PART II

Renewing the skills of ageing workforces: The role of migration*

Part II examines the role which different demographic groups (youth, new immigrants, persons of prime working age and older persons) have played in changes in the educational attainment of the labour force and in changes in the distribution of occupations.

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1. Introduction

As is well known, the next decade will see significant demographic change in the working-age population and labour force in OECD countries. The 8.6% increase in the working-age population (20-64-year-olds) observed on average over the period 2000-10 is expected to drop to barely 2% over the 2010-20 decade, even assuming a continuation of pre-crisis migration levels. Almost half of OECD countries will see declines in their working-age populations over the coming decade.

How will labour markets and enterprises adapt to the changing demographic landscape? Will labour and skill shortages materialise? What role will international migration play in filling them?

The 2008-09 recession and the slow recovery thereafter do not seem an opportune time to be considering prospects for international labour migration, given the extensive labour market slack which persists in many countries as a result of the economic crisis. Nonetheless, the demographic shift underway is so large and persistent that it is important to consider what contribution international migration can be expected to make to the evolution in the distribution of the workforce by educational attainment and by occupation in the future. For this, it is useful to cast a look back at the recent past, in particular the 2000-10 decade. Persons aged 55-64 in the year 2010, almost 40% of whom were already retired and who represented almost half of retirees over the 2000-10 decade, constitute the first cohort of baby-boomers born in the ten years after the second World War.[1]

Discussions concerning the ageing workforce are often phrased in terms of a replacement problem, with smaller youth cohorts entering the workforce as large baby-boom cohorts retire. The implication is that international migration will be needed to offset this imbalance, in support of economic growth, both to maintain the size of the labour force and to ensure an adequate supply of skills to respond to the continuing expected growth in high-skilled jobs.[2]

But how appropriate is the replacement model as a picture of what will happen over the next ten years and to assess the extent and nature of future skill needs that will have to be filled by recruitment from abroad? We know, for example, that young workers are on average more educated than their retiring forebears, but will there be fewer of them, and if so, does this mean that more highly educated migrants will need to be recruited? What precisely has been the role of international migration in labour force and occupational renewal over the recent past?

This part aims to provide some contextual data on, and exploratory analysis of, these issues. It attempts to do so by a decomposition of educational and occupational change according to the contribution to change of new entrants, prime-age workers, retiring workers and in particular, immigrants. The objective is to get a clearer picture of the demographic imbalance question that is central to discussions of ageing, to see how it is playing out in practice and where immigrants fit into the picture. As will be seen, the picture is not quite so simple as sometimes portrayed.

The first section of this part outlines the general methodological approach that will be followed for the analyses in the rest of the chapter. This is followed by a brief section which considers the relation between the presence of immigrants in the labour market and labour demand. The following section decomposes the change in the educational attainment of the labour force over the period from 2000 to 2010 by demographic group. The same approach is then used to examine the components of change in the distribution of occupations, which underwent considerable change over the decade. The final section summarises and concludes.

2. Main findings

- The educational attainment of new entrants into the labour force was much higher than that of retiring workers over the period 2000-10. New immigrants had educational levels that were between those of new entrants and retirees, with proportionally more highly educated workers among new immigrants than retirees, but more low-educated workers than among new entrants.
- Not only were new entrants to the labour force more educated over the period 2000-10, there were more of them. There were close to three highly educated new entrants for every retiring one in both Europe and the United States, and the reverse situation held for the low-educated.
- Immigrants represented 47/70% of the increase in the labour force in the United States and Europe, respectively, over the decade, but 21/14% respectively of the increase in the highly educated labour force. They are thus playing a more significant role in maintaining the size of the labour force than in its up-skilling in most countries.
- The composition of occupational change over the decade mirrored that observed for the educational attainment of the labour force. Young new entrants into strongly growing occupations (most of which were highly skilled) far outnumbered retirees over the past decade. Likewise, retirees from strongly declining occupations greatly outnumbered new entrants. Indeed, over 40% of net occupational change took place through the entry and exit of young and older workers.
- New immigrants represented 15% of entries into strongly growing occupations in Europe over the decade and 22% in the United States. They are thus playing a significant role in the most dynamic sectors of the economy, even under conditions when most migration has not been demand-driven.
- At the same time immigrants represented 24/28%, respectively, of entries into the most strongly declining occupations in Europe and the United States.
- Almost half of low-skilled jobs on average are taken up by immigrants, with considerable variation across countries. In some countries, the immigrant share is very high, which risks creating a segmented labour market, as low-skilled jobs become the exclusive domain of immigrants.
- In countries where labour migration has been more significant, the contribution of migrants to the up-skilling of the workforce and to growing occupations has been more significant.
- A demographic imbalance model of labour force change and occupational change seems inappropriate in the face of the large differences in educational attainment between entry and exit cohorts and in entry and exit from growing and declining occupations.

The potential need for immigrants in the ageing context thus cannot be assessed on the basis of demographic imbalances alone, but must take into account changes in the nature of employment, which appear to be more dynamic than changes in the age composition of the population and labour force.

3. General methodological approach

The analyses presented in this chapter examine change (in educational attainment, in the occupational distribution, in the levels of skills) through a *demographic accounting framework*. Succinctly, the *net* change over a period for a particular characteristic is decomposed into that due to young workers, new immigrants, prime-age workers and older workers, where the age-related components of change are estimated by comparing the situation of so-called "pseudo age-cohorts" in 2000 and 2010, respectively (see Annex II.A1 for the details). The pseudo-cohort approach implicitly includes the effects of emigration and mortality, which cannot be observed directly.[3]

In addition, since characteristics are observed at two points in time, abstraction is made of multiple changes that may have occurred over the period. A worker may change jobs if not occupation several times in the intervening period, but the only jobs and occupations that are observed are those at the beginning and end of the time period, which are the ones which enter into the net change calculations. Note also that with the pseudo-cohort approach, much of the change observed for young workers and older workers will be due to workforce entry and retirement, respectively. For the age-groups considered, these largely predominate over occupational change in the net change calculations. This means in practice that the contributions to change in the labour force and in occupations due to young and older workers are always positive, respectively negative for the labour force and for every occupation. For example, on average across countries, the net changes in employment for young workers and older workers amount to approximately 87% and 80% of employment for an entry cohort (aged 25-34 in the year 2010) and an exit cohort (aged 45-54 in the year 2000), respectively. For the prime-age group, on the other hand, the net change measure may hide a considerable amount of movement which is not visible, because it is offsetting, as new hires replace persons who quit or are laid off. The data used for the analyses are taken from the European Union labour force survey for European countries, from the American Community Survey for the United States and from the Survey of Labour Income and Dynamics (SLID) for Canada.

4. The role of immigrants in the labour market

Before delving into the empirical data, it is useful to consider first the relation between labour demand and the presence of new immigrants in the labour market. This question is of particular interest because of the fact that most arriving immigrants have not ostensibly been recruited from abroad by employers for specific jobs for which there has been an identified or tested labour need, but have arrived for family or humanitarian reasons or through unauthorised channels. Many have entered the labour market, either upon arrival or later, and been hired into jobs, of which the skill level may or may not always have been commensurate with their formal qualifications. They are not unique in this respect; some young persons entering the labour market are in the same situation. But some immigrants arrive with little knowledge of the destination-country language and with qualifications and experience acquired abroad in a different economic context that may not easily be transferable to the labour markets and workplaces of destination countries.

Still, many immigrants, especially those arriving under free-circulation regimes or through unauthorised means, may nonetheless arrive in response to knowledge about job opportunities transmitted through the media or by migrant networks, in particular friends and relatives in destination countries. There may even be specific jobs awaiting them upon arrival.

The same applies to the non-labour migrants who enter the labour market every year but were admitted under another type of residence permit. A study covering immigrant entries into the labour force over the 2004-06 period in France, for example, showed that 90% of the entries consisted of non-labour migrants, at a time when direct recruitment accounted for less than 5-10% of total immigrant inflows in France (Léger, 2008). More than three-quarters of non-labour migrant entries into the labour force occurred during the year following arrival.

The statistics and results presented in this chapter will reflect the impact of a mix of migrants in the labour market, with persons who were not specifically recruited by employers being in the majority in many countries. If the incidence of labour migration increases in the near-to-medium term, one can expect some shift in the impact of migration in general, as more workers arrive for specific jobs and relatively fewer as general entrants into a labour market, searching for work along with other domestic suppliers. In this respect, the experience of labour migration countries may be an instructive guide to what the future holds for countries expecting to increase their labour migration in the following decades.

5. The demography of changes in the educational attainment of the labour force

The labour force has increased by about 0.9 percentage points per year on average between 2000 and 2010, an amount that is expected to decline to less than 0.2 percentage points per year over the coming decade. The demographic composition of this change is portrayed in Table II.1, applying the decomposition methodology described in Annex II.A1. The labour force renewed itself by about a quarter over the period, from inflows (new entrants and immigrants) replacing outflows (retirees). Immigrants on average accounted for about 19% of the inflows, with contributions far above average in Ireland (34%), Luxembourg (57%), Spain (40%) and Switzerland (40%).

The inflows of young resident workers into the labour force have exceeded the outflows of older workers by about 5% of the labour force on average. With total growth in the labour force at 11% over the period, this means that immigrants have accounted for over 57% of the total labour force growth over the period, although their share of entries into the labour force has been considerably lower (less than 25%). In a number of countries (Switzerland, Italy, Luxembourg and the United Kingdom), all or almost all of the growth in the labour force has come from the arrival of new immigrants.

As educational attainment in origin countries has been increasing, so also has been that of immigrants arriving legally in OECD countries. But the immigrant population also includes a significant proportion of low-educated persons in a number of countries, with many persons in this group having arrived through family reunification or formation or having fled war zones or persecution in their countries of origin. Low levels of education have also been characteristic of unauthorised migration in the United States and of labour migration in southern Europe. In most other countries, legal long-term labour migration by

Table II.1. **Contributions to growth in the labour force by demographic group, 2000-10**

Percentages

	Total growth of the labour force (A + B + C + D)	Young workers (new entrants) (A)	New immigrants (B)	Prime-age workers (C)	Older workers (retirees) (D)	Net turnover (see Notes)	Replacement surplus (entrants of younger + retirement of older) (A + D)
Austria	11	22	6	–1	–17	23	5
Belgium	10	24	8	–4	–17	27	7
Canada	21	22	12	–1	–11	23	11
Switzerland	13	19	12	–1	–17	25	1
Czech Republic	3	21	1	3	–21	23	0
Germany	5	27	3	–2	–23	27	3
Denmark	–1	18	2	–2	–20	21	–2
Estonia	5	26	1	–1	–20	24	6
Spain	30	25	17	2	–14	29	11
Finland	2	19	2	0	–19	20	1
France	10	26	3	1	–20	25	6
Greece	10	22	5	1	–19	23	4
Hungary	5	22	1	2	–20	23	2
Ireland	24	25	13	–2	–12	26	13
Italy	6	17	6	0	–18	21	–1
Luxembourg	23	20	26	–5	–18	35	2
Netherlands	8	21	2	–2	–14	19	8
Norway	10	21	5	–1	–16	21	5
Portugal	8	22	4	0	–19	23	4
Sweden	12	24	6	2	–20	26	4
United Kingdom	9	24	11	–5	–20	30	4
United States	13	20	6	–1	–13	20	7
OECD average	**11**	**22**	**7**	**–1**	**–18**	**24**	**5**

Notes: The contribution of each group is the net change in the labour force for the group divided by the total number of persons in the labour force in 2000. Net turnover is half the sum of the absolute values of the individual contributions. It understates total turnover, because some entries and exits within the prime-age group and more generally as a result of in- and out-migration of residents may be offsetting. Data for Germany and the United Kingdom on the composition of growth by demographic group are based on 2005-10 change, adjusted to agree with the observed change in the labour force for the period 2000-10.

Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.

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low-educated persons has been more limited. Table II.2 provides a general overview of average education attainment levels of entrants to, and exits from, the labour force in 2010 across OECD and EU member countries, excluding youth under 25 in education. On average overall, the differences between new entrants and retiring older workers was very large, with the percentage of young new entrants having low attainment levels being 31 percentage points lower than retiring older workers and the percentage of new entrants having high attainment levels being 22 percentage points higher. The improvement in attainment levels in the labour force across generations in the countries of southern Europe and Ireland was especially large, with declines in the labour force with low attainment of about 50 points. Canada is the only country which did not see double-digit reductions across generations in the percentage of the labour force with low attainment levels, but the percentage of such workers among retirees was already relatively low in that country.

At the other end of the attainment spectrum, almost all countries have seen double-digit increases in the per cent of young workers with tertiary attainment levels compared to retirees, with generally at least 20 percentage point increases. Thus in general, the difference in attainment levels between incoming and outgoing labour force cohorts is quite large.

Table II.2. **Educational attainment of the labour force, new entrants, new immigrants and retirees, 2000-10**

	Low attainment			Medium attainment			High attainment			Immigrants compared to new entrants		
	Older workers (retirees)	Young workers (new entrants)	New immigrants	Older workers (retirees)	Young workers (new entrants)	New immigrants	Older workers (retirees)	Young workers (new entrants)	New immigrants	Low atttainment	Medium attainment	High attainment
	Per cent of all retirees	Percentage points +/– retirees		Per cent of all retirees	Percentage points +/– retirees		Per cent of all retirees	Percentage points +/– retirees		Percentage points +/– new entrants		
Denmark	. .	. .	. .	. .	. .	. .	27	+20	+8	. .	. .	–12
Canada	16	–10	–8	35	–10	–10	49	+19	+18	+2	–	–1
Czech Republic	18	–14	–7	73	–4	–8	10	+18	+15	+7	–4	–3
United States	19	–15	+11	52	–2	–14	29	+18	+3	+26	–12	–14
Norway	. .	. .	. .	. .	. .	. .	26	+21	+10	. .	. .	–11
Germany	26	–16	+2	52	+14	–17	22	+2	+15	+18	–31	+14
Switzerland	26	–19	–7	62	–7	–29	13	+26	+36	+12	–22	+10
Austria	28	–20	–4	60	+11	–10	11	+9	+14	+16	–21	+5
Sweden	29	–18	+3	42	+10	–19	29	+9	+17	+21	–29	+8
Hungary	29	–20	–17	55	+1	–8	16	+19	+25	+2	–9	+6
United Kingdom	30	–28	–14	53	–2	+4	17	+30	+9	+14	+6	–20
Netherlands	33	–19	–2	47	–5	–15	20	+24	+17	+18	–10	–7
Finland	42	–36	–7	32	+20	+13	27	+17	–6	+29	–7	–23
France	44	–32	–8	39	+3	–9	17	+29	+17	+24	–12	–12
Luxembourg	45	–32	–31	40	+9	–17	15	+23	+48	+1	–26	+25
Belgium	49	–37	–19	28	+11	+4	23	+25	+15	+18	–7	–11
Ireland	58	–56	–47	27	+8	+12	14	+48	+35	+9	+4	–13
Italy	65	–52	–23	25	+34	+22	10	+18	+1	+29	–12	–17
Greece	66	–52	–10	23	+19	+11	11	+33	–	+42	–9	–33
Spain	80	–51	–38	6	+16	+30	14	+35	+8	+13	+13	–27
Portugal	89	–54	–43	5	+27	+35	6	+27	+7	+11	+9	–20
OECD average	**42**	**–31**	**–14**	**40**	**+8**	**–1**	**19**	**+22**	**+15**	**+16**	**–9**	**–7**

Notes: See Table II.1. "Low" here refers to less than upper secondary attainment, "medium" to upper secondary and post-secondary non-tertiary, "high" to tertiary. The second and third columns of each attainment level give the difference between the percentage of persons in the attainment level within the group compared to the corresponding percentage within the retiring cohort. Data on low and medium attainment for Denmark and Norway were unusable because of breaks in the attainment series.
Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.
StatLink http://dx.doi.org/10.1787/888932617018

In most countries, the attainment levels of new immigrant entries into the workforce were also higher than those of retiring cohorts, but not to the same extent as young resident entrants. The United States and, to a lesser extent, Finland are the only countries which saw immigrant entries into the labour force of lower attainment levels than those of retiring cohorts. The picture is much more diverse when one compares new immigrants to resident new entrants, however (last three columns). With few exceptions (Canada, Hungary, Luxembourg and to a lesser extent Ireland and the Czech Republic), there are proportionally many more new immigrants with low attainment levels than young new entrants, on average 16 percentage points more. This is generally mirrored by relatively fewer new immigrants at high attainment levels than among new entrants. The exceptions are the German-speaking countries, Hungary and Sweden, which received proportionally more highly educated immigrants and Canada and the Czech Republic, where the percentage of highly educated new immigrants is about the same as among young new entrants.

These results by themselves would point to a labour market role for new immigrants that may not resemble that for young new entrants, with their generally much higher attainment levels.

6. The composition of changes in the educational attainment of the labour force

The results above, however, concern the distribution of attainment levels in the labour force among demographic groups. They tell us little about volumes, that is about the relative numbers of entrants, new immigrants and retirees, and possible demographic imbalances resulting from large retiring cohorts compared with declining youth cohorts.

To get a clearer picture of the possible imbalances, we proceed to the decomposition of the total absolute change in the labour force by attainment level over the 2000 to 2010 period. The changes recorded represent a mix of two developments, namely increases in average attainment levels and changes in labour force participation. As noted earlier, the latter changes, for young and older workers, reflect essentially labour force entry and retirement, respectively. Note that changes attributable to prime-age workers either entering or leaving the labour force, emigrating or who have deceased appear implicitly as increases or declines in educational attainment levels of the prime-age labour force.[4] The objective is to see more clearly the contributions of various demographic groups to the evolution of educational attainment in the labour force. This hopefully provides more focused information than estimates of differences in stock levels, which are strongly affected by the inertia of the large numbers of persons whose educational attainment remains unchanged.

Figure II.1 gives the result for Europe as a whole and for the United States, as well as for a selected number of countries. The results show the composition of change in the educational attainment of the labour force over the period 2000-10. The number of young workers entering the labour force with high levels of educational attainment is much larger than that of retiring older workers, with, for example, almost three young workers at a high education level entering the labour force for each retiring worker at this level. Some of the increase in attainment has been occurring in tertiary high-level technical and vocational qualifications, forms of education which were less common decades ago than is currently the case. For low attainment, the situation is the reverse; there are three retiring workers for every entry.

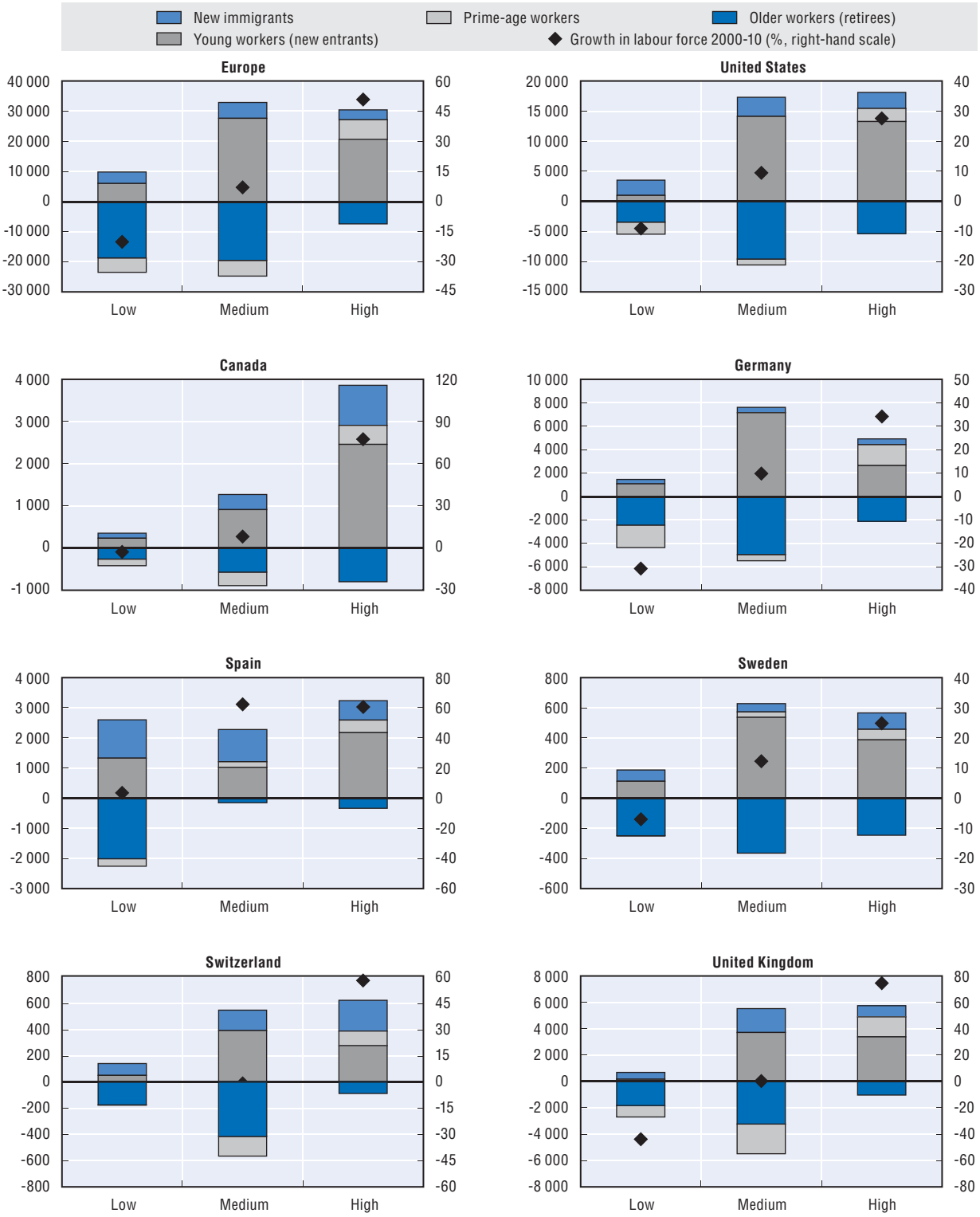
That some upgrading in the educational attainment of the work-force was occurring was evident. It is the difference relative to the retiring cohort that is noteworthy. In Europe, the overall increase in the number of persons in the labour force with tertiary attainment has been on the order of 50% over the past decade, while the decline in workers with less than upper secondary has been about 20%. Workers with medium education levels have increased by about 7%. In the United States, where tertiary education levels reached high levels earlier than in Europe, the increase in the tertiary-educated labour force was about 28%. Persons in the labour force with mid-range education increased by 10%, while those with low education declined by 9%.

New immigrants were found more often in medium- and low-education levels than in high. They accounted for about 14% of the increase in high-educated workers in Europe and 20% in the United States. While low-educated workers have declined in numbers, immigrants accounted for almost 40% of the new workers at this education level in Europe and 70% in the United States.

Figures II.2a through II.2c give, for all countries, the general picture of changes in the labour force by educational attainment level and source over the 2000-10 decade. The strong increase in tertiary attainment levels among new entries compared with retiring cohorts (Figure II.2a) is seen universally. Indeed, it may even be underestimated, because a certain proportion of increases in the prime-age groups consists of late completers, that is, persons completing a first tertiary degree after the age of 24. The average ratio of young

Figure II.1. **Changes in the educational attainment of the labour force, 2000-10, by source**

Thousands



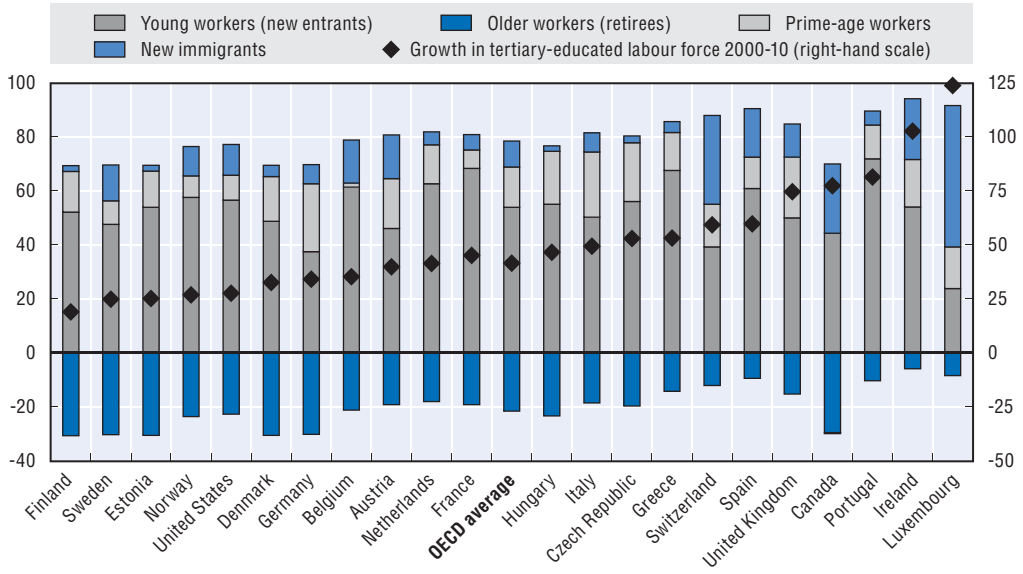
Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.

StatLink http://dx.doi.org/10.1787/888932615574

entrants to retiring older workers is more than 3.5 which hardly suggests a replacement problem at this early juncture of ageing, at least in terms of educational attainment levels. The share of immigrants in the increase in the labour force with tertiary attainment averages about 15%, with especially high levels for Luxembourg (68%) and Switzerland (46%) and shares between 20 and 30% in Austria, Belgium, Spain and the United Kingdom.

Figure II.2a. **Composition of the change in the tertiary-educated labour force, by demographic group, 2000-10**

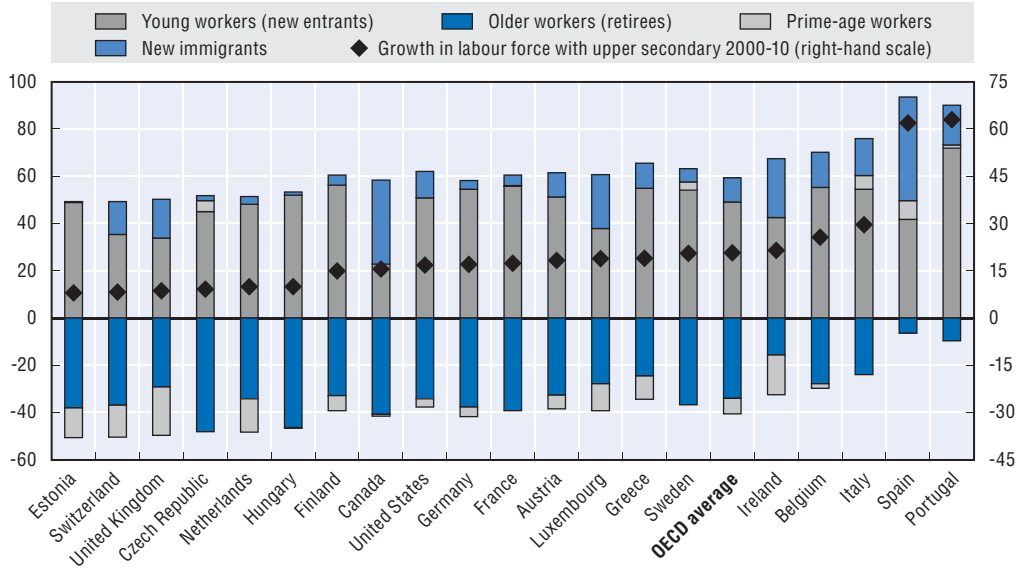
Percentages



Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics. StatLink http://dx.doi.org/10.1787/888932615593

Figure II.2b. **Composition of the change in the labour force with upper secondary attainment, by demographic group, 2000-10**

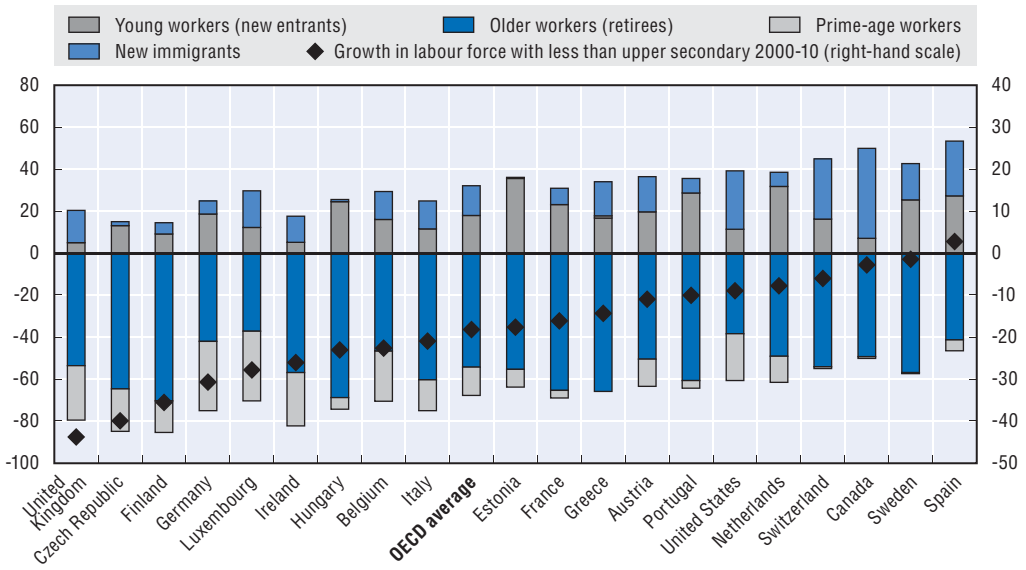
Percentages



Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics. StatLink http://dx.doi.org/10.1787/888932615612

Figure II.2c. **Composition of the change in the labour force with less than upper secondary education, by demographic group, 2000-10**

Percentages



Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics. StatLink http://dx.doi.org/10.1787/888932615631

Note that there is no obvious relation between the extent of replacement of older workers by younger ones and the share of immigrants in the increase in tertiary attainment levels. By contrast, there are relatively few entries of low-educated workers into the labour force compared with retirements of such workers, with entries representing on average about 40% of retirements (Figure II.2c). As for the high-educated, entries of young mid-educated workers also tend to outnumber retirements, except in a few countries, in particular, Switzerland and the Czech Republic. On average there are about one and one-half entering mid-educated workers for every retiring one. The role of migration in the evolution of the low- and mid-educated workforces (Figures II.2b and II.2c) is more evident than was the case for the highly educated, but again, there is no obvious relationship between a "replacement deficit" and the extent of entering low- and mid-educated immigrants.

There is some selectivity in favour of high-skilled migrants in a number of countries which have seen considerable labour migration over the past decade, namely Ireland, Luxembourg and Switzerland, but most of these movements have occurred in the context of free-circulation rather than discretionary migration from non-EU countries, where employers recruit workers from abroad in response to labour market needs and where the declared needs of employers are generally verified by destination country administrations.

On the other hand, in the "new" migration countries of southern Europe, which have had substantial labour migration over the past decade as well as being open to lower-skilled migration, the increases in the labour force have come largely from lower-educated labour migrants. However, not all of these have been recruited from abroad; many have been unauthorised and later regularised, or been hired within the country after arrival under a non-work status.

In summary then, the past decade saw the replacement of retiring labour force cohorts by much more highly educated new entrants. The most highly educated were far more numerous than those retiring, which by itself would not suggest a problem with the supply

of highly educated workers. Immigrants added to this number over the decade, representing about 15% of tertiary-educated entries into the labour force. This rich supply of skills among entrants does not exclude the possibility of skill shortages in certain areas, however. In most countries, immigrants had educational attainment levels that were somewhere in between entry and retiring cohorts, in a context in which most migration was non-discretionary.

7. The demography of occupational change

Background

Given the substantial increase in the educational levels of young workers entering the labour force in OECD countries, one might expect analogous changes to occur in the distribution of occupations and in the skill levels of jobs in the labour market. However, with increasing educational levels, one could also be witnessing an increasing proportion of entrants overqualified for available jobs. Such a result would suggest that the increase in attainment levels would be more supply- than demand-induced. As will be seen, the skill level of jobs is increasing as well.

The trends in the composition of employment have shown a continuous process of skill upgrading between 1950 and 2010 (Handel, 2010). The occupational distribution of employment has changed: shifting first from agricultural to production jobs, and later to professional, associate professionals and technical jobs.

Thus, there is little doubt that there has been an increase in job skill demands in OECD countries in the last decades. The increase in the demand for high-skilled workers has been interpreted for a long time as the result mostly of technological change (see Autor and Katz, 1999 for a review of the literature on skill-biased technological change, SBTC).

However, parallel to this increase in employment in higher skilled occupations, there has been as well an increase in lower-skilled occupations and a decrease in middle-skilled occupations. This phenomenon of *job polarization* has been observed in several OECD countries. Acemoglu and Autor (2010) describe the simultaneous increase in the share of employment in high-skill, high-wage occupations and low-skill, low-wage occupations in the United States and in the European Union. The authors argue that to describe the changes in the employment distribution a complex framework is necessary with "interactions among worker skills, job tasks, evolving technologies and shifting trading opportunities".

Several factors might explain *job polarisation,* Autor, Levy and Murnane (2003) suggested a *routinisation hypothesis*: middle-skilled and manual jobs are substituted by technological improvements and the relative demand for jobs with non-routine tasks increases. Non-routine tasks include not only abstract tasks which require high educational levels, but also non-routine manual tasks, as in many service occupations such as elderly care, security services, etc.

Other factors such as the increase in offshoring and outsourcing, in themselves partly facilitated by technological change, and changes in labour market institutions could be partly responsible for the reduction in the number of jobs in certain occupations. Goos, Manning and Salomons (2009, 2010) suggest that the *routinisation* of tasks is the main factor explaining the observed job polarisation of employment, abetted by offshoring. Labour market institutions affecting relative wages seem to play a smaller role in the process.

Michaels, Natraj and van Reenen (2010) have presented evidence that the observed job polarization is based on ICT technological change that increases the relative demand for high-educated workers and decreases the relative demand for middle-educated workers.

The extent of occupational change over the decade 2000-10

How much occupational change is there? The amount of change observed will depend on how fine the viewing lens is; the greater the magnifying power, the more movement one will observe. The occupation data used for the analyses to follow generally apply the International Standard Classification of Occupations (ILO, 1988), which classifies occupations up to four-digit level (390 occupations). However, for the analyses carried out here, the two-digit classification (27 groups)[5] has been used. It represents an appropriate compromise between fine resolution, on the one hand, and sampling variability, on the other, given that change is being measured at the level of the individual occupation.

The time period used for the analysis (2000-10) includes the recent economic crisis and the sluggish recovery of 2009-10. In practice, this means that the changes observed may in part be cyclical in character, in that some declines may reflect the rise in unemployment among persons in certain occupational groups.

Table II.3 lists the occupations in European countries and the United States and the growth rates observed over the period 2000-10, as well as the share of employment by occupation for all workers and for immigrants. For European countries, among the thirteen occupations with growth rates over 15% over the period, only three do not fall into a higher skill category, namely agricultural, fishery and related labourers, personal and protective

Table II.3. **Growing and declining occupations, 2000-10**

Percentages

European countries

ISCO88 code		Average growth 2000-10	Average share of employment 2010 (all workers)	Average share of employment 2010 (immigrants)
24	Other professionals	52	5.8	5.4
21	Physical, mathematical and engineering science professionals	50	3.9	4.1
32	Life science and health associate professionals	43	3.0	2.4
33	Teaching associate professionals	39	1.5	1.0
11	Legislators and senior officials	28	0.2	0.2
34	Other associate professionals	36	8.9	6.0
12	Corporate managers	29	4.2	3.5
51	Personal and protective services workers	25	9.9	12.1
31	Physical and engineering science associate professionals	22	4.0	2.8
22	Life science and health professionals	22	2.2	2.4
92	Agricultural, fishery and related labourers	22	0.5	1.0
23	Teaching professionals	21	4.6	3.0
91	Sales and services elementary occupations	21	6.4	13.6
42	Customer services clerks	12	2.1	1.7
52	Models, salespersons and demonstrators	10	5.5	5.2
93	Labourers in mining, construction, manufacturing and transport	6	2.5	4.3
83	Drivers and mobile-plant operators	5	4.0	3.8
71	Extraction and building trades workers	–1	5.4	7.0
13	General managers	–3	3.3	3.1
41	Office clerks	–6	8.6	5.5
81	Stationary-plant and related operators	–11	0.9	0.9
72	Metal, machinery and related trades workers	–12	4.7	3.9
61	Market-oriented skilled agricultural and fishery workers	–16	3.3	1.3
82	Machine operators and assemblers	–19	2.6	3.5
74	Other craft and related trades workers	–29	1.7	1.8
73	Precision, handicraft, printing and related trades workers	–31	0.6	0.5
	All occupations	9	100.0	100.0

Note: ISCO88: International Standard Classification of Occupations, 1988 version.

Table II.3. **Growing and declining occupations, 2000-10** *(cont.)*

Percentages
United States

SOC code		Average growth 2000-10	Average share of employment 2010 (all workers)	Average share of employment 2010 (immigrants)
39	Personal care and service occupations	37	3.6	4.4
31	Healthcare support occupations	35	2.5	2.8
37	Building and grounds cleaning and maintenance occupations	31	4.0	8.3
29	Healthcare practitioners and technical occupations	27	5.5	5.0
35	Food preparation and serving related occupations	26	5.7	8.2
21	Community and social service occupations	21	1.7	1.0
33	Protective service occupations	20	2.3	1.1
25	Education, training, and library occupations	18	6.3	3.9
13	Business and financial operations occupations	16	4.7	3.6
11	Management occupations	12	9.7	7.4
15	Computer and mathematical occupations	8	2.5	3.4
45	Farming, fishing, and forestry occupations	8	0.7	2.1
41	Sales and related occupations	6	11.2	9.0
53	Transportation and material moving occupations	4	6.1	6.8
27	Arts, design, entertainment, sports, and media occupations	4	1.9	1.5
19	Life, physical, and social science occupations	1	0.9	1.2
23	Legal occupations	0	1.0	0.5
47	Construction and extraction occupations	–2	5.1	7.7
17	Architecture and engineering occupations	–6	1.8	2.0
43	Office and administrative support occupations	–6	13.6	9.1
49	Installation, maintenance, and repair occupations	–17	3.2	2.6
51	Production occupations	–25	5.9	8.4
	All occupations	6	100.0	100.0

Note: SOC – Standard Occupational Classification.
Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey.

StatLink http://dx.doi.org/10.1787/888932617037

services workers and sales and services elementary occupations. Occupations which declined by at least 15% concern workers in the trades and in manufacturing-related jobs or skilled agricultural and fishery workers.

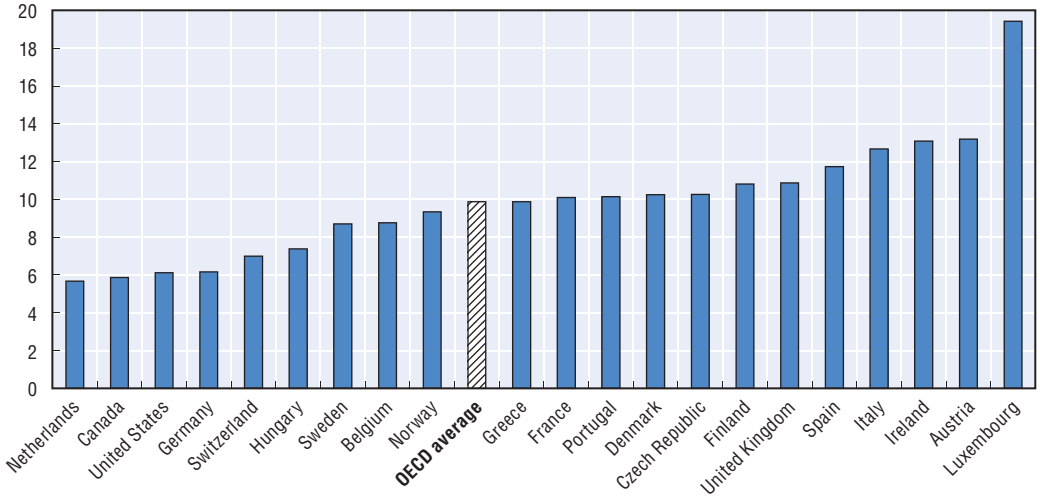
In the United States, the picture appears less clear-cut. Although there is no skill or credential level associated with occupational groups in the US occupational classification, one can more or less distinguish occupational groups which on the whole seem highly skilled from those which are lesser skilled. They are those numbered from 11 to 29 in Table II.3, for which the per cent of workers with tertiary qualifications varies from about 55% to 85%. This is comparable to the groups consisting of professionals, senior officials and managers in European countries (ISCO major groups 11 to 26), for which the per cent of workers with tertiary attainment varies between 55 and 90%.[6]

Among occupational groups with growth rates over 15% in the United States, 5 out of the 9 appear lesser skilled, with healthcare practitioners and technical occupations and education, training and library occupations being the two which appear to group more highly skilled occupations. Among the strongly declining occupational groups are installation, maintenance and repair occupations (–17%) and production occupations (–25%).

Over the decade from 2000 to 2010, the occupational distribution in OECD countries changed by approximately 10 percentage points on average (Figure II.3), that is, it would require a reallocation of 10% of employed persons from the occupational distribution observed in 2010 in order to make it identical to that observed in the year 2000.

Figure II.3. **Total change in the distribution of employment by occupation, 2000-10**

Percentage of total employment



Notes: The statistic shown here is the index of dissimilarity between the distributions in the years 2000 and 2010, respectively. It is estimated as half of the sum of the absolute values of the difference in the share of workers in each occupation in 2000 and 2010. It can be interpreted as the percentage of workers in 2010 who would have to be reallocated to other occupations to make the 2010 distribution coincide with that for 2000.

Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics. StatLink http://dx.doi.org/10.1787/888932615650

As is evident from the figure, many of the countries which have seen high levels of labour migration over the decade, such as Ireland, Italy, Luxembourg, Spain and the United Kingdom, have also seen more occupational change. But this is not the case everywhere. For example, Greece, Switzerland and the United States also saw significant labour migration, but show less occupational change.

10% of the occupational distribution does not seem like a very large amount. By way of contrast, the net turnover in the labour force[7] for the four demographic groups over the period amounted to 24% of the 2000 labour force (see Table II.2). A 10% change in the occupational distribution in the face of 24% turnover would indeed be significant, if all of the change were occurring through entry and exit. But some occurs also in the prime-age workforce, as workers change occupations, by applying skills and experience acquired in one occupation to another, by means of educational upgrading or through training.

8. Demographic components of occupational change

For the purpose of the analyses in this section, the occupational groups for each country have been divided into *quintiles*, where the quintile designation is based on the growth in employment in the occupation over the period 2000-10. Each quintile thus contains approximately 20% of total 2010 employment for each country.[8] The occupational change occurring within each quintile is then decomposed into components in the usual way, namely, that attributable to young workers, to immigrants who entered over the 2000-10 period, to prime-age workers and to older workers. Because a high proportion of the change observed for young and older workers, respectively, reflects entry and retirement, the young-worker and older-worker groups will sometimes be referred to as "new entrants" and "retirees" in what follows.

The grouping into growth quintiles makes it simpler to examine more closely a number of questions of particular interest, with respect to recent immigrants, but provides information for other demographic groups as well. Of particular interest is the role of each group in the growth and decline of occupations and the special role, if any, played by immigrants in this regard.

Figure II.4 summarises the initial results by quintile for all European countries taken as a whole, for the United States and for a selected number of other OECD countries. It gives the contribution of each demographic group to the change in employment observed in each occupational growth quintile over the period 2000-10. The underlying data for the figures as well as similar data for all other countries for which the immigrant labour force survey samples are sufficiently large to support this kind of analysis can be found in Annex II.A1. The results for European countries as a whole and for the United States are similar in a number of respects.

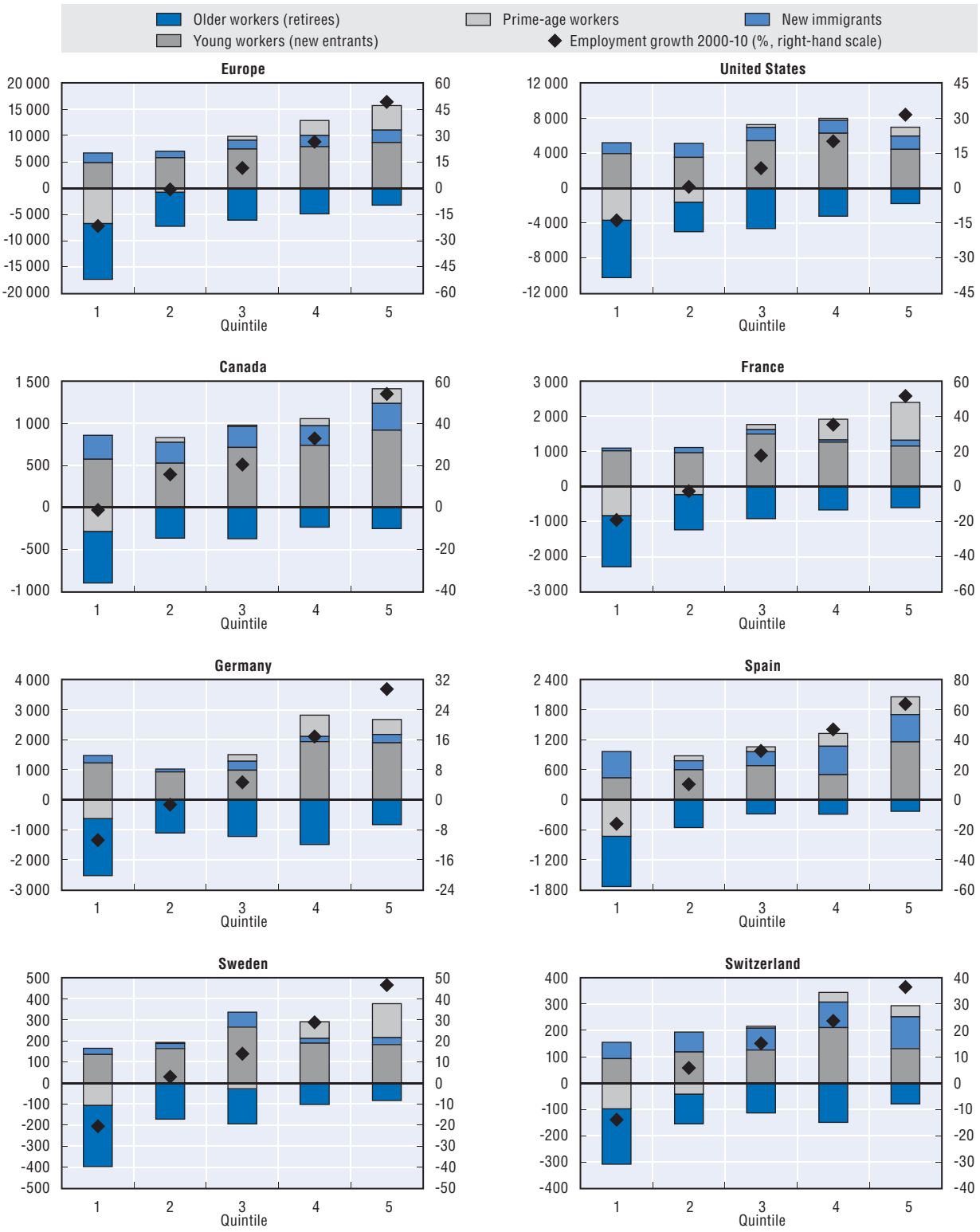
The first thing to note is that, in general, the number of older workers leaving particular occupations becomes smaller as one moves from strongly declining to strongly growing occupations. Conversely, the number of young worker entries increases as one passes from declining to growing occupations. Indeed, the balance between the entry of young workers and the exit of older workers accounts on average in Europe, the United States and Canada for from 35% to 60% of the net change in employment in each of the occupational growth quintiles (Table II.4). In other words, a considerable amount of net occupational change occurs through generational change in the workforce, that is, through the entry of young workers and the exit of older workers. That some of this should be the case was to be expected; that the correspondence between change and entry and exit should be so strong was less so. The data suggest that jobs in declining occupations are often suppressed following the retirement of their incumbents and that jobs for which many young workers are hired are often new ones. Note, however, that the patterns for individual countries may not always be so clear-cut.

Accompanying the general pattern observed for young and older workers is the movement out of declining occupations and into growing occupations on the part of prime-age workers. This subsumes a number of different phenomena in addition to occupational mobility, namely mortality and emigration, persons leaving employment after resignation or layoff, and movements into employment by the unemployed or inactive, in particular women re-entering the workforce after an absence. Occupational change by prime-age workers and occupational entries by young workers are both strong predictors of the direction of occupational change in general (correlations with occupational growth of 0.80 and 0.85, respectively, across occupations).[9] The change by older workers (including retirement) is a weaker covariate (0.62) and occupational entries of immigrants weaker still (0.35).

The particular character of immigrant occupational entry (an equal distribution across quintiles in the United States and a strong presence in the lowest quintile in Europe) may well be associated with the lower average level of educational attainment of this group or with the nature of the skills which they bring with them to their new country of residence. New immigrants may lack the language proficiency of the native-born and may have qualifications and experience which are not recognised by employers or are not easily transferable to a different working environment.

Figure II.4. **Demographic components of net occupational change by occupational growth quintile, 2000-10**

Thousands



Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.

StatLink http://dx.doi.org/10.1787/888932615669

Table II.4. **Occupational entry and exit and occupational growth and decline, 2000-10**

Percentages

Occupational growth quintile	European countries			United States			Canada		
	Growth 2000-10	Contribution of entry-exit to employment growth	Share of entry-exit in net employment growth	Growth 2000-10	Contribution of entry-exit to employment growth	Share of entry-exit in net employment growth	Growth 1998-2008	Contribution of entry-exit to employment growth	Share of entry-exit in net employment growth
1	–22	–12	55	–14	–7	52	–1	–1	96
2	–1	–2	291	1	1	123	16	5	34
3	12	4	36	9	3	31	20	12	57
4	26	10	37	20	13	64	33	20	61
5	49	22	44	31	16	51	54	31	58

Notes: Entry here refers to entries of young workers, exit to retirement of older workers. Entry and exit figures shown here are net of some occupational change occurring among young and older workers.

Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.

StatLink http://dx.doi.org/10.1787/888932617056

Figure II.4 also shows that there are many more net entries into occupations in the top 2 growth quintiles than there are retirements. The concept of replacement thus hardly seems pertinent for these occupations, although the surplus of entries over exits does not exclude the possibility that the occupations may nevertheless be in shortage. Shortages may be regional, in highly specific occupations or fields of study or may involve high-level skills for which the domestic supply is limited. A recourse to recruitment from abroad cannot be excluded in particular cases, but the evidence does not favour a demographic explanation for expected labour needs arising because of the retirement of large baby-boom cohorts. The changing nature of labour demand, and in particular of occupations would appear to weigh heavily in the balance.

At the same time as new jobs are being created, many jobs are disappearing (bottom quintile). In other words, only a fraction of workers retiring from these jobs is being replaced. For these the role of new immigrants may be crucial, especially if the jobs are not viewed as attractive by the domestic workforce.

In almost all countries, immigrants are less numerous among entries into the bottom 2 quintile occupations than they are among entries into the top two, but somewhat less so than is the case for new entrants (Table II.5). There are some exceptions to this, however, namely the Czech Republic, Denmark, the Netherlands and Norway, where immigrants enter less often into high-growth occupations than into low-growth ones. Since the top quintiles are the growing ones, one would of course necessarily expect some groups to be overrepresented there, but that immigrants would be overrepresented was far from pre-ordained. Note in particular that it is in the countries of Southern Europe, where labour migration over the past decade has been high, as well as in Luxembourg, Switzerland and the United Kingdom that one sees more immigrants entering high-growth occupations.

That immigrants are more often entering high-growth than low-growth occupations says little about their contribution to the evolution of these occupations. They may play a relatively minor role compared with the more numerous domestic sources of labour supply, which include former migrants as well as young workers and prime-age workers. Indeed in some countries (France, Germany, the Netherlands, Sweden), the role of immigrants was not especially important over the past decade, accounting for less than

Table II.5. **Entries of new immigrants into growing and declining occupations, 2010**

	Share of immigrant entries				New immigrant share of all entries		
	In growing occupations A	In declining occupations B	Difference A-B	Difference for young resident workers	In growing occupations C	In declining occupations D	Difference C-D
	Percentages		Percentage points		Percentages		Percentage points
Denmark	34	44	–10	30	10	30	–20
Norway	41	50	–9	22	12	27	–14
Netherlands	36	42	–6	13	6	10	–4
Czech Republic	42	47	–5	18	3	7	–5
Ireland	41	42	–1	55	29	82	–53
Canada	42	40	2	16	22	31	–9
United States	41	39	2	14	20	28	–8
Sweden	31	29	2	8	9	15	–6
France	40	37	2	7	5	10	–5
Austria	40	37	3	16	12	24	–12
Finland	38	30	8	14	4	6	–2
Belgium	46	37	9	8	20	24	–4
Germany	42	32	10	24	8	14	–6
United Kingdom	47	37	11	15	22	32	–10
Portugal	47	34	12	38	10	24	–14
Greece	52	34	18	24	17	25	–8
Switzerland	50	31	19	19	34	40	–5
Spain	53	34	19	25	33	43	–10
Hungary	60	32	27	24	3	4	–1
Luxembourg	60	30	30	20	50	58	–7
Italy	59	24	35	11	22	22	0
Average, new immigrants	45	36	9	20	17	26	–10
Average, young resident workers (detail by country not shown)	49	29	20				

Notes: Growing occupations are in the top two growth quintiles, declining occupations in the bottom 2 quintiles. Entries include those of new immigrant and resident young workers plus net occupational change by prime-age workers (when positive).
Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.
StatLink http://dx.doi.org/10.1787/888932617075

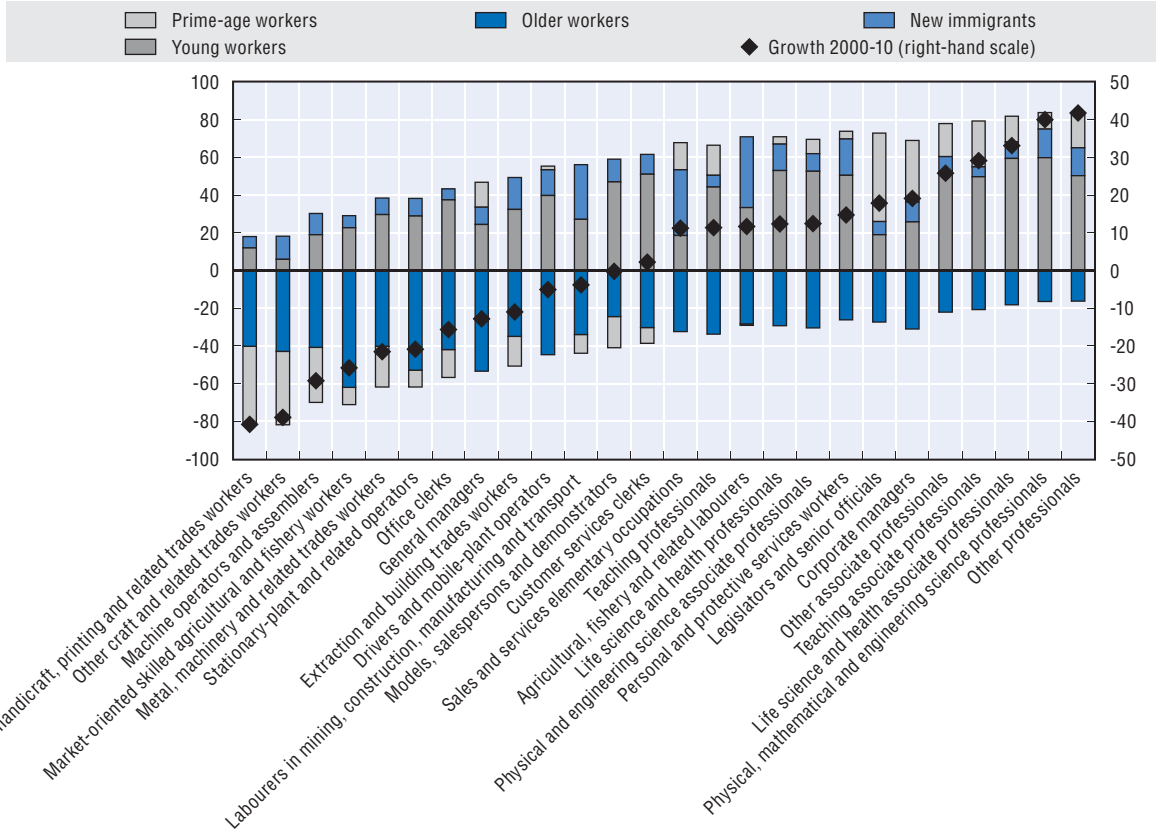
10% of the movements into high-growth occupations. Again, it is in the same countries noted above (southern Europe, Luxembourg, Switzerland, the United Kingdom) that the contribution of immigrants to high-growth occupations becomes more significant, ranging from 20% to as high as 50% of the change observed (in Luxembourg).

Changes in employment by occupation 2000-10

The picture for individual occupations is shown in Figure II.5a on average for European countries and in II.5b for the United States. The movement out of declining occupations (largely through retirement) by older workers, the movement into growing occupations by prime-age and young workers and entries by immigrants in both growing and declining occupations are evident. In both figures, the strong immigrant presence in particular lower-skilled occupations (sales and service elementary occupations, agricultural fishery and related labourers in European countries; farming, fishing and forestry occupations and building and ground cleaning and maintenance in the United States) are also evident. For neither the European countries nor the United States does immigrant entry into specific occupations appear to be related closely to occupational growth or decline or to a replacement deficit due to the retirement of older workers, at least not at the occupational

Figure II.5a. **Contribution of different demographic groups to occupational growth, average over European countries, 2000-10**

Percentages



Sources: European Labour Force Surveys (Eurostat).

StatLink http://dx.doi.org/10.1787/888932615688

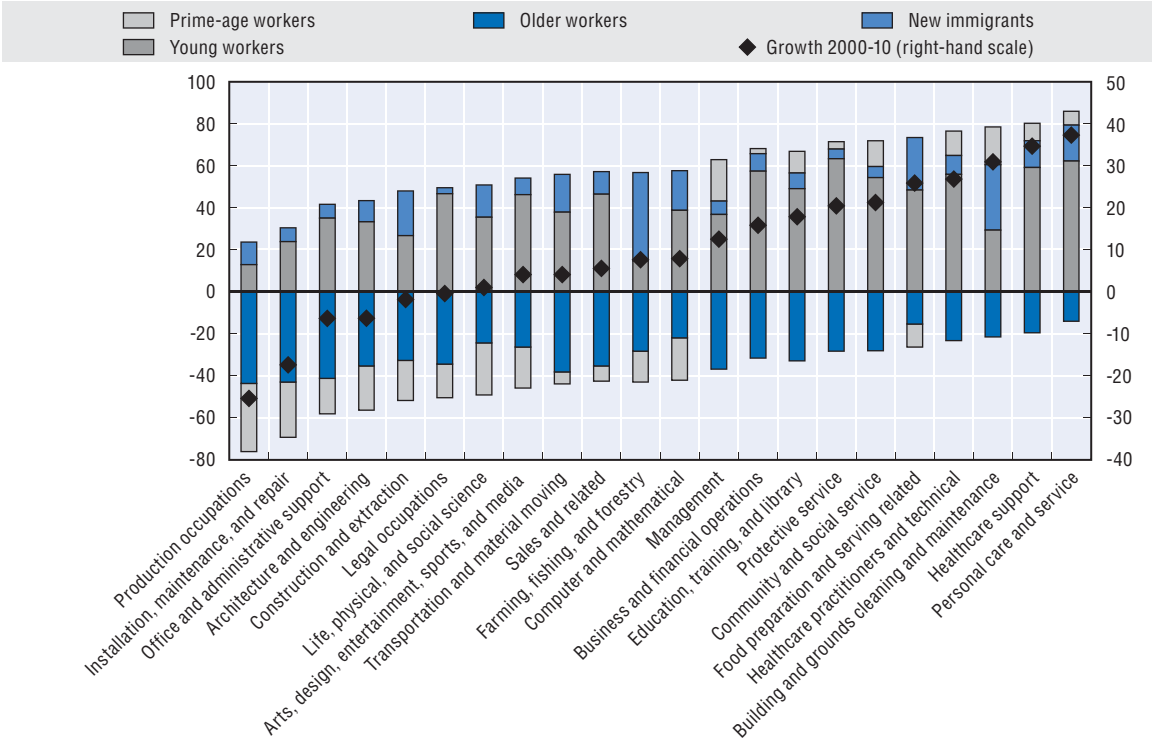
level examined here. The strong growth of highly skilled occupations across the board evident in European countries appears to be less present in the United States, where architecture and engineering occupations, for example, have actually declined and where occupations in the life, physical and social sciences show scarcely any increase over the period 2000-10.

In summary then, the past decade has seen considerable occupational change, in particular movement away from trades and manufacturing professions and towards professional and other skilled occupations, especially in Europe. In the United States, the movement seems to be less polarised, with some high-skilled occupations declining or not growing. A significant part of net occupational change appears to occur towards the beginning and end of working life as older workers leave or retire from declining occupations and younger workers enter growing ones. Entries of young workers into growing occupations far outnumber the retirement of older workers from these. For declining occupations, the situation is the reverse.

Immigrants have been significant players in the growth and decline of occupations but have not been as present in entries into high-growth occupations as natives, and in particular young workers. Although more numerous among entries into growing than declining occupations, they are proportionally more present in declining or slower-growing occupations.

Figure II.5b. **Contribution of various demographic groups to occupational growth, United States, 2000-10**

Percentages



Source: American Community Survey.

StatLink http://dx.doi.org/10.1787/888932615707

These results raise a number of questions. Firstly, if there is (and perhaps continues to be) such a large surplus of new entrants over retirees in growing occupations, will skill shortages still develop to the extent expected? How significant will recruitment from abroad actually have to be? The existence of a surplus is no guarantee that shortages will not emerge, if the hiring of immigrants into growing occupations over the past decade is any indication, but to project or identify shortages on the basis of analyses of demographic imbalances alone seems problematical. The evolution of the economy and of occupations would appear to be far more important factors for projecting labour needs than demographic trends *per se*.

Secondly, new immigrants account for a significant proportion of entries into declining occupations. Are they filling a real need here, for example, by taking up occupations abandoned by domestic workers and which would otherwise go begging, or are they providing cheap labour to firms that are on the decline? The answers to these questions may affect the extent to which migration channels for lesser-skilled jobs need to be opened up over the next decade.

The evolution of occupational and job skill levels

It was noted above that growing occupations in European countries on average tend to be the highly skilled ones, that is, professional, technicians and associate professionals, with some growth as well in low-skilled occupations. Although the picture for individual occupations is mixed in the United States, the aggregate result is fairly similar. Table II.6 summarises the growth rates by occupational skill level and country for the period 2000

Table II.6. **Employment growth, by occupational skill level, 2000-10**

Percentages

European countries	Employment growth 2000-10					Contributions to total employment growth				
	Professionals, senior officials and managers (A)	Technicians and associate professionals (B)	Clerks, service workers, skilled trades, machinery operators (C)	Elementary occupations (D)	All workers (A + B + C + D)	Professionals, senior officials and managers (E)	Technicians and associate professionals (F)	Clerks, service workers, skilled trades, machinery operators (G)	Elementary occupations (H)	All workers (E + F + G + H)
Austria	11	61	–4	39	11	2	9	–3	3	11
Belgium	28	10	1	–6	9	8	1	1	–1	9
Switzerland	29	16	0	15	10	6	3	0	1	10
Czech Republic	–3	39	1	–36	5	0	7	1	–3	5
Germany	21	14	–2	9	7	4	3	–1	1	7
Denmark	8	17	–6	–16	0	2	4	–3	–2	0
Spain	38	58	7	17	19	7	6	4	2	19
Finland	8	8	–2	9	3	2	1	–1	1	3
France	42	21	–5	35	11	8	4	–3	3	11
Greece	25	41	–7	44	7	6	3	–4	3	7
Hungary	18	–2	–7	11	0	3	0	–4	1	0
Ireland	22	42	2	–4	10	7	2	1	0	10
Italy	5	33	–8	32	4	1	6	–5	3	4
Luxembourg	83	54	–11	–9	22	18	10	–5	–1	22
Netherlands	12	8	2	6	7	4	1	1	1	7
Norway	18	22	5	–16	10	3	5	3	–1	10
Portugal	16	24	–5	–10	0	2	2	–3	–1	0
Sweden	31	17	–2	22	10	7	3	–1	1	10
United Kingdom	3	56	–6	39	6	1	5	–3	3	6
OECD average	22	28	–2	9	8	5	4	–1	1	8
OECD average (excluding Luxembourg)	18	27	–2	11	7	4	4	–1	1	7

Sources: European Labour Force Surveys (Eurostat).

United States	Employment growth 2000-10				Contributions to total employment growth			
	High-skilled	Medium-skilled	Lower-skilled	All workers	High-skilled	Medium-skilled	Lower-skilled	All workers
	13	–2	26	6	5	–1	2	6

Source: American Community Survey.

StatLink http://dx.doi.org/10.1787/888932617094

to 2010. The professionals group increased by 22% on average over the period, associate professionals by 28%. Occupations at mid-range skill levels, including clerks, office workers, skilled trades and machinery operators, actually declined by 2% on average, while elementary occupations grew by 9%. In the United States, the skilled group progressed by 13%, middle-skill occupations declined by 2% and low-skilled ones increased by 26%.[10] The trend is thus towards an increase at the extremes of the skill distribution and a loss of jobs in the middle, a pattern consistent with that described in Acemoglu and Autor (2011).

The situation is not entirely uniform across countries, however. The mid-range occupations progressed in a number of countries, in particular Spain and Norway, while elementary occupations declined in Belgium, the Czech Republic, Denmark, Luxembourg, Norway and Portugal.

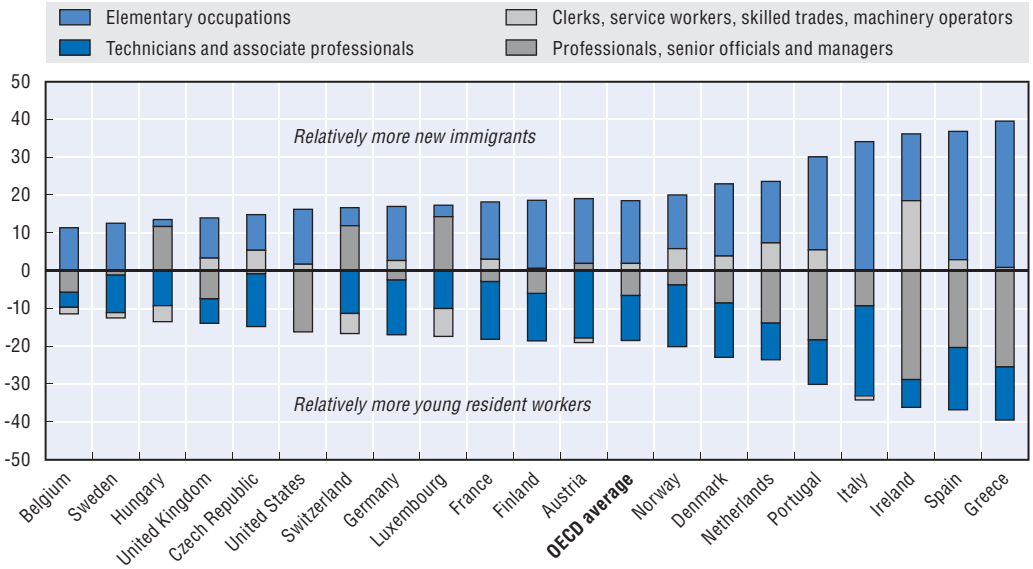
The increase in elementary occupations is especially large in some countries, ranging from 22% in Sweden to 39% in Austria and the United Kingdom. These occupations are not

especially numerous, however; their contribution to the total employment growth observed over the period of 8% was approximately 1% on average across countries.

This provides the general picture for the economy as a whole. How have the skill levels of jobs held by immigrants evolved over the past decade? We have seen that immigrants are relatively more present among movements into growing occupations and that the latter *on average* tend to be highly skilled. One might be tempted to conclude that new immigrants are finding jobs in highly skilled occupations. Although some are, the distribution of skill levels among recent immigrants is significantly below that of young workers entering or changing jobs (Figure II.6). On average, there is a 20-point difference between recent immigrants and young workers in the percentage taking on highly skilled jobs (managers, professionals and associated professionals). This apparent contradiction is due to the fact that growing occupations also include agricultural, fishery and related labourers and sales and services elementary occupations and that many recent immigrants have found jobs in these occupations.

Figure II.6. **Differences in the distribution of occupational skills of workers entering or changing jobs (2000-10) by skill level, new immigrants compared to young resident workers**

Percentages



Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey.

StatLink http://dx.doi.org/10.1787/888932615726

Only in Hungary, Luxembourg and Switzerland does one find relatively more recent immigrants in highly skilled jobs (professionals, senior officials and managers) than young workers entering such jobs. In all other countries, there are relatively fewer recent immigrants taking on skilled jobs than young workers, ranging from 10 percentage points less in Belgium and Sweden to over 35-40 percentage points less in southern Europe and Ireland. Likewise, the greater specialisation of immigrant in low-skilled jobs is evident in almost all countries, the immigrant percentage in entries into low-skilled jobs exceeding that of the young workers by 18 percentage points on average.

Finally, Figures II.7a and II.7b summarise the situation comprehensively with regard to entries and exits into jobs by occupational skill level and demographic group. In most countries, new immigrants are entering elementary occupations proportionally more than

Figure II.7a. **Skill level composition of occupational entries or exits, 2000-10, by demographic group**

Percentages

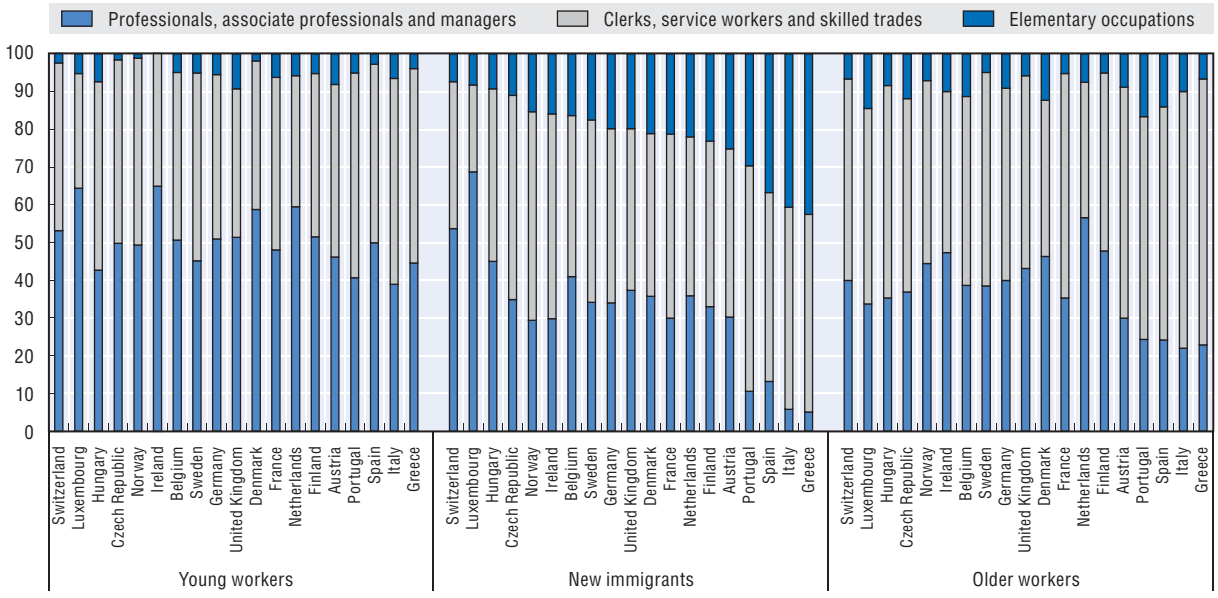


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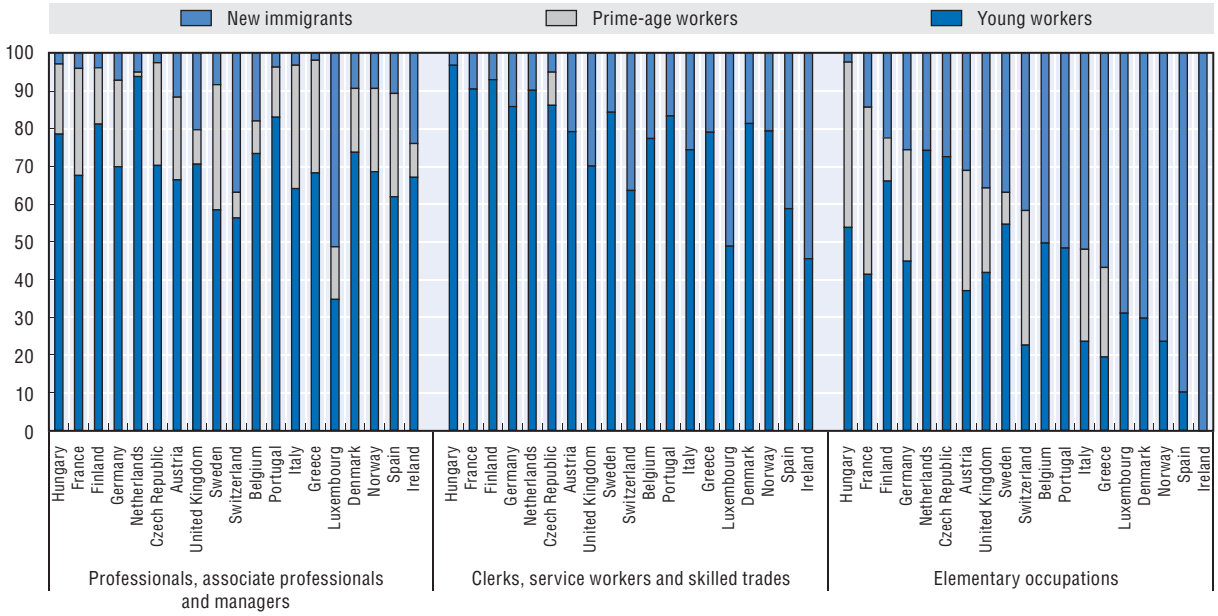
Figure II.7b. **Demographic composition of occupational entries or exits, 2000-10, by skill level**

Percentages



Note: In most countries, the number of prime-age workers in mid-skill jobs actually declined over the 2000-10 period, which is why they do not appear in the central panel and in for some countries in the right-hand panel.

Source: European Labour Force Surveys (Eurostat).

StatLink http://dx.doi.org/10.1787/888932615764

young workers and their presence in these occupations is often substantial. There are only a few countries where this is less the case, namely Luxembourg, Switzerland, the Czech Republic and Hungary. In the countries of southern Europe, some 30% or more of arriving immigrants over the period 2000-10 entered elementary occupations. These countries are also those which have shown the greatest increase in the share of high-skilled jobs among young workers compared with older workers over the decade. Indeed, there is a moderately strong positive correlation association (0.68) between the extent of job upskilling among young workers entering the labour force over the period 2000-10 and the incidence of new immigrants taking on low-skilled jobs.[11]

Low-skilled jobs are becoming more and more "reserved" for immigrants, as is evident from Figure II.7b, which shows that on average across countries, half of low-skilled jobs are being filled by immigrants. The proportion, however, ranges from less than 15% in France and Hungary to over 90% in Spain and Ireland.

9. Conclusion

The objective of this chapter was to examine the role of demography in educational and occupational change, in order to obtain some insight into the role which immigrants have played and can be expected to play in the future as labour markets respond to the retirement of baby-boomers and the entry of smaller youth cohorts into working life.

The past ten years have seen the entry of youth cohorts which are much more educated on average than older retiring cohorts. Attainment levels of arriving immigrants entering the labour force, on the other hand, have tended to be somewhere in between. Over a third on average are highly educated, but almost the same proportion have less than upper secondary attainment. This reflects at one and the same time the preference for highly educated labour migrants in most countries, but also the preponderance of family and humanitarian migrants in inflows, many of whom have low educational attainment levels. Immigrants have accounted for significant proportions of labour force entries of low-educated persons in many countries, while their contribution to the growth of the high-educated labour force is generally significant only in countries which have seen high levels of labour migration.

Not only have young entrants been more highly educated, there were many more of them than retiring highly educated workers. On the face of it then, this does not seem to suggest an upcoming skill deficiency, but ageing is still in its early phase and one needs to look more closely at how occupations are changing.

Over the past decade, the upskilling of jobs has gone hand-in-hand with increasing levels of educational attainment. Generally, high-skilled occupations have grown strongly, low-skilled occupations somewhat less so, while medium-skilled occupations have declined or stagnated.

In growing occupations, there were several entrants for every retirement, while at the other end of the spectrum, the reverse was generally the case. New immigrants contributed 16% of entries into growing occupations and 26% of entries into declining occupations.

In strongly growing occupations, the large surplus of new entrants over retirees means that many of the jobs were newly created ones, for which there appeared to be no shortage of domestic candidates, among both new entrants and prime-age workers. But many new immigrants were also hired into these jobs, indicating that domestic sources were not sufficient to satisfy all of the needs. At the same time, new immigrants replaced only a fraction of retiring workers in declining occupations. Many of the jobs were cut after their incumbents retired.

In other words a surplus of entrants over retirees does not obviate the need for labour migrants, nor does a significant deficit imply a major shortfall of workers that must be filled through recruitment from abroad. The labour and skill shortages to come are not a simple function of demographic imbalances in the labour force but depend significantly on the changing nature of demand for particular skills and the extent to which these can be filled from existing sources of supply. In a sense this is obvious, but the scale of ongoing and future demographic change is large and the prospect of a drop in the labour force and perhaps even in the size of the economy, has tended to dominate discussions in this area, to the neglect of the dynamics of occupational change.

The links between occupational growth and decline, demographic imbalance and the need for immigrant workers are thus far from obvious. This is all the more the case since many immigrants have arrived as a result of family and humanitarian reasons rather than having been directly recruited from abroad by employers. Their lesser-or-greater presence in certain occupations may thus reflect in many cases less a response to needs that could not be filled by resident workers, such as is generally the case for labour migrants, than a fortuitous match between whatever skills they brought with them and available jobs in a labour market where there were many other players.

For some immigrants, low levels of education constrained their occupational choices to lesser-skilled jobs and for others, the education and work experience earned abroad made them sometimes ill-prepared to compete with the skills of recently graduated young workers and of prime-age workers already having made their way in the labour market.

The analyses presented here illustrate that the labour market is highly dynamic. The focus of many analyses of ageing has emphasised the demographic imbalances and the consequences this is having and will have on the size of the workforce and on skill needs. The objective of this analysis was to focus more precisely on the impact of ageing on the educational attainment of the labour force and on occupational change, and the role of labour migration in this dynamic process.

What emerges is that labour market change is more rapid than demographic change and many future jobs are likely to be significantly different from those held by cohorts which will be retiring over the next twenty years. International migrants frequently will not be replacing retiring baby-boomers, but rather responding to the labour and skill requirements of a forever changing labour market.

Notes

1. It is on average about one third larger than the previous ten-year age cohort.
2. Although the term “high-skilled” here is used in reference to jobs, it will also generally be used synonymously with “highly educated”, since for new hires, it is generally the case that high-skilled jobs require some form of tertiary education or equivalent qualification. Likewise the term “lower-skilled” or “low-skilled” will generally be used to mean “lower educated” or “low-educated”, despite the fact that in every country there exists a proportion of highly educated persons who are working in lower-skilled jobs. When the distinction between education level and skill level needs to be made, it will be clear from the context.
3. Some persons who leave a particular occupation, for example, consist of persons who died or left the country over the observed period. The essential point is that they are no longer in the labour force or employed in their occupation at the end of the period. Likewise, some who enter an occupation are native-born expatriates who return from abroad; they also are not identified specifically.

4. The group representing school completers excludes some persons who obtained a first tertiary degree after the age of 25. Persons in this situation show up in the estimates for the prime-age group.
5. Two groups are excluded, namely subsistence agricultural and fishery workers (sub-major group 62) and the armed forces (major group 0).
6. The tertiary attainment share of employment in an occupational group drops off strongly thereafter in the United States, to 30%, whereas the category of associate professionals and technicians in European countries shows tertiary attainment percentages ranging from 33 to 50%. Occupations in these groups would appear to be included in the highly educated 1-to-10 numbered group in the United States.
7. A measure of turnover would in principle show how much the composition of the labour force has changed due to entry and exit. The measure given here (net turnover) is an approximation which underestimates the total turnover (see note to Table II.3).
8. The number of persons employed per quintile is not exactly 20% because the requirement that an occupational group be entirely within a quintile creates some imbalance in the quintile sizes.
9. The correlations are calculated, across occupations, between the rate of growth of the occupation and the contribution of each demographic group to the total growth.
10. Because the US Standard Occupational Classification does not include a skill classification for occupations, for the purpose of the analysis presented here, skill levels were assigned to occupations on the basis of the educational attainment of the incumbents. High-skilled occupations were defined to be those for which at least 55% of the holders had a tertiary qualification and mid-skilled those among the remaining for which at least 70% of persons employed had at least upper secondary education.
11. Luxembourg is an outlier and has been excluded from the calculation.

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ANNEX II.A1

Methodology for estimating the components of demographic change

The components of demographic change identified in this part are derived using some basic demographic accounting methods, applied to changes in educational attainment, in the labour force and in the distribution of employment by occupation.

Roughly speaking, the method rests on the following general equality concerning the measure of change in a particular characteristic between time t1 and time t2:

$\Delta(T) = E + I + \Delta(PA) - R,$

where $\Delta(T)$ = the total change observed in the characteristic over the period,

E = new non-immigrant entrants over the period,

I = new immigrants who arrived over the period,

$\Delta(PA)$ = change in the prime-age group over the period,

and R = retirees over the period.

This amounts approximately to change = inflows – outflows, except that one allows for internal change in the stocks as well as distinguishing between internal inflows (new entrants) and external ones (immigration). External outflows (deaths and emigration) are included implicitly in each of the four components and are essentially netted out.

For almost all countries, the decomposition is applied to change over the period 2000-10 and is based on labour force survey data. We will describe the method in general for changes in the labour force, before explaining a number of technicalities resulting from its application to specific cases. The basic components are as follows

- New entrants = the labour force 15-34 in 2010, less persons 15-24 who were already in the labour force in the year 2000. This approximates young persons who entered the labour force over the period.
- Retirees = the labour force 45+ in 2000 less the labour force 55+ in 2010. Temporary withdrawals and re-entries prior to definitive retirement are implicitly netted out.
- Prime-age workers = the labour force 35-54 in 2010, less the labour force 25-44 in 2000.
- New immigrants = immigrants in 2010 with duration of residence of 10 years or less. Note that this implies that this group has to be excluded from all the other components above involving 2010 data, to avoid double-counting.

As can be verified, the net change in the labour force 15 years of age and older is the sum of these four components, and the sum is perfectly additive, modulo non-response.

The decomposition of change described above can be applied to each educational attainment level within the labour force. However, new entrants now have a more precise meaning, namely persons who completed their education over the period and entered the labour force, provided one excludes persons still in education from the calculation. The change for prime-age workers represents educational upgrading for this group as well as, implicitly, loss due to emigration or death.

New entrants are now estimated as follows: persons 15-24 not in education in 2010 + (persons 25-34 in 2010 – persons 15-24 not in education in 2000), for each educational attainment level.

The first term consists of persons who in principle have completed their education by 2010. For the second term, not all persons 25-34 have completed their education. However, since it is tertiary attainment that is of interest, it is assumed that persons 25-34 who are still in education will already have at least a first tertiary degree. The tertiary attainment levels of those who do not (and there are some) will show up as educational upgrading among persons who are 25-44 in 2000 and 35-54 in 2010. This is not ideal, but it is difficult to take into account sensibly situations in which a first tertiary degree is completed without interruption at a late age.

From the population of persons 25-34 in 2010, one subtracts persons from the same cohort who had already completed their education in 2000, namely persons 15-24 not in education.

This kind of decomposition can be carried out for various characteristics, in particular occupation or sector, and by gender, to provide an indication of the demographics of change for each of these characteristics.

ANNEX II.A2

Table II.A2.1. **Decomposition of growth in the labour force by educational attainment and source, 2000-10**

Thousands

	Young workers	New Immigrants	Older workers	Prime-age workers	Still in education	Residual	Net change in the labour force	2000 labour force
Austria	850	243	–642	–46	14	0	420	3 864
Low	71	60	–183	–47	9	0	–89	811
Medium	605	121	–386	–69	5	0	276	2 467
High	174	61	–73	70	0	0	233	586
Belgium	1 057	351	–757	–190	–7	31	484	4 411
Low	128	105	–370	–189	–4	9	–321	1 418
Medium	413	111	–209	–13	–3	9	309	1 585
High	516	134	–178	13		12	496	1 408
Canada	3 602	–1 637	1 422	–25	284	0	3 646	11 071
Low	233	–263	117	–158	138	0	67	2 512
Medium	912	–574	354	–318	100	0	474	4 606
High	2 456	–800	950	451	46	0	3 104	3 953
Czech Republic	1 074	55	–1 087	131	–29	0	144	5 123
Low	39	6	–192	–60	–5	0	–212	530
Medium	740	35	–791	76	–25	0	36	3 989
High	295	13	–104	114	1	0	320	605
Denmark	510	59	–563	–47	13	71	43	2 804
Low	. .	. .	. .	. .	. .	. .	. .	. .
Medium	. .	. .	. .	. .	. .	. .	. .	. .
High	239	21	–149	81	3	29	222	681
Estonia	165	3	–128	–9	0	2	33	654
Low	18	0	–28	–4	–1	0	–14	82
Medium	82	1	–64	–21	0	1	–2	379
High	65	2	–37	16	1	1	49	194
Finland	515	45	–490	–10	–51	0	9	2 663
Low	26	16	–204	–44	–30	0	–236	662
Medium	266	20	–155	–30	–14	0	86	1 163
High	222	9	–131	64	–6	0	158	837
France	6 665	750	–5 117	188	82	55	2 625	25 752
Low	802	270	–2 268	–129	–9	10	–1 323	8 198
Medium	2 834	226	–1 998	14	57	22	1 156	11 363
High	3 029	254	–851	303	34	23	2 792	6 191
Germany	10 857	1 323	–9 509	–671	–215	452	2 236	39 390
Low	1 080	366	–2 436	–1 919	–565	224	–3 250	9 467
Medium	7 143	457	–4 946	–528	321	154	2 601	21 766
High	2 634	499	–2 127	1 776	29	73	2 885	8 158
Greece	1 006	247	–842	25	–36	0	400	4 617
Low	142	138	–558	9	–10	0	–279	1 946
Medium	424	82	–191	–75	–26	0	214	1 795
High	440	26	–93	92	1	0	465	876

Table II.A2.1. **Decomposition of growth in the labour force by educational attainment and source, 2000-10** *(cont.)*

Thousands

	Young workers	New Immigrants	Older workers	Prime-age workers	Still in education	Residual	Net change in the labour force	2000 labour force
Hungary	906	29	–826	93	–21	0	182	4 074
Low	86	3	–241	–19	–2	0	–173	750
Medium	504	14	–451	0	–18	0	48	2 665
High	317	12	–134	112	0	0	307	659
Ireland	417	219	–199	–26	–39	1	374	1 694
Low	11	25	–116	–52	–20	0	–152	582
Medium	148	86	–55	–59	–18	1	104	701
High	258	108	–28	84	–1	0	422	411
Italy	4 072	1 467	–4 280	110	–68	33	1 332	23 642
Low	535	617	–2 801	–684	–48	19	–2 362	11 267
Medium	2 412	693	–1 063	251	–27	12	2 277	9 503
High	1 125	156	–417	543	7	3	1 417	2 872
Luxembourg	36	47	–32	–9	–1	0	40	181
Low	5	7	–15	–13	–1	0	–17	61
Medium	18	11	–13	–5	0	0	10	82
High	14	30	–5	9	0	0	48	38
Netherlands	1 696	158	–1 088	–128	–4	41	675	8 028
Low	233	50	–361	–91	–39	16	–193	2 478
Medium	715	51	–511	–210	2	16	64	3 605
High	748	58	–216	173	33	9	805	1 945
Norway	478	120	–357	–12	13	0	243	2 330
Low	. .	. .	. .	. .	. .	. .	. .	. .
Medium	. .	. .	. .	. .	. .	. .	. .	. .
High	225	43	–92	31	–10	0	196	732
Portugal	1 093	199	–911	22	–24	0	379	5 201
Low	384	92	–811	–48	–27	0	–410	4 078
Medium	347	81	–47	7	1	0	388	631
High	362	26	–52	63	2	0	401	493
Spain	4 519	2 988	–2 508	355	–174	0	5 180	17 909
Low	1 326	1 275	–2 012	–251	–69	0	269	9 720
Medium	1 018	1 070	–157	190	–66	0	2 056	3 407
High	2 175	644	–340	415	–39	0	2 855	4 782
Sweden	1 035	239	–862	105	74	10	600	4 349
Low	112	75	–250	–2	48	3	–13	917
Medium	537	55	–365	36	28	4	295	2 147
High	386	109	–247	71	–3	3	319	1 285
Switzerland	728	482	–673	–42	–6	9	497	3 971
Low	52	92	–173	–3	–19	2	–49	812
Medium	396	156	–415	–151	8	3	–3	2 233
High	280	234	–86	113	5	3	549	926
United Kingdom	7 273	3 174	–6 068	–1 613	–295	21	2 493	28 583
Low	171	521	–1 816	–881	–147	8	–2 144	4 577
Medium	3 717	1 816	–3 220	–2 256	–214	8	–148	17 688
High	3 385	837	–1 032	1 524	66	6	4 785	6 319
United States	28 456	8 318	–18 337	–823	–31	0	17 584	138 831
Low	1 027	2 495	–3 442	–2 003	–1 460	0	–3 384	21 454
Medium	14 153	3 142	–9 551	–983	1 047	0	7 808	71 074
High	13 276	2 681	–5 345	2 164	383	0	13 159	46 303

Notes: Components of change for Germany and the United Kingdom are based on 2005-10 data, which have been "decadised" to agree with net change in the labour force observed over the period 2000-10. Data on low and medium attainment for Denmark and Norway were unusable because of breaks in series. See Annex II.A1 for a description of the decomposition methodology. Some change estimates, in particular those smaller than 5 thousand, may not be significantly different from zero.

Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.

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Table II.A2.2. **Decomposition of occupational change (2000-10) by growth quintile and source**

Thousands

		Young workers	New immigrants	Prime-age workers	Older workers	Net change in employment 2000-10	2000 level employment
Austria		809	220	–26	–589	413	3 671
	1	103	40	–187	–196	–240	1 019
	2	156	42	–112	–144	–58	872
Quintile	3	160	49	36	–173	71	873
	4	181	49	61	–70	220	600
	5	209	40	177	–5	420	307
Belgium		932	284	–148	–712	356	4 078
	1	198	61	–242	–262	–245	1 372
	2	135	43	–22	–121	35	646
Quintile	3	192	50	6	–156	92	756
	4	152	61	9	–84	138	640
	5	255	69	100	–88	336	663
Canada		3 471	1 330	45	–1 837	3 009	13 968
	1	575	282	–283	–613	–40	3 387
	2	526	249	57	–365	467	2 970
Quintile	3	714	246	17	–371	606	2 972
	4	737	234	83	–235	819	2 494
	5	919	319	172	–253	1 158	2 145
Czech Republic		978	53	195	–1 013	213	4 657
	1	74	12	–119	–293	–326	1 149
	2	239	13	–48	–262	–58	1 218
Quintile	3	179	6	81	–214	52	893
	4	218	14	123	–129	226	752
	5	269	8	159	–116	320	645
Germany		6 956	1 093	806	–6 535	2 320	36 101
	1	1 223	245	–628	–1 900	–1 059	9 866
	2	926	100	–2	–1 101	–77	5 933
Quintile	3	985	293	226	–1 218	286	6 154
	4	1 930	176	714	–1 488	1 331	7 907
	5	1 892	279	496	–828	1 839	6 241
Denmark		448	94	–57	–549	–63	2 702
	1	32	15	–87	–192	–232	744
	2	65	27	–32	–130	–70	649
Quintile	3	120	21	–5	–99	37	510
	4	117	14	10	–66	75	472
	5	114	18	57	–61	128	327
Spain		3 175	2 100	81	–2 364	2 993	15 359
	1	301	530	–728	–1 006	–902	4 817
	2	566	182	96	–556	288	3 082
Quintile	3	662	279	100	–282	758	2 387
	4	493	569	257	–287	1 031	2 217
	5	1 154	540	357	–232	1 819	2 858
Finland		468	36	20	–443	81	2 355
	1	59	7	–111	–161	–206	714
	2	98	4	–19	–99	–16	473
Quintile	3	86	12	45	–88	56	491
	4	108	4	43	–62	92	398
	5	117	9	61	–33	155	280

Table II.A2.2. **Decomposition of occupational change (2000-10) by growth quintile and source** *(cont.)*

Thousands

		Young workers	New immigrants	Prime-age workers	Older workers	Net change in employment 2000-10	2000 level employment
France		5 881	590	747	–4 657	2 560	22 847
	1	1 017	76	–830	–1 463	–1 200	6 279
	2	962	145	–228	–1 008	–129	4 720
Quintile	3	1 490	133	145	–916	851	4 833
	4	1 265	62	586	–667	1 246	3 540
	5	1 148	174	1 074	–604	1 791	3 475
Greece		798	209	66	–806	267	4 057
	1	69	26	–56	–336	–297	1 167
	2	147	45	–25	–162	5	861
Quintile	3	172	30	17	–133	85	752
	4	178	36	44	–92	166	652
	5	233	72	86	–83	308	625
Hungary		730	27	34	–795	–4	3 760
	1	87	5	–120	–216	–244	1 044
	2	123	3	3	–158	–29	689
Quintile	3	134	2	–2	–139	–5	667
	4	221	10	56	–192	94	921
	5	165	6	97	–89	179	440
Ireland		267	212	–84	–227	169	1 664
	1	3	42	–98	–103	–155	529
	2	16	47	–20	–41	2	302
Quintile	3	80	35	–10	–36	70	350
	4	79	50	3	–23	109	259
	5	89	37	42	–25	143	223
Italy		3 520	1 245	15	–3 996	784	20 024
	1	433	163	–1 045	–1 442	–1 890	5 513
	2	624	135	–245	–855	–340	4 203
Quintile	3	1 030	209	107	–977	369	4 968
	4	698	333	287	–447	871	2 967
	5	736	405	910	–276	1 775	2 373
Luxembourg		33	46	–7	–32	39	181
	1	6	5	–13	–16	–18	68
	2	4	8	–5	–7	0	43
Quintile	3	6	4	1	–4	7	22
	4	11	9	7	–4	23	29
	5	5	18	4	–1	27	19
Netherlands		1 547	141	–160	–1 076	452	7 819
	1	200	23	–221	–320	–318	1 918
	2	354	36	–83	–231	77	1 971
Quintile	3	234	32	56	–201	120	1 323
	4	350	28	19	–176	220	1 385
	5	409	22	69	–148	352	1 221
Norway		479	112	–4	–354	233	2 262
	1	47	35	–81	–159	–158	713
	2	104	20	1	–75	51	430
Quintile	3	70	11	6	–36	51	285
	4	144	31	19	–61	132	542
	5	113	15	52	–23	157	292

Table II.A2.2. **Decomposition of occupational change (2000-10) by growth quintile and source** *(cont.)*

Thousands

		Young workers	New immigrants	Prime-age workers	Older workers	Net change in employment 2000-10	2000 level employment
Portugal		864	158	–123	–916	–18	4 971
Quintile	1	55	41	–187	–290	–381	1 336
	2	118	13	–39	–214	–123	1 192
	3	195	30	–42	–170	13	912
	4	225	64	64	–162	192	946
	5	272	9	81	–81	281	585
Sweden		936	181	111	–817	411	4 115
Quintile	1	135	30	–106	–291	–232	1 126
	2	164	23	5	–172	20	686
	3	266	71	–28	–167	142	1 021
	4	189	23	79	–103	188	653
	5	182	35	161	–84	293	630
Switzerland		676	440	–54	–666	395	3 875
Quintile	1	93	61	–98	–211	–154	1 105
	2	117	76	–42	–113	39	683
	3	125	83	7	–114	102	675
	4	210	98	36	–150	194	824
	5	130	121	42	–79	215	589
United Kingdom		5 003	1 989	–632	–4 673	1 687	27 155
Quintile	1	651	452	–1 755	–1 736	–2 388	8 768
	2	844	275	46	–1 041	124	5 183
	3	1 237	323	11	–922	650	5 289
	4	1 075	529	409	–628	1 385	4 349
	5	1 195	409	658	–345	1 916	3 565
United States		23 567	7 323	–3 711	–19 504	7 676	130 490
Quintile	1	3 931	1 245	–3 663	–6 538	–5 024	36 460
	2	3 521	1 584	–1 612	–3 368	125	23 045
	3	5 423	1 513	309	–4 622	2 623	30 698
	4	6 262	1 474	238	–3 207	4 767	23 788
	5	4 429	1 508	1 017	–1 769	5 185	16 499

Notes: Quintiles represent in principle 20% of 2010 employment. In practice, the percentage may deviate from 20 because of the requirement that an occupation must be entirely contained with one quintile. See Annex II.A1 for a description of the decomposition methodology. Some of the change estimates shown, in particular those less than 5 thousand, may not be statistically significant from zero.

Sources: European countries: European Labour Force Surveys (Eurostat); United States: American Community Survey; Canada: Survey of Labour and Income Dynamics.

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