efficiency and welfare gains associated with variety and returns to scale. Factor endowments play a smaller role since similar goods are traded; the static effect on the structure of demand and the temporary adjustment effect are weaker; demand for low-skilled workers falls mainly as a result of dynamic effects prompted by technological change. In particular, empirical evidence shows that intra-industry trade leads to limited adjustments costs due to the similarity between the nations concerned.

The most widely used indicator to measure the extent of intra-industry trade is the one proposed by Grubel and Lloyd. It computes the share of balanced trade (overlap between exports (X) and imports (M)) in all trade in a given industry k:

$$GL_k = 1 - \frac{|X_k - M_k|}{X_k + M_k}$$

In theory, the Grubel and Lloyd indicator can take values of between 0 and 1.

We propose a simple indicator derived from Grubel and Lloyd estimating the overall evolution of inter-industry trade with:

$$I_1 = \frac{\sum_k |X_k - M_k|}{\sum_k X_k + M_k}$$

where X_k and M_k respectively designate exports and imports in sector k.

However, the Grubel and Lloyd indicator presents a bias: it considers trade imbalances as inter-industry trade. In other words a trade deficit (or surplus) is considered to be inter-industry trade when it could reflect cyclical developments. In order not to overestimate the trend in inter-industry trade we evaluate a second indicator, which takes the following form:

$$I_2 = \frac{\sum_k |X_k - M_k * (X/M)|}{\sum_k X_k + M_k * (X/M)}$$

where X and M designate global exports and imports. In I_2, the contribution of a sector k is positive

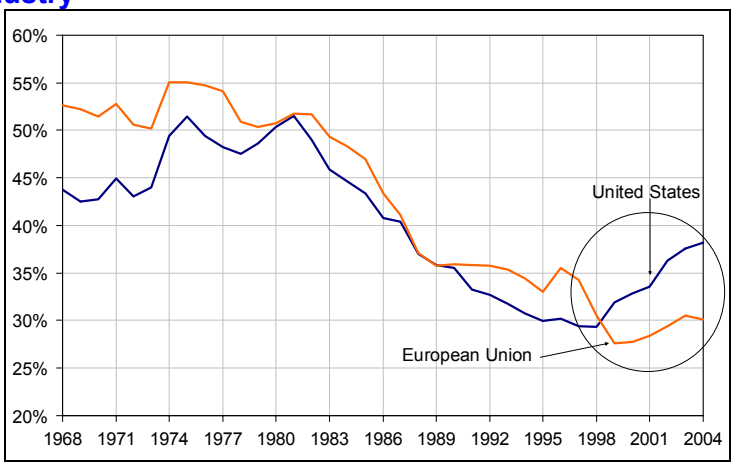
[12] For details see, Fontagné L. and Péridy N., Intra-industry trade: Methodological Issues Reconsidered, CEPII Working Paper no 97-01, January.

(respectively negative) if the sector k has an identifiable comparative advantage (respectively disadvantage), that is to say if the sector trade balance is higher (respectively lower) than the global trade balance.

These two indicators can take values between 0 and 1, which respectively stand for full intra-industry trade and full inter-industry trade.

The indicator (I_1) derived from Grubel and Lloyd (see box 3 for definition) illustrates the growth of inter-industry trade in agriculture and industry for the United States and extra-European Union trade (see figure 4).

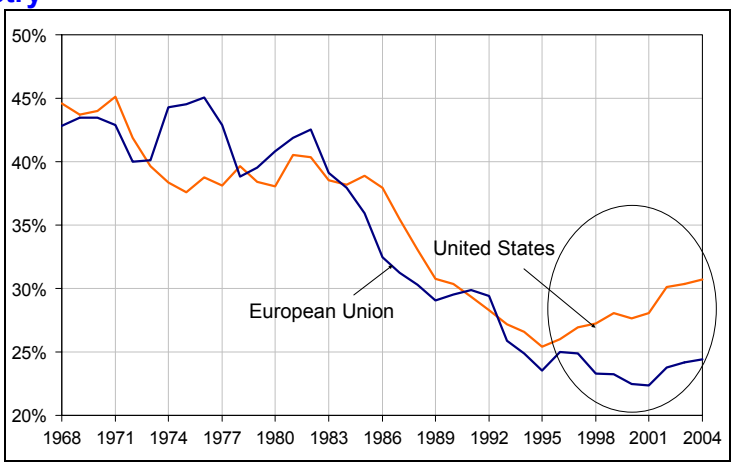
Figure 4. A simple indicator of inter-industry share in extra-EU (EU15) and US trade for agriculture and industry



Note: the indicator implemented here is $\frac{\sum_k |X_k - M_k|}{\sum_k X_k + M_k}$ where k designates the sector, X exports and M imports.

For the European Union, only extra-EU trade is taken into account.
Source: CEPII-Chelem (73 different products in agriculture and industry), authors' calculation

Figure 5. An indicator of inter-industry share in extra-EU (EU15) and US trade for manufacturing industry



Note: the indicator implemented here is $\frac{\sum_k |X_k - M_k * (X/M)|}{\sum_k X_k + M_k * (X/M)}$ where k designates the sector, X exports and M imports. For the European Union, only extra-EU trade is taken into account.
Sou: CEPII-Chelem (all manufacturing products), authors' calculation

The indicator (I_2) gives similar results for manufacturing products, which confirms that the increase observed in the United States is not linked to the widening trade deficit nor to oil price trends: the share of inter-industry trade in manufactured goods in extra-European trade has been rising since 1999/2000 (see figure 5).

2-2 The development of inter-industry trade is driven mainly by emerging countries

The growth in inter-industry trade—since 1999 for European Union and since 1996/1997 for the United States—is stems from two main factors:

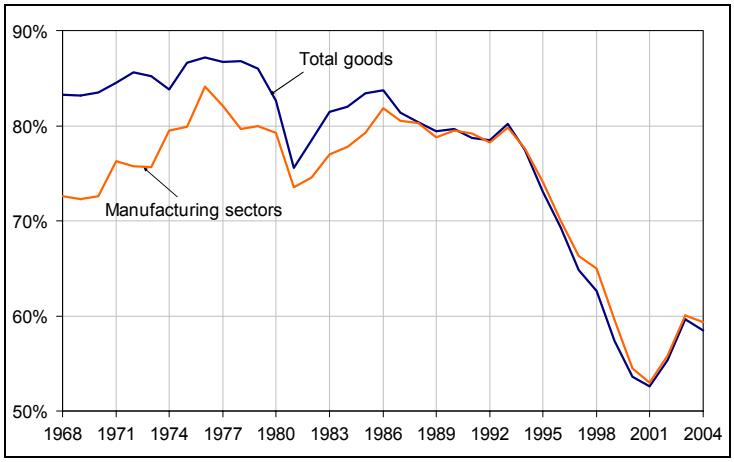
- The rapid rise in energy prices (oil and gas) in recent years accounts for approximately 1/3 of this phenomenon for Europe.
- The rapid integration into world trade of emerging countries with a high level of inter-industry trade accounts for the remaining 2/3[13].

The combination of two elements explains the role of emerging country in the increased share of inter-industry trade in EU external trade. First, the share of inter-industry is higher in trade between emerging countries and developed countries than in trade between developed countries. It is true in particular for trade between EU and China[14] (see figure 6). A second factor should be the more rapid development of trade with developing countries compared to trade with developed countries. Although the inter-industry share of European Union trade with China has been shrinking rapidly (see Figure 6), its impact on total trade has grown as a result of China's increased share in the EU's external trade. The fact that the share of inter-industry trade between China and European Union for all goods and manufacturing industries has again increased since 2001 has added to the rapid growth of bilateral trade.

[13] These calculations are based on the indicator I_1. Additional assumptions are required in order to calculate these contributions . Yet, since I_2 corrects the bias induced by trade balance, and since petrol has played a key role in trade balance widening in the recent period, oil's contribution can be expected to be smaller in I_2.

[14] Nevertheless, improving Chinese technology could transform the pattern of trade with the EU in the long run. Indeed, more sophisticated goods from China, such as office machinery and telecommunications equipment, have significant increased their share of euro area imports (Gaulier et al., 2005). In addition, a new wave of FDI since the late-1990s has been directed at relatively capital and technology-intensive industries. Thus the commodity composition of international processing operations has shifted towards machinery and electrical equipment. In 2000-01 these products accounted for 28.7% of total Chinese exports, compared with 4.4% in the period 1985-89. Moreover, high-tech exports have grown more rapidly than high-tech imports. High-tech trade has been concentrated in radio and TV, office machinery and precision instruments.

Figure 6. Inter-industry share in trade between China and European Union (EU15)



Note: the indicator implemented here is $\frac{\sum_k |X_k - M_k * (X / M)|}{\sum_k X_k + M_k * (X / M)}$ where k designates the sector, X exports and M imports.
Source: CEPII-Chelem.

To summarise, recent trade trends are characterised by a revival of inter-industry trade in goods and manufacturing industries reflecting the growing international division of labour and specialisation. The revival of inter-industry trade stems mainly from the integration of emerging countries into world trade. Against this background, the next section seeks to project the impact of the increased division of labour on skill demand by industry in the European Union.

3 - Impact on manufacturing sectors of inter-industry trade and technological change resulting from globalisation

The recent revival of worldwide inter-industry trade, reflecting the emergence of new actors in global trade, could have a substantial impact on the relative demand for skilled and low-skilled labour across developed economies. Increased inter-industry trade is expected to modify the structure of production through increased specialisation, which in turn is expected to modify the structure of total labour demand–since the skill structure of labour demand differs from one industry to another. While growth in inter-industry trade *per se* does not entail a shift in the relative demand for skilled and low-skilled labour within industries, technological change resulting from globalisation and increased competition could play this role. This section advances some descriptive statistics illustrating the impact of globalisation on the structure of production.

The calculations below concern manufacturing industry[15].

- ***Trade balance and value added***

Increased inter-industry trade in a given industry can be represented through the change in the industry's trade balance relative to total manufacturing value added. Industries with a comparative advantage should see their trade balance improve, while this should deteriorate in industries with a comparative disadvantage.

In order to identify the impact on output of an increased or reduced comparative advantage, we have tested the correlation between trends in value added and the trade balance. The correlation is carried

[15] There are 10 manufacturing sectors in the OECD STAN-database. See table 3.

out at industry level and takes into account the size heterogeneity among European economies by including a fixed effect by country.

The results (table 1) show a positive and significant correlation between trends in trade balance ratios and value added ($(\ln Y_k)_{2002} - (\ln Y_k)_{1995}$)[16]. On average, when an industry's trade balance divided by national GDP rises by 1 percentage point, industry value added rises by 13.3%.

Table 1. A positive correlation between output trends and the trade balance

Variable	Coefficient
$\left(\frac{X_k - M_k}{Y}\right)_{2002} - \left(\frac{X_k - M_k}{Y}\right)_{1995}$	13.26 *(2.84)*
Observation base (country industry)	180
R^2	0.22

Note: Weighted by industry value added regression with country dummies. The dependent variable is $(\ln Y_k)_{2002} - (\ln Y_k)_{1995}$. Student's-t statistic in parenthesis.

Industries enjoying a growing comparative advantage measured by an increasing trade surplus see their output increase (chemicals and machinery and equipment for Ireland and Finland, transport equipment for Portugal, food products, beverages and tobacco for Poland, etc.). In parallel, output declines in industries suffering from a growing comparative disadvantage (textiles for Portugal, Greece, Germany, and Poland, etc.).

Therefore, industries exposed to inter-industry trade, for which trade balance ratios change rapidly, are also likely to experience changes in their output levels, reflecting a new division of labour between a country and its trading partners.

- ***Trade balance and the share of wages in value added***

Globalisation could also modify the production function and could notably increase or reduce the share of wages in value added. Two mechanisms are working in opposite directions when we look at the share of wages in value added by a given industry: more intense international competition leads to greater capital deepening while increasing the share of skilled labour. It is possible that trends in the share of wages in value added are linked to technological change at the level of the individual industry.

Greater international competition through increased inter-industry trade is measured by the trend in the industry trade balance ratio ($\left(\frac{X_k - M_k}{Y_k}\right)_{2002} - \left(\frac{X_k - M_k}{Y_k}\right)_{1995}$). We have tested its impact on the share of wages in the value added of a given industry ($\left(\frac{W_k}{Y_k}\right)_{2002} - \left(\frac{W_k}{Y_k}\right)_{1995}$). As in the previous correlation, we allow for size heterogeneity among European economies by introducing country fixed effects. Table 2 presents the results and the positive and significant correlation between the trade balance ratio and the share of wages in value added. On average, a 1 percentage point increase in an industry's trade balance increases the share of wages in the industry's value added by 0.051 percentage point[17].

[16] This estimate will provide a calibration to determine the impact of trade on value added per industry (see box 4) in 2020.

[17] There is no significant correlation between trade openness and the share of wages in value added *i.e.* between $\left(\frac{X_k + M_k}{Y_k}\right)_{2002} - \left(\frac{X_k + M_k}{Y_k}\right)_{1995}$ and $\left(\frac{W_k}{Y_k}\right)_{2002} - \left(\frac{W_k}{Y_k}\right)_{1995}$. This means that globalisation through increased exposure does not appear to have a clearcut impact on the share of wages in GDP, whereas the inter-industry trade share has.

Table 2. A positive correlation between technological change and the trade balance

Variable	Coefficient
$\left(\frac{X_k - M_k}{Y_k}\right)_{2002} - \left(\frac{X_k - M_k}{Y_k}\right)_{1995}$	0.051 *(2.53)*
Observation base	180
R^2	0.34

Note: Weighted by industry value added regression with country dummies. The dependent variable, a proxy of technological change, is $\left(\frac{W_k}{Y_k}\right)_{2002} - \left(\frac{W_k}{Y_k}\right)_{1995}$. Student's-t- in parenthesis.

This correlation means that industries that have experienced an improvement in their comparative advantage have on average experienced an increase in the share of wages in their value added. Hereafter we assume that this increase stems from a change in technology involving capital/labour substitution. This technological change effect is taken into account in the projection of labour demand in Part IV. This technological change could also stem from a skilled/low-skilled substitution. This is probably not the case, however: if it was, we would find a greater number of skilled workers in industries enjoying a comparative advantage. And yet the positive industry correlation observed in France[18] in 2002 (see Figure A2 in annex) between the trade balance ratio and the share of high-skilled workers in the labour force is immaterial**.**

To sum up, inter-industry trade leads to structural transformation in the European economies. Industries with a comparative advantage increase their share in total GDP, and the share of wages in value-added within those industries rises. Although these two factors do not alter relative low-skilled/skilled demand within industries, they do have implications at the level of the economy as a whole since demand for skills differs from one industry to another.

In order to assess the potential impact of the new trend in globalisation over the coming years, the next section performs some simple labour demand projections by skill-level, taking these trends into account. It also puts the findings for manufacturing industry into perspective, comparing these results with the potential growth of the service sector.

[18] Data on skills by sector in all European countries were not available.

4 - Projections of labour demand

Industries that are more exposed to inter-industry trade (either through imports or exports) are also more likely to experience changes in their output level.

The recent growth of inter-industry trade's share of extra European Union trade reflects the EU's increased international specialisation deriving from an improvement in its relative comparative advantage at present (Part II). Extrapolating from this recent trend, **extra-European inter-industry trade could increase by 40% and return to its early-1980s level by 2020**.

The shift in the structure of EU trade will in turn bring about a shift in the structure of production within Europe: industries with a comparative advantage (respectively disadvantage) in 2003 can expect to increase (respectively decrease) their share of GDP looking to 2020.

At the same time, greater inter-industry trade stimulates technological change in each industry, as illustrated in Part III. "Globalisation-driven technological change" comes only from inter-industry trade's increased share and not from globalisation as a whole[19], and technological change takes the form of a change in the share of wages in value added, with no impact on the skill structure of labour demand.

All projections are based on the simple estimates of the impact of inter-industry trade on output and technological change presented in Part III (see box 4 for details of the methodology).

Box 4. Labour demand projections—methodology

Labour demand projections derive from changes in skills demand resulting from increased extra-EU inter-industry trade and further intra-EU specialisation. They mainly reflect the shift in the structure of manufacturing by industry. They assume that globalisation does not modify the relative demand for skills in each sector.

Labour demand is projected by means of a series of steps:

1. Projecting **extra-EU trade**. The projections assume that:

The share of inter-industry trade in extra-EU trade will grow at the same rate as in the early-2000s: the EU inter-industry trade share should increase by 40 % looking to 2020. This should push the share of inter-industry trade back to its level in the early-1980s.

Extra-EU inter-industry trade is computed by: $I_2 = \frac{\sum_k \left| X_k - M_k * (X/M) \right|}{\sum_k X_k + M_k * (X/M)}$

The penetration ratio will continue to rise up to 2020 at the rate observed over the last decade. It is expected to rise by 50% between 2003 and 2020.

For each sector k: $\frac{X_k^{2020} + M_k^{2020}}{Y^{2020}} = \alpha . \frac{X_k^{2002} + M_k^{2002}}{Y^{2002}}$ *where* $\alpha = 1.5$.

The projection also assumes that the relative comparative advantages/disadvantages of EU manufacturing industries are extended proportionally in order to meet the target in terms of inter-industry trade.

[19] Part III shows that there is no significant correlation between trade openness and technological change.

$$(X_k^{2020} - M_k^{2020}) - \frac{X_k^{2020} + M_k^{2020}}{X^{2020} + M^{2020}}(X^{2020} - M^{2020}) =$$

For each sector k:

$$\beta.\left[(X_k^{2002} - M_k^{2002}) - \frac{X_k^{2002} + M_k^{2002}}{X^{2002} + M^{2002}}(X^{2002} - M^{2002})\right]$$

Where β is calibrated according to the inter-industry trade share target measured by I_2 in 2020.

These assumptions allow for computation of the share of exports and imports in GDP in year 2020 at the EU level. The observed trend for extra-EU trade is assumed to be identical for each country (i.e. growth in extra-EU exports in sector k in each EU country will be similar to the increase in extra-EU exports in the same industry at the EU level).

2. Projecting **intra-EU trade**.

Projections assume that intra EU specialisation is progressing in line with the trend observed over the last decade: comparative advantages and disadvantages in intra-European trade are respectively increasing and decreasing (no specific assumption is made regarding intra-EU trade penetration).

$$(X_k^{2020} - M_k^{2020}) = \frac{X_k^{2002} + M_k^{2002}}{X^{2002} + M^{2002}}(X^{2002} - M^{2002}) + \frac{18}{10}.\sum_{t=1992}^{t=2002}\left[(X_k^t - M_k^t) - \frac{X_k^t + M_k^t}{X^t + M^t}(X^t - M^t)\right]$$

3. Projecting sector production.

Production in each sector is computed using estimates of sectoral trade balance variations (derived from the previous two steps) and the estimated correlation (δ) between variations of sectoral production levels and trade balance variations.

$\ln(Y_k^{2020}) = \ln(Y_k^{2002}) + \delta.\left[\frac{X_k^{2020} - M_k^{2020}}{Y^{2020}} - \frac{X_k^{2002} - M_k^{2002}}{Y^{2002}}\right]$ where δ is estimated at the EU level (δ equals 13.26, see table 1)

4a. Impact on labour demand structure without technological change (Scenario 1).

Technology used in France in 2002 is assumed to be available throughout the EU: the demand for skills by each industry is taken as fixed across countries.

The production function does not change between 2002 and 2020 (i.e. the impact on employment is similar to the impact on production).

4b. Impact on labour demand structure taking into account globalisation-induced technological change (Scenario 2).

Technology used in France in 2002 is assumed to be available throughout the EU: the structure of skill demand for each industry is unchanged between 2002 and 2020.

The capital/labour ratio changes between 2002 and 2020 according to estimates of the impact of sector trade balance variations on the share of wages at the sectoral level:

$\left(\frac{W_k}{Y_k}\right)^{2020} = \left(\frac{W_k}{Y_k}\right)^{2002} + \varphi\left[\frac{X_k^{2020} - M_k^{2020}}{Y_k^{2020}} - \frac{X_k^{2002} - M_k^{2002}}{Y_k^{2002}}\right]$ where φ is estimated at the EU level (φ equals 0.051, see table 2).

The shares of low-killed, medium-skilled and high-skilled jobs in the total labour force of a given

sector remains constant in each sector and equal to those observed in France in 2002.

Computations are made for manufacturing industry (10 sectors: OECD International Standard Industrial Classification Rev.3.) and for 19 EU countries (data for non-OECD EU countries are not available).

Data for exports, imports, value added and employment come from the OECD-STAN database.

Labour skill structure for each manufacturing industry (see figure 8) is derived from the employment survey for France for 2002.

4-1 Impact of increased international division of labour on EU specialisation

According to projections for extra-European trade, the process of specialisation should continue to intensify (see table 3), with strong growth in exports of chemical, rubber, plastics and fuel products, transport equipment, machinery and equipment, respectively from 65%, 66% and 53%. In contrast, exports of wood and wood and cork industry products are forecast to decline sharply while imports will rise steeply. Other non-metallic mineral, and textiles, textile products, leather and footwear industries are also set to experiences a sharp rise in imports, by 113% and 83% respectively. These trends illustrate how Europe is forecast to exploit its comparative advantages to 2020.

Table 3. Trends in extra-EU exports and imports between 2002 and 2020 (in %)

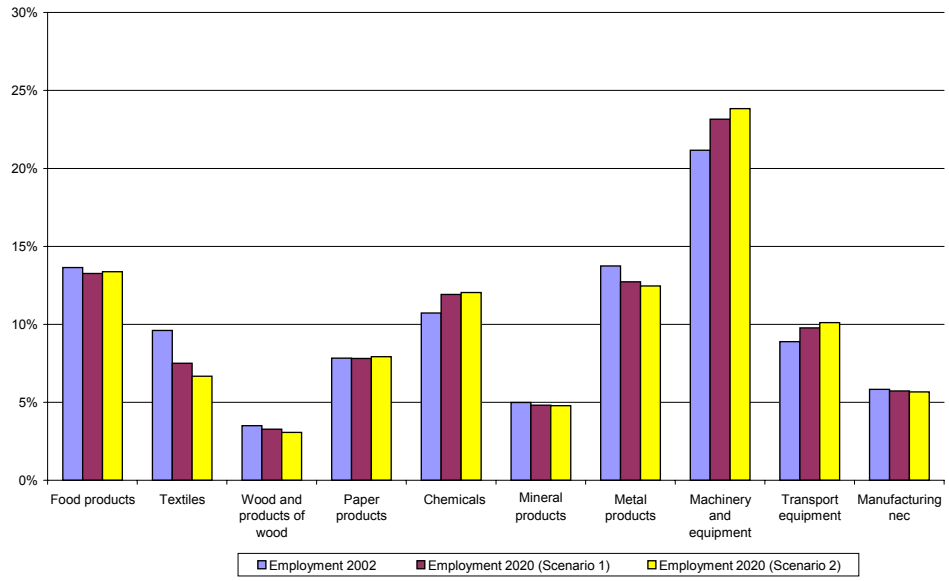
Sector	Exports evolution	Imports evolution
Food products, beverages and tobacco	46	64
Textiles, textile products, leather and footwear	3	83
Wood and products of wood and cork	-81	153
Pulp, paper, paper products, printing and publishing	38	80
Chemical, rubber, plastics and fuel products	65	37
Other non-metallic mineral products	26	113
Basic metals and fabricated metal products	38	70
Machinery and equipment	53	55
Transport equipment	66	34
Manufacturing nec.	20	84

Source: STAN-OECD, authors' calculations.

4-2 Projections of the skill structure of labour demand

Projections of labour demand by manufacturing sectors show transfers of the workforce between sectors (see figure 7). Transfers are marginally larger when allowance is made for globalisation-induced technological change. Between 2002 and 2020 the share of jobs in manufacturing sectors may decrease, except for machinery and equipment, chemicals and transport. Employment in machinery and equipment and transport equipment industries would increase respectively by 13 and 14 % between 2002 and 2020. In the same manner, employment in chemicals would increase by 12 %. This reflects the reinforcement of specialisation for European economies in machinery and equipment industry, chemicals and transport equipment, where labour demand is forecast to rise relative to the rest of the European economy (projections are to be considered in terms of structure rather than levels, since no allowance is made for productivity gains). At the opposite end of the spectrum, employment in the textile industry could fall by 30%.

Figure 7. Employment trends in manufacturing industry (in %)



Source : STAN-OECD, authors' calculation

The consequences of this shift in manufacturing employment for skills demand appear to be limited (see table 4): by 2020 the demand for low-skilled and medium-skilled workers in manufacturing industry could drop by about 2 and 1% respectively, whereas demand for higher-skilled workers could increase by about 3%[20]. The main driver behind this shift in demand for skills is the direct impact of the growth in inter-industry trade, while technological change will have a more limited impact (further details are presented in the Annex, see Tables A3 and A4). Our methodology only takes into account the technological change induced by the pickup of inter-industry trade and not the intensification of trade openness: technological change reinforces the shift in in the structure of demand, which is slightly more biased towards high-skilled workers.

The countries forecast to experience the heftiest shifts in the skills structure of demand are Austria, the Czech Republic, Finland, Hungary, Ireland, Portugal and the Netherlands. Demand for low-skilled labour is expected to decline by around 14% in the Czech Republic and by 12% in Portugal, while demand for high-skilled workers would rise by around 18% and 13% respectively. These substantial effects stem from a very high level of specialisation in both countries (in machinery for the Czech Republic and in transport and machinery for Portugal).

Not all countries are forecast to experience significant changes in skill demand. This is particularly true for the larger countries such as Germany, UK and France, which are expected to remain almost unaffected by globalisation pressures and globalisation-induced technological change. This may reflect the fact that the manufacturing sector has already adapted and that further specialisation will occur among sectors that are only slightly different in terms of skill structure.

[20] Those demand shifts conventionally assume a constant overall employment level in manufacturing.

Table 4: Change in the labour structure of manufacturing industry between 2002 and 2020 (in %) due to specialisation induced by international trade and technological change

Country	Labour structure in 2002			Labour structure in 2020			Change in demand according to skill		
	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled
Austria	23	42	35	21	41	38	-6	-2	+6
Belgium	23	42	35	22	40	38	-6	-5	+9
Czech Republic	23	42	35	19	40	41	-16	-6	+18
Denmark	22	41	37	21	41	38	-6	-1	+4
Finland	21	41	37	20	40	40	-6	-3	+7
France	23	42	36	22	42	36	-1	0	+1
Germany	21	41	37	21	41	37	1	0	0
Greece	27	42	31	25	42	33	-6	-1	+6
Hungary	24	41	35	22	41	37	-9	-1	+7
Ireland	23	40	37	21	39	40	-9	-2	+7
Italy	23	43	34	23	42	35	-2	-1	+3
Netherlands	22	42	36	21	43	36	-6	2	+1
Poland	25	42	33	25	41	34	0	-1	+1
Portugal	27	43	31	23	42	35	-12	-2	+13
Slovak Republic	23	42	34	22	41	37	-4	-4	+7
Spain	24	43	34	24	42	34	0	-1	+1
Sweden	21	42	37	20	41	38	-3	-1	+3
United Kingdom	22	42	36	22	42	36	0	0	0
UE	**23**	**42**	**35**	**22**	**42**	**36**	**-2**	**-1**	**+3**

Source: STAN-OECD, authors' calculation

The benign nature of the results is probably due to the weak correlation for manufacturing sectors between comparatives advantages and the skills of the labour force. There appear to be only two sectors where demand for skills matches their trade balance trend, namely the chemical industry, which experienced a strong improvement in its trade balance between 1995 and 2002 (see table 5) and where the proportion of high-skilled workers (41%) exceeds the average (35%); in contrast, the textile industry experienced a sharp deterioration in its trade balance (-15%) and has a larger share of low-skilled workers (around 7 percentage points) than in manufacturing industry as a whole.

It is pointed out that results are very likely to be nomenclature dependent: a more refined taxonomy of manufacturing industries would very probably increase the estimated effects on skills demand via a stronger linkage between comparative advantage and demand for skills.

The direct impact of international trade on output levels by industry and the indirect impact to 2020 of technological change induced by international trade at the sectoral level are presented in Table 6[21]. As already mentioned, this shows that impact on employment is likely to be greater in the small EU countries than in the larger ones. Nevertheless, results by country must be viewed with caution. The methodology reproduces what has been observed in the recent past for intra-EU trade projections, which could prove to be difficult to reproduce in the future for some countries. For example, the growth in employment in the chemical industry in Ireland mainly reflects the sector's dynamism over the past ten years.

[21] For additional results see Table A3 and A4 in Annex.

Table 5. Change in comparative advantages in European manufacturing industries and distribution of skills (in %)

Sector	Change in extra-EU trade balance (1995-2002)	Distribution of labour demand by skill in 2002		
		Low-skilled	Medium-skilled	High-skilled
Agribusiness	-1	34	37	29
Textile, clothes	-15	30	45	25
Wood	+4	37	39	24
Paper	+4	14	43	43
Chemicals	+14	24	35	41
Other mineral	+1	22	48	30
Metal	+3	20	52	28
Machinery and equipment	+6	15	37	48
Transport	-4	18	46	36
Machine fabrication	-8	26	45	29
Manufacturing industry	**+3**	**23**	**42**	**35**

Source: STAN-OECD, authors' calculation. The skill structure of labour demand is that of France and is assumed to be the same for all European countries in 2002.

Table 6: Employment trends in manufacturing industries between 2002 and 2020 (in %) due to international trade and technological change-induced specialisation

Country	Food	Textiles	Wood	Paper	Chemicals	Minerals	Basic metals	Machinery	Transport	Manufacturing nec
Austria	-12	-22	-39	-23	-2	-24	-27	+47	+40	-12
Belgium	-24	-25	-29	-1	+47	-20	-34	+94	-67	-48
Czech Republic	-41	-74	-42	-23	-48	-49	-61	+136	-2	-19
Denmark	-44	-18	-14	+4	+60	-12	+8	+12	-9	-25
Finland	-17	-16	-47	-51	+26	-17	-24	+56	-5	-22
France	-7	-15	-8	+1	+13	-2	-4	-1	+16	-4
Germany	+2	-13	-7	-3	+16	-4	-5	-9	+18	-9
Greece	-3	-46	-5	+16	+27	+6	-10	+49	+134	+6
Hungary	-29	-58	-10	+46	+7	+8	-21	+30	+68	+48
Ireland	0	-9	-35	-27	+194	-5	+9	-4	-18	-33
Italy	+20	-34	-7	-1	+26	-4	-4	+9	+31	-10
Netherlands	-55	+10	+12	+16	-31	+16	+12	+6	+59	+13
Poland	+17	-20	-3	+20	-11	+7	-32	+6	+7	+23
Portugal	-3	-67	-32	-3	+54	-6	+36	+118	+187	+12
Slovak Republic	+36	-36	-22	-6	-40	-11	-51	+56	+49	-5
Spain	+5	-4	-4	+6	+7	+1	-1	+7	-21	0
Sweden	-13	+7	-38	-29	+29	-15	-10	+24	+6	-19
United Kingdom	+10	-15	+3	+11	0	+5	0	-4	-6	-9
EU	**-2**	**-31**	**-12**	**+1**	**+12**	**-4**	**-9**	**+13**	**+14**	**-3**

Source: DGTPE, STAN-OECD, authors' calculation

4-3 Job turnover

Beyond the overall effect on the structure of the demand for skills, the international division of labour will bring additional significant job turnover in manufacturing sectors at all skill levels. This should put a significant pressure on workers inasmuch as a significant proportion of the labour force is likely to be obliged to move between industries over the next 15 years.

Box 5: Estimating job turnover

Job turnover by skill level is estimated for each skill q by:

$$T_q = \frac{1}{2} * \frac{\sum_k |\Delta L_{kq}|}{\sum_k L_{kq}}$$

where ΔL_{kq} represents the change in employment by skill q between 2002 and 2020 for each manufacturing sector k.

Around 9% of are likely to have to move from one industry to another one between 2002 and 2020 (see table 7). The turnover rate will be about the same at the lower, medium and higher skill levels for the European Union and stems mainly from the direct impact of international trade-induced specialisation, and only to a small extent from globalisation- induced technological change (see table A5 in annex).

Table 7. Turnover in manufacturing industry by skill level due to international trade and technological change-induced specialisation (in %)

Country	Low-skilled	Medium-skilled	High-skilled
Austria	12	13	14
Belgium	20	21	23
Czech Republic	30	32	37
Denmark	14	11	11
Finland	17	18	20
France	4	3	3
Germany	4	4	5
Greece	12	13	14
Hungary	17	17	16
Ireland	34	27	27
Italy	9	8	7
Netherlands	13	11	11
Poland	8	8	7
Portugal	22	25	27
Slovak Republic	18	19	20
Spain	3	3	3
Sweden	10	9	10
United Kingdom	3	3	3
EU	**9**	**8**	**9**

Source: DGTPE, STAN-OECD

Note: 12% of the jobs occupied by a low-skilled person in 2002 will be replaced by a job with the same skill level but in another industry by 2020.

Countries forecast to experience a high rate of job turnover are those that appear to be less advanced in the reallocation of production. The Czech Republic, Portugal, Belgium, Finland, the Slovak Republic and Ireland present an indicator superior to 20%.

4-4 The potential role of agriculture and services in skills demand

Hitherto the analysis has focused on the impact of increased EU specialisation due to globalisation on the labour demand structure of the manufacturing sector. It probably captures a large part of the expected outcome, as manufacturing industry is the main sector facing pressures from globalisation. Although it would have been interesting to add several service sectors also engaged in global competition (business services for example), this proved impossible due to unavailability of data.

For a broader view of what to expect for the economy as a whole, we also need to have estimates of labour demand by skill-level for services, agriculture and industrial non-manufacturing sectors. For these sectors, globalisation is assumed to have no impact and employment is merely an extrapolation of the employment trends observed between 1995 and 2002 for each sector (see box 6).

Box 6. Methodology for projecting labour demand in the economy as a whole

The economy as a whole is represented by 28 sectors: the 10 manufacturing sectors affected by globalisation, 4 industrial non manufacturing sectors, 1 agricultural sector and 13 service sectors. Globalisation is assumed to have no impact on labour demand in services, agriculture and industrial non-manufacturing sectors. For the economy as a whole, labour projections are derived as follows:

- In step 1, for each of the 28 sectors (including manufacturing sectors), the employment projection is computed as an extrapolation of the employment trends observed between 1995 and 2002.

- In services, agriculture and industrial non-manufacturing sectors, the share of low-skilled, medium skilled and high-skilled workers is assumed to be constant (*i.e.* production functions are unchanged[22]). This gives figures for low-skilled, medium skilled and high-skilled labour demand in the economy as a whole apart from the manufacturing sectors.

- In each of the ten manufacturing sectors, the employment extrapolations are modified according to the employment projections derived from the increased international division of labour (see box 4) while taking into account the relative productivity gains of manufacturing sectors (i.e. the level of employment in the manufacturing industry is not affected by globalisation[23]). We thus take into account the declining share of manufacturing employment in total employment.

Results (see table 8 and figure 8) suggest that demand for high-skilled labour will rise far more significantly for the economy as a whole than for the manufacturing sector alone, due to a sharp increase in demand for high-skilled workers in services. Services sectors are characterised by a predominant proportion (over 35%) of high-skilled workers in 2002, forecast to rise to around 40% by 2020. At the same time, demand for the medium-skilled is set to fall not only in services but also in

[22] The skill structure of labour demand for each industry is assumed to be the one estimated in France in 2002.
[23] This is a simplifying assumption consistent with the fact that induced technology change does not have a large impact on employment.

manufacturing sectors and agriculture. The share of low-skilled labour demand is predicted to remain more or less unchanged when taking into account agriculture and services.

These results vary dramatically across countries. In countries where globalisation has had a strong impact on skill structure of labour demand, reasoning at the whole economy level reduces the impact on low-skilled workers while increasing the impact on medium skilled. For example, in the Czech Republic and in Portugal, the increase in demand for high-skilled workers is respectively 18% and 13% for manufacturing sectors, while it is only 9% and 5% for the economy as a whole. The decline in demand for the low-skilled is also sharply reduced in these countries when we reason at the level of the economy as a whole.

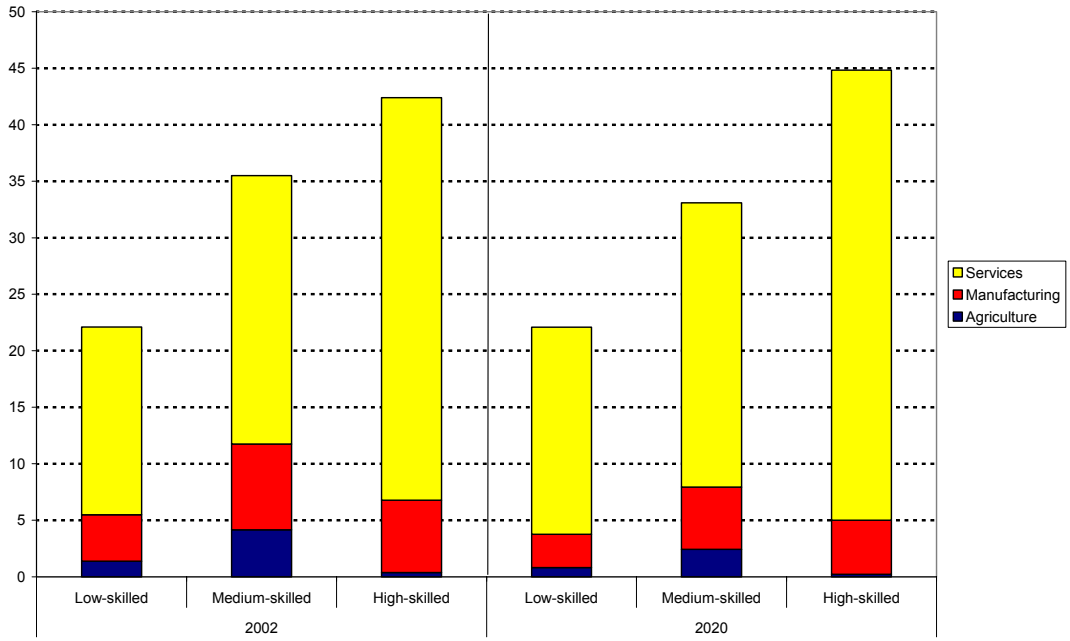
Table 8: Change in labour demand for the economy as a whole between 2002 and 2020 (in %) due to international trade and technological change- induced specialisation

Country	Labour structure in 2002			Labour structure in 2020			Change in demand according to skill		
	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled
Austria	22	39	39	22	33	45	-1	-13	+14
Belgium	21	34	45	21	32	47	0	-7	+5
Czech Republic	22	37	41	21	34	45	-1	-9	+9
Denmark	22	34	44	22	32	46	+2	-8	+5
Finland	21	36	43	22	33	45	0	-8	+6
France	21	35	44	21	33	46	0	-6	+5
Germany	22	34	44	23	30	46	+4	-11	+6
Greece	24	40	37	24	36	41	0	-10	+12
Hungary	22	37	41	21	36	43	-2	-4	+5
Ireland	22	36	42	21	35	44	-5	-3	+6
Italy	23	35	42	23	32	45	0	-8	+7
Netherlands	22	34	44	22	32	46	-2	-5	+5
Poland	23	43	35	22	40	38	-1	-6	+8
Portugal	22	39	39	22	36	42	-2	-7	+8
Slovak Republic	22	36	42	23	34	44	+2	-7	+5
Spain	23	37	41	19	37	44	-18	+1	+9
Sweden	21	33	45	21	31	48	0	-7	+5
United Kingdom	22	32	46	22	30	48	+1	-7	+4
EU	**22**	**36**	**42**	**22**	**34**	**45**	**0**	**-7**	**+6**

Source: STAN-OECD, authors' calculation.

Note: projections for manufacturing sectors take into account the effect of the increase in the share of inter-industry trade and of globalisation-induced technological change, while projections for other sectors are extrapolations of what has been observed between 1995 and 2002.

Figure 8. Distribution of labour demand by skill at the European level (in %)



Source: STAN-OECD, authors' calculation.

5 - Change in skill supply

A number of mechanisms are affecting the skill structure of the population (25-64 years)[24], namely:

- Greater investment in initial education raises the skill levels of new cohorts.
- Greater investment in lifelong training raises the skills of each cohort during its working life.
- Migration may modify the skill structure if migrants do not have the same skill pattern as the local population.

These factors will dramatically affect the skill structure of most European countries over the next 15 years. These changes can be assessed through projections of the skill structure.

Even with conservative assumptions regarding educational attainments (see box 7), projections show that every European country can be expected to raise the average skills of its labour force drastically. At the European level, the supply of low-skilled labour is forecast to fall by at least 17%. This is likely to be accompanied by an increase of 5% and 14% respectively in the supply of medium and high-skilled labour (see Figure 9).

Projections[25] point to a wide heterogeneity in expected outcomes across countries. Countries starting with a low level of skills (Belgium, Spain, Finland, France, Greece, Ireland, Italy, Portugal) can expect the supply of low-skilled labour to fall by more than 25%. The improvement in other countries is likely to be smaller.

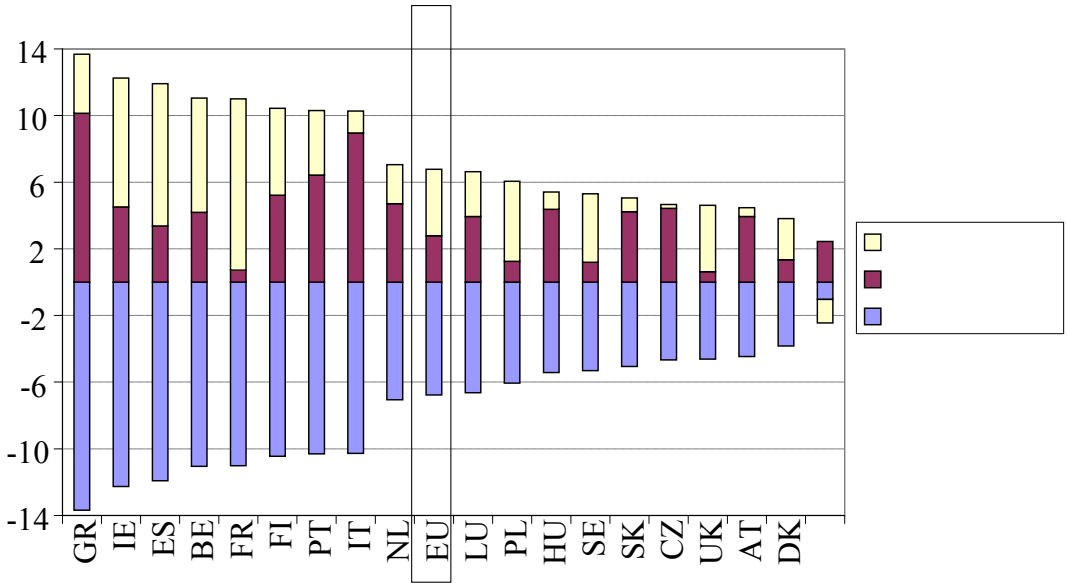
[24] The 15-24 age group has been excluded. For countries like the United Kingdom, where the employment rate for young people is fairly high, this group could have been included. But this would have been difficult, since the skills of young people in work or who have time to work differ from the average skills of young people. As far as the skill level is concerned, inclusion of the 15-24s would have lowered the general level of skills, whereas it is unclear what impact this would have had on the general trend.

[25] The labour supply projections were estimated by Magali Baillet (DGTPE-French Ministry), who has developed a methodology that takes lifelong training into account.

Using more detailed and less conservative assumptions (i.e. taking into account lifelong training, see Box 7), projections show an even greater increase in average skill levels in Europe.

These projections of labour supply by skill level are compared with the projections of the skill structure of labour demand in the main findings.

Figure 9: Change in share of the labour supply by skill level between 2003 and 2020



Source: DGTPE, OECD (Education at a Glance, 2005), EPC (Ageing Working Group). In the European Union, the share of low-skilled workers declines from 34% to 28%, and the figure accordingly shows a fall of 6 percentage points.

Table 10. Change in the share of the labour supply in European countries between 2003 and 2020 (in %)

	Low			Medium			High		
	Share		Change	Share		Change	Share		Change
	2003	2020		2003	2020		2003	2020	
AT	20	16	-20	65	69	+5	15	16	+3
BE	34	25	-28	35	38	+11	31	37	+19
CZ	13	8	-33	75	79	+5	12	13	+2
DE	16	15	-6	60	62	+4	24	23	-5
DK	19	16	-18	49	50	+2	32	35	+7
ES	54	44	-19	19	22	+16	27	34	+28
FI	22	13	-43	44	48	+11	34	39	+14
FR	33	23	-29	42	43	+2	25	34	+36
GR	44	32	-28	36	45	+25	20	23	+16
HU	23	18	-22	62	66	+7	16	17	+6
IE	36	25	-30	36	40	+11	28	34	+25
IT	52	43	-17	37	45	+22	11	12	+11
LU	39	34	-15	45	48	+8	16	18	+15
NL	32	26	-19	43	47	+10	25	27	+8
PL	50	45	-11	35	36	+3	15	19	+28
PT	76	67	-12	13	18	+44	11	15	+30
SE	15	10	-30	50	51	+2	35	39	+10
SK	11	7	-40	77	80	+5	12	13	+6
UK	35	31	-12	37	38	+1	28	32	+13
European Union	**34**	**28**	**-17**	**43**	**46**	**+5**	**23**	**26**	**+14**

Source: DGTPE, OECD (Education at a Glance, 2005), EPC (Ageing Working Group)
Note: high = tertiary; medium = upper secondary education; low = below secondary education. Projections are based on the skill structure by age groups for 2003 of the OECD – Education at a Glance 2005, and the labour supply projections of the Ageing Working Group of the ECOFIN-EPC. They are computed assuming that new cohorts entering the labour market have the same skills as the cohorts aged 25-34 in 2003 and that there is no lifelong training or migration to modify the skill structure of each cohort.

Box 7 : Conservative projections of labour supply skills

Simple projections can be made in order to serve as a benchmark of skill levels in the European Union to around 2020, starting with the labour supply structure compiled by the OECD for 2003 (OECD-Education at a Glance 2005).
Projections are based on a very simple cohort framework making conventional assumptions due to data limitations:

- Despite efforts made throughout Europe to improve the output of the educational system in the 1990s, the projections assume that the European educational systems are mature, implying no dramatic improvement in the educational attainments of young people in the future.
- In the absence of any clear indication as to the skill levels of migrants in the coming years, projections assume that migration flows will have the same skill structure as the average population.
- When a cohort leaves the educational system, its skills progressively improve over its lifetime as a result of lifelong training. The projections assume that this effect is negligible and that skills are stable over the cohort's lifetime.

These three assumptions are deliberately conservative, implying a lower estimate of the increase in the working population's average skill level. Educational systems improved in the 1990s and have not yet delivered all that can reasonably be expected for the 25-34 cohort. Training too is also contributing to this effort to improve average skills. On the other hand, migrations from outside the EU are expected to continue to have a marginal impact on the skill structure. Projections are performed for three skill

levels (low, medium and high-skilled) as determined by the highest diploma obtained.

Projections with lifelong training can be made using the more detailed data provided by the Finance Ministries of Hungary, Germany, Portugal, Poland, Austria and Denmark for the Globalisation Working Group of the Ecofin-EPC. Labour supply projections are computed for two dates (usually 1990 and 2005) of observation of skill supply in the recent past.

The choice of projection methodology depended on the age category, on skill improvement observed in the past, and on data availability. Projections are made by age category:

- Taking the skill distribution observed in 2005 for the same age category ("by age" method).
- Taking the skill improvements observed between 1990 and 2005 for a cohort ("by cohort" method). We thus assume a constant impact of lifelong training on the average skill level over time.

Broadly speaking, "by age" methods are used for younger age categories, which are entering the labour market, and "by cohort" methods are used for other age categories.

For all countries where comparisons with different projections (taking into account lifelong training and improvements in the educational system's output) were possible, educational attainments work out significantly higher. For example, the results for France and Portugal show that the share of low-skilled workers decreases by 16 and 30 percentage points respectively (compared to 11 and 10 percentage points in the simple projections). The share of medium-skilled workers increases by 5 and 12 percentage points respectively (compared to 1 and 6), and the share of high-skilled workers increases by 11 and 16 percentage points respectively (compared to 10 and 4).

Change in labour supply shares between 2003 and 2020

	Simple projections			Projections with lifelong training		
	Low	Medium	High	Low	Medium	High
France	-10	+1	+9	-16	+5	+11
Austria	-4	+4	+1	-12	+6	+6
Hungary	-5	+4	+1	-19	+15	+5
Poland	-6	+1	+5	-12	-6	+18
Denmark	-4	+1	+2	-6	-1	+7
Germany	-1	+2	-1	+2	-3	+1
Portugal	*-10*	*+6*	*+4*	*-30*	*+12*	*+16*

Source: Country Ministries of Finance, DGTPE calculations, Denmark Ministry of Finance labour supply projections.

[26]. OECD, Education at a Glance (2005).

Annex

- **Unemployment rate in European OECD countries**

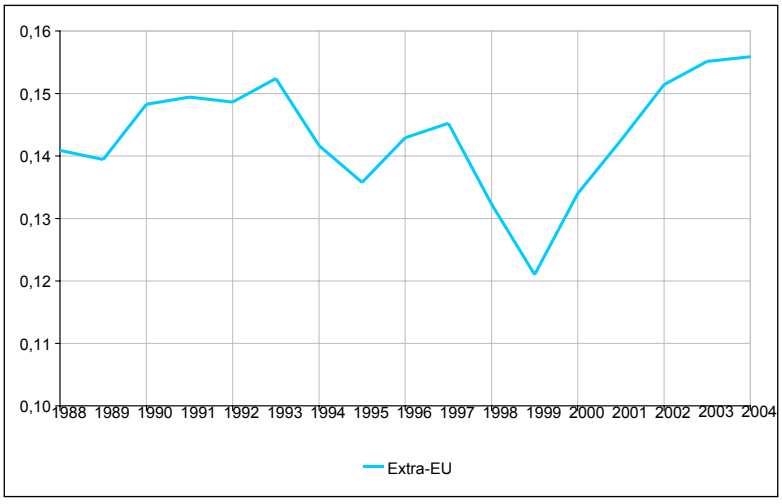
Table A1: Trends in high-skilled, medium-skilled and low-skilled unemployment in European OECD countries (in %).

Country	High-skilled unemployment				Medium-skilled unemployment				Low-skilled unemployment			
	1991	1998	2003	Change	1991	1998	2003	Change	1991	1998	2003	Change
Slovak Rep	2.7	3.2	3.7	1	9.6	8.8	13.5	3.9	24	24.3	44.9	20.9
Czech Rep	0.7	1.9	2	1.3	2.1	4.6	6.1	4	7.7	14.5	19.8	12.1
Poland	2.8	2.5	6.6	3.8	11.1	9.1	17.8	6.7	13.9	13.9	25.9	12
Germany	3.3	5.5	5.2	1.9	4.7	10.3	10.2	5.5	7.4	15.4	18	10.6
Sweden	1.1	4.4	3.9	2.8	2.3	7.8	5.2	2.9	2.6	10.4	6.1	3.5
Italy	5	6.9	5.3	0.3	7.2	8.2	6.4	-0.8	5.7	10.8	9	3.3
Austria	1.5	2	2	0.5	3.1	3.6	3.4	0.3	4.8	6.9	7.9	3.1
Finland	3.4	5.8	4.3	0.9	7.3	10.6	9.2	1.9	8.6	13.8	11.1	2.5
France	3.7	6.6	6.1	2.4	6.6	9.6	7.5	0.9	10.6	14.9	12.1	1.5
Greece	8.1	6.2	5.6	-2.5	9	10.4	9.1	0.1	6.3	7.3	6.6	0.3
Hungary		1.7	1.4	-0.3		6.2	4.8	-1.4		11.4	10.6	-0.8
Belgium	2	3.2	3.5	1.5	4.2	7.4	6.7	2.5	11.8	13.1	10.7	-1.1
Spain	9.3	13.1	7.7	-1.6	12.2	15.3	9.5	-2.7	13.7	17.1	11.2	-2.5
Portugal	3.2	2.8	4.9	1.7	4.5	5.1	5.1	0.6	5.3	4.4	5.7	0.4
United Kingdom	3.3	2.6	2.4	-0.9	6.5	5	3.9	-2.6	10.4	10.5	6.9	-3.5
Netherlands	1.5	1.7	2.1	0.6	4.6	2.4	2.2	-2.4	8.6	4.9	3.8	-4.8
Denmark	4.9	3.3	4.7	-0.2	9.1	4.6	4.4	-4.7	14.2	7	7.2	-7
Ireland	4.1	3	2.6	-1.5	7.3	4.5	2.9	-4.4	20.3	11.6	6.3	-14

Source: OECD, Education at a Glance 2005, and authors' calculation. Countries are ranked according to the change in low-skilled unemployment (last column).

- **Trends in inter-industry trade**

Figure A1: Inter-industry share of industry in extra-European trade



Note: the indicator implemented here is $\frac{\sum_k |X_k - M_k * (X / M)|}{\sum_k X_k + M_k * (X / M)}$ *where k designates the industry, X exports and M imports. Source: STAN-OECD*, authors' calculation.

- **Detailed results of demand projections**

Table A2: Change in the labour structure of manufacturing industry between 2002 and 2020 due to specialisation and technological change

Country	Labour structure in 2002			International trade effect (in %)			Additional effect with technological change		
	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled	Low-skilled	Medium-skilled	High-skilled
Austria	23	42	35	-6	-2	+6	-0.2	0	+0.1
Belgium	23	42	35	-4	-4	+8	-1.1	-0.8	+1.7
Czech Republic	23	42	35	-14	-5	+15	-2.8	-0.8	+2.7
Denmark	22	41	37	-5	0	+3	-0.9	-0.1	+0.6
Finland	21	41	37	-5	-3	+6	-0.5	-0.1	+0.4
France	23	42	36	-1	0	+1	-0.4	0	+0.3
Germany	21	41	37	0	0	0	0.1	0	0
Greece	27	42	31	-3	-1	+3	-2.8	-0.4	+2.9
Hungary	24	41	35	-6	0	+4	-2.9	-0.5	+2.6
Ireland	23	40	37	-3	-3	+5	-5.4	0.9	+2.3
Italy	23	43	34	-2	-1	+2	-0.4	-0.2	+0.6
Netherlands	22	42	36	-5	+2	+1	-1.3	0.5	+0.2
Poland	25	42	33	0	-1	+1	-0.2	-0.3	+0.5
Portugal	27	43	31	-9	-2	+10	-3	-0.2	+2.8
Slovak Republic	23	42	34	0	0	0	-4.3	-3.5	+7.2
Spain	24	43	34	0	0	0	-0.1	-0.1	+0.2
Sweden	21	42	37	-3	-1	+3	-0.1	0	+0.1
United Kingdom	22	42	36	0	0	0	-0.2	-0.1	+0.2
EU	**23**	**42**	**35**	**-2**	**-1**	**+2**	**-0.7**	**-0.2**	**+0.7**

Source: STAN-OECD, authors' calculation

Table A3: Labour demand trends by sector in manufacturing industries between 2002 and 2020 (in %) due to international trade -induced specialisation

Country	Food	Textiles	Wood	Paper	Chemicals	Minerals	Basic metals	Machinery	Transport	Manufacturing nec
Austria	-12	-21	-32	-22	-4	-23	-23	+48	+22	-16
Belgium	-22	-21	-18	-6	+42	-18	-31	+75	-50	-27
Czech Republic	-37	-54	-32	-24	-37	-41	-54	+117	-9	-23
Denmark	-39	-11	-10	+2	+50	-9	+5	+11	-7	-18
Finland	-6	-9	-4	0	+11	-2	-3	-1	+12	-3
France	-6	-9	-4	0	+11	-2	-3	-1	+12	-3
Germany	+1	-8	-6	-3	+14	-5	-4	-8	+17	-7
Greece	-1	-28	+4	+11	+17	+6	-3	+26	+55	+6
Hungary	-25	-36	+6	+29	+3	+9	-14	+19	+51	+32
Ireland	-80	-17	-26	-32	+232	-21	-12	-31	-10	-27
Italy	+14	-27	-3	-1	+21	-3	-3	+8	+21	-6
Netherlands	-43	+9	+10	+13	-25	+13	+10	+5	+39	+11
Poland	+12	-14	+2	+14	-9	+6	-25	+3	+5	+17
Portugal	+1	-55	-13	+1	+39	-2	+26	+94	+128	+11
Slovak Republic	+1	-1	0	0	-2	0	-2	+1	+1	+1
Spain	+4	-3	-1	+4	+5	+1	-1	+5	-17	0
Sweden	-12	-10	-29	-27	+22	-16	-10	+25	+4	-17
United Kingdom	+7	-6	+3	+8	-1	+4	0	-5	-5	-3
EU	**-3**	**-22**	**-7**	**0**	**+11**	**-4**	**-7**	**+9**	**+10**	**-2**

Source: DGTPE, STAN-OECD

Table A4: Additional effects on labour demand by sector in manufacturing industries between 2002 and 2020 (in % points) due to technological change-induced specialisation

Country	Food	Textiles	Wood	Paper	Chemicals	Minerals	Basic metals	Machinery	Transport	Manufacturing nec
Austria		-1	-7	-1	+2	-2	-3	-1	+18	+4
Belgium	-2	-3	-11	+5	+5	-2	-3	+18	-17	-21
Czech Republic	-4	-20	-9	+1	-11	-7	-7	+19	+7	+4
Denmark	-5	-7	-4	+2	+10	-3	3	+1	-3	-7
Finland	-11	-7	-42	-51	+15	-15	-21	+57	-17	-19
France	-1	-6	-4	+1	+3	0	0	0	+4	-1
Germany	1	-4	-1	0	+2	0	0	0	+1	-2
Greece	-2	-18	-10	+5	+9	0	-7	+23	+79	0
Hungary	-4	-23	-16	+17	+5	-1	-7	+11	+17	+16
Ireland	+80	+8	-9	+5	-38	15	21	+26	-8	-6
Italy	+6	-7	-4	0	+6	-1	-1	+1	+11	-4
Netherlands	-12	+1	+2	+3	-6	3	2	+1	+20	+2
Poland	+5	-6	-5	+5	-2	1	-7	+3	+2	+5
Portugal	-4	-12	-19	-4	+15	-5	10	+24	+59	+1
Slovak republic	+34	-35	-22	-7	-38	-11	-48	+55	+48	-5
Spain	+1	-1	-3	+2	+2	0	0	+2	-5	0
Sweden	-1	+17	-9	-2	+6	0	0	0	+2	-2
United Kingdom	+3	-9	-1	+3	+1	+1	0	0	-1	-5
EU	**+1**	**-9**	**-6**	**+1**	**+1**	**-1**	**-2**	**+3**	**+4**	**-1**

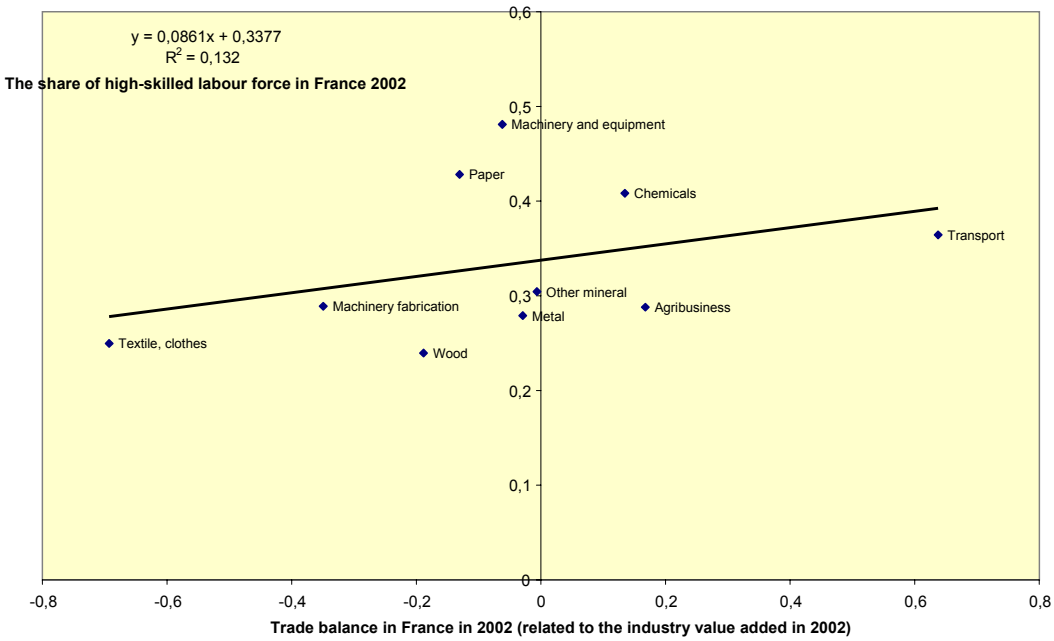
Source: DGTPE, STAN-OECD

Table A5: The revival of inter-industry trade in increasing labour turnover in manufacturing industry by skill level (in %)

Country	Low-skilled	Medium-skilled	High-skilled
Austria	12	13	14
Belgium	16	17	19
Czech Republic	26	28	32
Denmark	11	9	9
Finland	16	17	19
France	3	3	2
Germany	4	4	4
Greece	7	7	8
Hungary	12	12	11
Ireland	37	31	34
Italy	7	6	6
Netherlands	10	9	8
Poland	6	6	5
Portugal	17	19	20
Slovak Republic	14	15	15
Spain	2	2	2
Sweden	9	9	9
United Kingdom	2	2	2
EU	**7**	**7**	**7**

Source: DGTPE, STAN-OECD
Note: The turnover is estimated as described in Box 5.

Figure A2: Trade surplus and intensity of high-skilled labour in production.



Source: DGTPE, French Employment Survey

The distribution of skills for the service and agriculture sectors in France (see Figure A6) illustrates the wide disparities between sectors. The electricity-gas (74%), education (76%), financial intermediation (59%), and property (56%) sectors are characterised by a predominance of high-skilled labour. In contrast, low-skilled workers are well-represented in sectors such as retail trade (47%), and hotels and restaurants (42%).

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