

CHAPTER 4

Work-force ageing in OECD countries

A. INTRODUCTION AND MAIN FINDINGS

1. Introduction

Expanding the range and quality of employment opportunities available to older workers will become increasingly important as populations age in OECD countries. Accordingly, there is a need to understand better the capacity of labour markets to adapt to ageing work forces, including how it can be enhanced.

Both the supply and demand sides of the labour market will be important. It is likely that pension programmes and social security systems in many OECD countries will be reformed so that existing incentives for early retirement will be reduced or eliminated. Strengthening financial incentives to extend working life, together with a large increase in the older population and improvements in their health, means that the supply of older workers will increase sharply in the coming decades. The *demand* for older workers, along with the efficacy of labour markets in matching supply and demand, will determine their employment and earnings prospects, as well as the impact of work-force ageing on aggregate productivity and income.

Section B assesses how the supply of older workers is likely to change over the next several decades, confirming that significant labour-force ageing is in prospect. Section C presents a conceptual framework for analysing the implications of this for employment and earnings. The empirical relationships between compensation and age, and productivity and age are taken up in Sections D and E, respectively. Section F then analyses mobility patterns among older workers. The final section presents some concluding remarks.¹

2. Main findings

Labour force ageing in OECD countries is likely to be substantial over the next several decades. In many countries, labour force growth will also slow and educational attainment among older workers will rise rapidly. Pension policy changes designed to raise the *effective* retirement age will magnify labour

force ageing, but offset part of the projected fall in labour force growth.

OECD labour markets have adapted to significant shifts in the age structure of the labour force in the past. However, the ageing projected over the next several decades is outside the range of recent historical experience. Hence, it is uncertain how easily such a large increase in the supply of older workers can be accommodated, including the implications for the earnings and employment of older workers.

There is only weak evidence that the earnings of older workers are lower relative to younger workers in countries where older workers represent a larger share of total employment. This may indicate that workers of different ages are close substitutes in production, so that an increased supply of older workers can be employed without a significant fall in their relative wages. However, a number of factors affect the demand for older workers at any given relative wage and greater relative wage flexibility may sometimes be an important component of an overall programme to adapt to work-force ageing.

Improved job skills and access to training could help reduce the risks of unemployment and low pay for older workers. Work-force ageing also means that OECD countries will have to rely increasingly on mid- and late-career workers to meet emerging skill demands. This heightens the importance of improving the opportunities of older workers to develop new skills and to renew and re-deploy old skills. The limited evidence currently available suggests that older workers with adequate educational attainment and a history of participation in on-the-job training appear to be good training prospects, and training rates do not fall off strongly until workers approach conventional retirement ages.

However, older workers do encounter significant difficulties if they lose their job, as reflected in a high incidence of long-term unemployment and the large earnings losses experienced by older displaced workers, when they do find a new job. If their labour market mobility remains limited, these problems could increase as the work-force ages, since it is likely that increasing numbers of older workers will experience lay-offs.

Firms' pay, training, recruiting and other personnel practices will be key factors in determining the employment and earnings opportunities of older workers. Furthermore, proactive strategies, emphasising the skill base with which workers enter the later stages of their careers, are likely to be more effective than remedial measures after older workers have encountered employment problems. Thus, the training and other personnel practices of employers, as well as the career planning of workers, need to begin now to adapt to the prospect of workforce ageing. Governments have an important educational and co-ordinating role to play in facilitating these adjustments.

B. WORK-FORCE AGEING OVER THE NEXT SEVERAL DECADES

1. Future scenarios of the size and age composition of the labour force

This section uses UN population projections to assess the likely impact of population ageing on labour supply in OECD countries. Simple projections through the year 2030 are considered that illustrate the implications of population ageing for the size and composition of the future labour force (see Annex 4.A). Population trends alone are insufficient, however, to determine labour force trends. If labour force participation rates continue to evolve differently at different ages, the labour force will not age in lock-step with the total population. In particular, the extent to which population ageing will result in older labour forces depends critically on the future evolution of the effective age of retirement, which is uncertain.² The plausible range of trends in retirement patterns can be assessed accurately enough, however, to construct illustrative scenarios.

In most OECD countries, it appears that pension and social security programmes will be adjusted so that possibilities for early retirement will be more limited or less attractive, and that workers will respond to these changes in incentives by seeking to delay retirement. Hence, the trend among men toward younger retirement ages could cease or reverse. The scenarios examined below are based on the assumption that this pattern becomes general and make no allowance for specific national factors that might suggest a different evolution.

The "baseline" scenario assumes that age-specific participation rates remain unchanged at their current levels. Under the "later-retirement" scenario, it is assumed that much of the recent trend among men toward retiring at younger ages is gradually reversed. It is assumed that the 1995 patterns of

labour force exit after age 45 – calculated separately for men and women – make a smooth transition to the 1970 pattern for men between 2000 and 2020.³ These scenarios, in conjunction with population forecasts from the UN, are used to examine the future rate of growth of the labour force and its age composition.

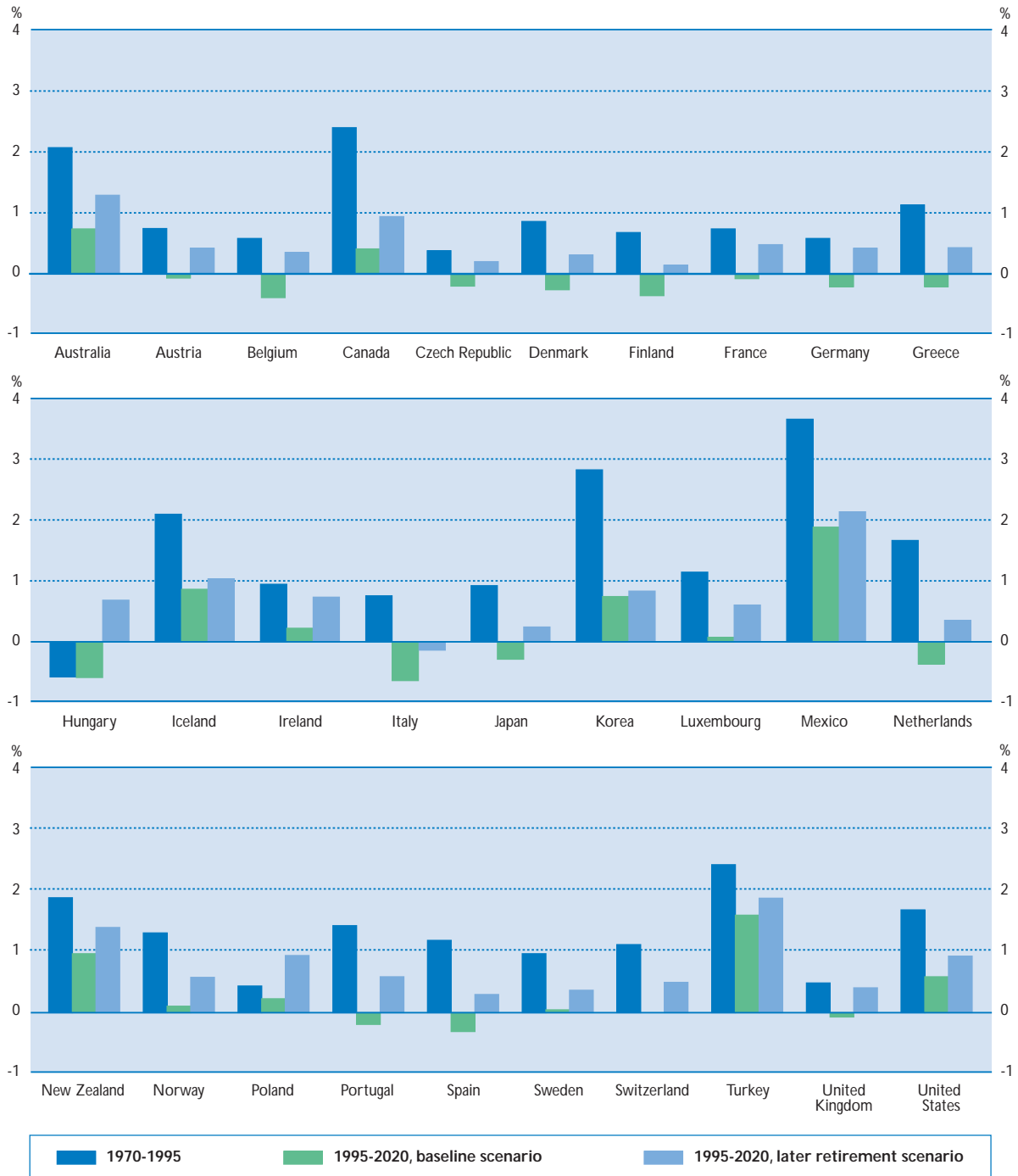
This simple exercise suggests that the rate of growth of the labour force in the early 21st Century will be considerably lower than in the recent past in many Member countries (Chart 4.1). Under the baseline assumption, labour force growth decelerates in all countries except Hungary, often sharply. It could even become negative in a substantial number of European countries and Japan. In most countries, labour force growth is projected to be significantly stronger under the later-retirement scenario, since the combination of a rapid increase in the older population with an increase in retirement ages results in a large increase in the number of older workers. Only in Hungary and Poland is the projected labour force growth more rapid than recent historical experience. Thus, many OECD countries will experience a significant reduction in labour force growth over the next three decades.

Labour forces will also likely become significantly older in the next several decades, although the strength of this effect varies markedly across countries (Table 4.1). Even under the more conservative baseline scenario, the OECD average share of workers aged 45 to 59 years rises from 26 to 32 per cent between 1995 and 2030, while the share aged 60 years and older rises from 5 to almost 9 per cent. Thus, firms will need to employ both a greater share of workers aged 45 to 59 years and a greater share of retirement-age workers (*i.e.* aged 60 years and over). A key question is how successfully firms can adjust to such a major shift in the composition of their work forces.

Comparing the two scenarios confirms that the extent to which the labour force will age will be strongly influenced by trends in retirement patterns. The OECD average share of workers aged 60 years and older in 2030 is 9 per cent under the baseline assumption, but rises to 17 per cent if retirement patterns return to those of 1970. Policy measures to encourage delayed retirement imply substantial shifts in the age composition of the work force that lie considerably outside the range of recent historical experience. Conversely, a continued trend toward earlier retirement could off-set the direct effect of the changing age structure of the population on the age composition of the labour force. However, large reductions in participation rates generally would be required, implying undesirable and, possibly, unsustainable increases in retirement dependency ratios [OECD (1998b)].

Chart 4.1.

Labour force growth: recent experience and two future scenarios^a
Average annual percentage change



a) The labour force is based on persons aged 15 and over. The baseline scenario assumes that age-specific participation rates remain unchanged at their current levels, while the later retirement scenario assumes that much of the recent trend towards earlier retirement gradually reverses (details in the text).
Sources: Secretariat estimates based on the ILO Labour Force Database and the UN Population Database.

Table 4.1. **Labour force shares of older workers, 1970-2030^a**

Percentage of total labour force

	Share of workers aged 45 to 59 years				Share of workers aged 60 years and older			
	1970	1995	2030 Baseline scenario	2030 Later retirement scenario	1970	1995	2030 Baseline scenario	2030 Later retirement scenario
Australia	24.2	23.9	28.6	29.4	6.4	3.6	6.3	14.5
Austria	25.9	25.4	34.2	34.9	5.6	1.2	2.7	10.4
Belgium	25.6	23.8	28.9	32.7	5.8	1.7	2.9	10.6
Canada	24.5	24.3	29.9	29.4	6.9	4.2	8.1	16.5
Czech Republic	26.2	28.9	37.1	37.3	7.5	3.8	5.8	11.8
Denmark	26.6	29.5	29.7	27.8	9.8	4.5	7.6	18.5
Finland	25.4	31.4	32.2	30.3	6.1	2.8	4.7	13.9
France	25.0	28.2	35.1	33.7	7.9	2.5	4.0	14.0
Germany	23.8	28.6	34.8	32.0	9.3	2.9	5.5	18.4
Greece	24.1	26.1	34.7	32.5	11.2	6.9	10.3	21.8
Hungary	23.0	26.4	34.5	32.1	12.2	0.4	0.6	22.2
Iceland	22.1	23.2	28.6	25.7	10.5	11.3	17.5	21.2
Ireland	24.9	22.7	32.9	31.5	14.1	5.7	9.3	18.4
Italy	24.6	25.2	34.3	36.0	5.9	4.3	8.7	14.6
Japan	21.9	33.1	34.5	31.1	9.3	12.5	20.7	30.1
Korea	19.7	22.3	33.6	32.4	4.9	6.2	16.2	19.0
Luxembourg	24.6	24.4	31.1	32.8	4.0	1.7	2.5	6.0
Mexico	16.0	15.6	25.8	26.1	9.4	6.2	12.6	16.9
Netherlands	23.3	24.9	29.5	30.2	6.4	1.7	4.0	14.9
New Zealand	25.0	25.3	30.1	29.9	6.5	3.3	5.3	12.7
Norway	29.9	27.9	30.0	28.2	12.5	6.9	11.5	20.2
Poland	22.7	24.1	32.9	31.9	12.1	8.1	11.0	21.7
Portugal	21.5	24.0	32.5	30.3	11.5	7.7	11.5	25.1
Spain	24.1	22.6	36.4	34.8	8.5	4.6	8.2	19.3
Sweden	29.8	32.3	31.1	29.2	9.5	6.3	9.6	16.5
Switzerland	23.7	28.3	32.1	28.6	10.4	6.0	12.3	24.1
Turkey	17.6	15.6	26.8	27.6	9.8	7.2	13.1	17.2
United Kingdom	28.9	28.2	30.6	29.7	9.0	5.3	8.1	16.4
United States	27.7	25.0	28.9	27.9	9.1	5.8	9.8	16.1
Unweighted average:								
North America ^b	22.8	21.6	28.2	27.8	8.4	5.4	10.2	16.5
European Union	25.2	26.5	32.5	31.9	8.3	4.0	6.6	15.9
OECD Europe	24.7	26.0	32.3	31.4	9.1	4.7	7.8	17.1
Total OECD	24.2	25.6	31.8	30.9	8.7	5.0	8.6	17.3

a) The total labour force is aged 15 years or more. See note to Chart 4.1. and text for an explanation of the two scenarios.

b) North America comprises Canada, Mexico and the United States.

Sources: Secretariat estimates based on the ILO Labour Force Database and the UN Population Database.

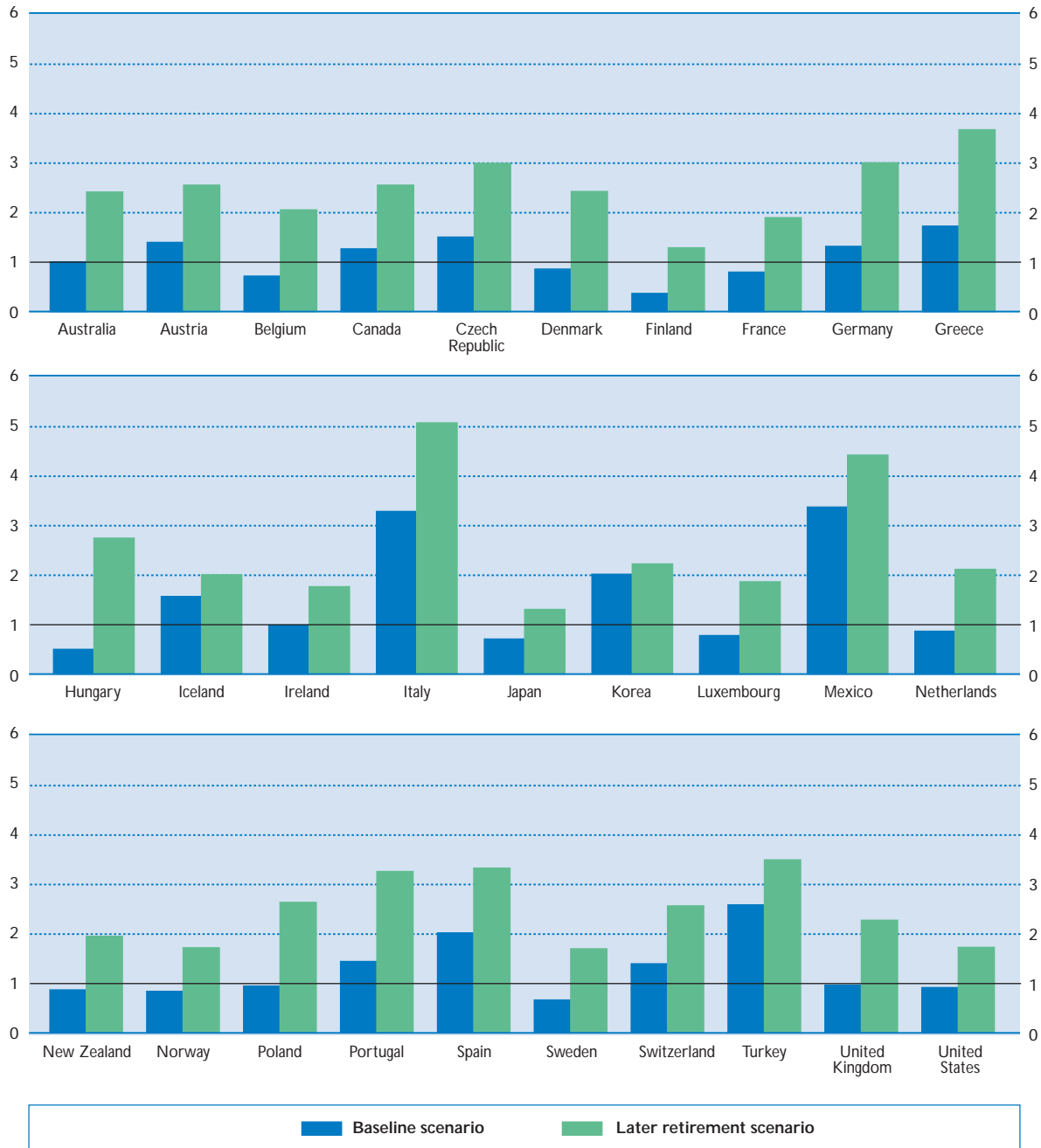
2. Scale of the required adjustments

This sub-section uses recent historical experience to provide a qualitative assessment of the scale of the adjustments required. Some indication of the capacity of OECD labour markets to adapt to these projected changes can be made by comparing the labour market performance of countries whose labour supply trends have differed in the past. This requires a summary index of the rate of change in the age structure. One such index is examined in Chart 4.2, which reports the ratio of the forecast rate of change in age composition to the actual change experienced in recent years.⁴

Several lessons emerge. First, OECD labour markets have faced considerable changes in the age structure in recent decades. It is possible that the rate of change will actually decelerate (yielding a ratio below 1.0) in many countries under the baseline scenario. Second, there are large cross-country differences. Italy, Mexico and Turkey stand out for the extent to which labour markets will likely need to accommodate a sharp acceleration in the rate of change. Third, the later-retirement scenario shows that reversing the trend toward earlier retirement will significantly increase the rate of change in age composition in all countries compared with the trend over the period 1970-1995. Finally, there are

Chart 4.2.

**Change in the age structure of the labour force,
1995-2020 projections relative to 1970-1995**
Ratio of 1995-2020 index to 1970-1995 index,^a values above 1.0 indicate accelerating change



a) Index of the absolute change in the cumulative distribution function of the labour force by age (see note to Chart 4.1. and text for further details).
Sources: Secretariat estimates based on the ILO Labour Force Database and the UN Population Database.

Table 4.2. **Cross-country correlations between measures of demographic change and measures of labour market performance, 1970-1996^a**

Labour market performance	Working-age population ^b	
	Average annual growth rate	Change in the age structure ^c
Average unemployment rate, 1970-1996	0.20	-0.29
Change in unemployment rate, 1970-1996	-0.38	-0.20
Average annual growth in employment, 1970-1996	0.75*	0.16
Average employment/population ratio, 1970-1996	-0.24	0.42*
Change in employment/population ratio, 1970-1996	-0.20	0.45*

* Significant at the 5% level.

a) Correlations are across all OECD Member countries except the Czech Republic, Hungary, Korea, Luxembourg, Mexico and Poland.

b) 15-64 years.

c) The index of age structure is based on the 1970-1996 changes in the distribution function of the population by the finest age-group disaggregation possible (see text).

Sources: Secretariat estimates based on the OECD Analytical Database and the UN Population Database.

important qualitative differences between the forecast changes in age composition and the changes already experienced, which the summary index does not capture. Between 1970 and 1995, most countries experienced the labour market entry and initial ageing of the baby-boom generation, and a strong trend toward earlier retirement. By contrast, 1995-2020 will be characterised by increases in the shares of older workers.

There has not been a strong association in the past between these two types of labour supply changes and unemployment (Table 4.2). Consistent with this finding, labour supply growth was positively correlated with employment growth.⁵ Strong conclusions cannot be drawn from these simple correlations, since no attempt was made to control for other determinants of labour market performance. Nonetheless, they provide a useful reminder that modern economies appear to have considerable capacity to adapt to different demographic conditions.

Several caveats to this optimistic appraisal are required. The demographic changes that will characterise labour supply in the next several decades are qualitatively different from past changes. Also, the fact that different national economies have accommodated quite different demographic environments in the past need not imply that abrupt *changes* in demographic trends will not require a difficult transition period. Finally, even if the macro indices of employment and unemployment examined here should not be greatly affected by work-force ageing, older workers could encounter increased employment difficulties.

3. The changing educational profile of older workers

The cohort of workers aged 45-64 years in 2015 will be better educated than their counterparts

today (Table 4.3).⁶ The share not having completed upper secondary schooling is likely to fall by over one-third (the unweighted OECD average falls from about 44 to 27 per cent). This trend is likely for all OECD member countries, although large international differences in the distribution of education levels will persist.

Rising educational attainment should ease the absorption of larger groups of older workers. Recent decades have witnessed a strong increase in the demand for more educated workers and a concomitant deterioration in the opportunities for less-educated workers [OECD (1997a, Chapter 4)]. Poorly-educated youths, particularly men, appear to have been most disadvantaged. However, older workers have also been negatively affected. Older workers displaced from production jobs, a group with low educational attainment on average, are at a high risk of remaining jobless for an extended period of time and typically experience large earnings losses if they do become re-employed [Podgursky and Swaim (1987); Jacobson, LaLonde and Sullivan (1993); Carrington and Zaman (1994); Fallick (1996)].

The forecast improvement in educational attainment of older workers is good news, perhaps especially for men, but a word of caution is in order. A "prediction" that the rapid increase in the educational levels of older workers is likely to expand their employment opportunities is potentially subject to a fallacy of composition. For a given cohort, more educated workers fare better on average than less educated ones. If this is due to so-called "screening" by employers, then it need not follow that an upwards shift in the amount of schooling received by a cohort will result in improved employment prospects for the cohort as a whole.⁷ Section E examines the implications of education and training for ageing in more detail.

Table 4.3. **Distribution of educational attainment of the labour force aged 45 to 64 years, 1995 and 2015**

	Percentages							
	1995				2015 ^a			
	Less than upper secondary	Upper secondary	Non-university tertiary	University	Less than upper secondary	Upper secondary	Non-university tertiary	University
Australia	44.8	29.0	11.6	14.6	37.1	31.8	12.1	18.9
Austria	33.0	58.7	1.5	6.8	17.5	69.8	2.8	9.8
Belgium	46.2	27.0	13.3	13.5	25.7	35.6	19.1	19.6
Canada	27.7	24.8	29.3	18.2	14.1	30.1	33.8	21.9
Czech Republic ^b	15.2	72.4	..	12.4	7.1	78.3	..	14.6
Denmark	35.5	42.4	6.1	15.9	23.5	49.6	8.3	18.6
Finland	43.4	36.0	8.6	12.0	17.9	56.2	10.5	15.4
France	38.4	44.0	6.5	11.1	15.4	57.8	11.0	15.8
Germany	15.4	58.1	11.7	14.8	8.6	63.5	10.8	17.1
Greece	71.4	14.4	3.6	10.6	41.5	29.6	9.9	19.1
Ireland	61.3	18.9	8.5	11.3	36.4	31.4	15.1	17.1
Italy ^b	67.2	21.9	..	10.9	44.6	42.3	..	13.1
Korea ^b	65.0	24.8	..	10.2	22.6	51.7	..	25.6
Luxembourg ^b	62.0	20.1	..	17.9	53.2	25.8	..	20.9
Mexico	85.1	7.0	0.5	7.4	64.7	16.7	1.9	16.7
Netherlands ^c	36.9	38.1	..	25.0	23.5	46.1	..	30.4
New Zealand	41.6	31.1	17.3	9.9	31.1	41.1	14.2	13.6
Norway	20.6	51.2	11.2	16.9	9.4	53.2	13.1	24.2
Poland	34.5	49.6	2.4	13.5	12.7	69.9	4.8	12.6
Portugal	84.0	5.2	3.8	7.0	67.8	14.7	4.3	13.2
Spain	78.8	7.1	2.7	11.5	49.5	20.1	8.4	22.0
Sweden	35.8	37.4	11.5	15.3	14.7	54.3	16.4	14.6
Switzerland	19.4	57.9	14.2	8.5	10.8	63.5	14.0	11.7
United Kingdom	27.6	51.3	9.9	11.2	13.0	61.3	9.4	16.4
United States	12.4	51.0	7.6	29.0	9.2	51.7	9.5	29.6
Unweighted average	44.1	35.2	9.1	13.4	26.9	45.9	11.5	18.1

.. Data not available.

a) The distribution of the labour force in 2015 is based on applying education-specific participation rates for individuals aged 45-64 years in 1995 to the population aged 25-44 years in 1995.

b) Data for non-university tertiary education are included in university education.

c) Non-university tertiary education is not applicable.

Sources: OECD Education Database except for Mexico where data were provided by the national authority as part of the OECD project on ageing populations.

C. CONCEPTUAL FRAMEWORK FOR ASSESSING THE EFFECTS OF WORK-FORCE AGEING

Economic theory provides a useful framework for analysing the earnings and employment consequences of work-force ageing [also see Disney (1996)]. This section, therefore, reviews economic models relevant for analysing, in turn, the labour market effects of *individual* ageing (*i.e.* individual employment histories and how they would change if workers desired to delay retirement) and *group* ageing (*i.e.* a shift in the age distribution of the work force, whether due to population ageing or an rise in the effective age of retirement). Subsequently, the determinants of the age at which workers wish to retire are reviewed.

1. Individual ageing

The basic model of competitive labour markets implies that, at any point in time, workers' wages

reflect their productivity. Human capital theory reconciles this equilibrium condition with the empirical tendency for earnings to rise over a large portion of most careers by positing that workers and their employers invest in on-the-job training that enhances future productivity. When the model is extended to incorporate the depreciation of skills and/or an eventual decline in productivity associated with biological ageing, it can generate realistically shaped age-earnings profiles: initially rapid earnings growth gradually slows, potentially even turning negative beyond a certain age. When this is combined with a rising disutility of working beyond a certain age, it creates an incentive for workers eventually to retire. So long as wages adjust to equal productivity at all ages, employers will find it profitable to employ older workers.

Analysing training choices as an optimal investment problem reveals incentives to concentrate training investments early in a worker's career. Both

the shorter time horizon remaining for an older worker to employ any newly acquired skills and any age-related diminution in the ability to learn new skills would reduce the economic returns to training. However, the returns to training older workers may be enhanced by other factors. If firms finance training or it imparts *specific* skills (*i.e.* skills that enhance productivity with the current firm, but would not do so in other firms), the time horizon over which the profitability of training is assessed is the worker's expected remaining tenure with that employer, which may be much shorter than their total expected remaining working life, especially for young workers. In these circumstances, the lower quit rate of older workers would raise the expected returns to training them, relative to that for younger workers. Similarly, rapidly changing skill requirements would reduce the importance of a long pay-back period to the selection of trainees, but magnify the importance of any age-related decline in the ability to learn new skills.

The distinction between general and specific skills has two additional implications for ageing. As workers age, skills learned on the job become more important relative to skills learned in school. On-the-job training tends to impart less general skills than formal education, however, implying that the human capital of older workers is less "portable" and they, therefore, risk large earnings losses if they change employers. Second, firms may under-invest in general skills because some of the returns accrue to other firms, who have an incentive to recruit workers after they have received general training from their current employers. This potential market failure has implications for workers of all ages, but could particularly disadvantage older workers by discouraging employers from investing to maintain the "trainability" of workers as they age, or providing them with skill credentials that are recognised in the external labour market.

Long-duration employment relations may facilitate investments in on-the-job training, but may also change how compensation varies with age. Many workers stay with the same employer for long periods and firms may prefer to pay these workers wages that do *not* correspond to their productive contributions at all points during their careers. A "back-loaded" compensation structure, in which pay is lower than productivity for junior workers, but rises more steeply and eventually surpasses productivity, potentially increases economic efficiency by strengthening incentives for workers to work more diligently, to remain with the same firm or to invest in firm-specific skills.⁸ Clearly, older workers generally are not disadvantaged by implicit contracts of this type, since both life-time and current earnings are increased. However, difficulties could

arise for older workers attempting to delay retirement or to change jobs because:

- employers will only find it profitable to enter into back-loaded pay schemes if a predetermined maximum retirement age prevails, which limits the period of time during which compensation exceeds productivity.⁹ Accordingly, the existence of such incentive schemes could create employment difficulties if future cohorts of older workers should desire to work beyond the retirement age targeted by employers. If pension reforms and related policies cause many mid- and late-career workers to revise upwards their desired age of retirement, it might prove difficult – at that late point – to modify the implicit contract with their employer. Reforms announced sufficiently in advance would be more easily accommodated, because wage profiles could be reconfigured to a later retirement age [Lazear (1984)]¹⁰; and
- employers who use back-loaded compensation schemes may prefer not to hire older job seekers, either because it is infeasible to offer an array of seniority pay schedules that are tailored to workers entering the firm at different ages or because this type of implicit contract creates a fixed cost of hiring and, hence, an incentive to hire younger workers whose expected future tenure with the employer is greater [Hutchens (1986, 1988)].¹¹

The argument that fixed hiring costs may disadvantage older job seekers is more general. The bias could also result from the costs of recruiting new employees or of providing initial job training [Oi (1962)]. Fixed hiring costs typically may increase the job security of older workers who are already employed, since the firm will want to amortize that investment over as many years as possible. However, firms may have a preference to shed their oldest workers when downsizing, because the "match capital" lost when a worker leaves the firm is larger the longer the worker would be expected to remain with the firm. This time horizon effect may be one reason that early retirement schemes are frequently used as a way to accommodate structural change [Handa (1994); OECD (1995a)].

Older workers may also face pay and employment disadvantages that result from *age discrimination*, defined as lesser opportunities of older workers that do not reflect lower productivity [Cain (1986)]. Negative age stereotypes might particularly disadvantage older job seekers, since prospective employers may have difficulty assessing their past job performance or other credentials. As with gender and ethnic dis-

crimination, it has proven difficult to find direct measures of age discrimination and most empirical estimates are based upon residual intergroup differences in pay or employment, after taking account of other explanations. Such estimates are inherently fragile, however, because it is never certain that all other factors have been adequately accounted for. This difficulty is particularly severe in the case of age discrimination, because the relationships between age, productivity and earnings are so complex.

2. Group ageing

The theory of factor demand with heterogeneous labour has been used to assess the quantitative implications of changes in the age structure of the work force for the employment and earnings levels of workers of different ages [see Hamermesh (1993)]. The starting point for this analysis is a production function summarising how much output can be produced for different combinations of factor inputs, including workers of different ages. Intuitively, a high degree of substitutability between workers of different ages would imply that firms could accommodate large shifts in the age mix of their work force with little effect on overall productivity and, hence, that relatively small adjustments in relative wages would be sufficient to maintain labour market equilibrium. If substitutability is more limited, expansion of the relative number of older workers would significantly reduce their marginal product, implying that their relative wage would need to fall considerably if they are not to be at an increased risk of unemployment.

The econometric evidence on substitution patterns for workers of different ages is limited to a few countries and is neither entirely consistent nor easily extrapolated to the future. Overall, this evidence suggests that workers of different ages are quite good substitutes in production. To the extent this finding is reliable, it suggests that modest declines in the relative earnings of older workers would be sufficient to secure their employment in the future.¹² Any such changes in the wage structure would also provide an incentive for employers to adjust recruitment and training practices so as to take fuller advantage of the potential contribution of older workers. However, this research provides little guidance about how efficiently the human resource practices of firms will respond to the market signals created by work-force ageing, or whether public policies can facilitate those adjustments.

The production function approach adopts a static notion of skill requirements that side-steps the difficult issue of whether an older work force will be less adaptable. While future skill needs cannot

be forecast with precision, it is virtually certain that the introduction of new technologies and the constant flux of product market competition will create an ongoing need for workers to learn new skills and to move from declining to growing firms. The models of human capital, implicit contracts and fixed hiring costs discussed above suggest that older workers, being more heavily invested in their current jobs and specific skills than younger workers, find it more costly to make these sorts of adjustments. Therefore, younger and low-tenure workers provide a disproportionate share of the work force's overall adaptability. As the share of younger workers falls, it is likely that older workers will have to provide more of these adjustments. If there are age-related disadvantages in adaptability, access to training or job search, they may have increasingly adverse consequences for the employment and earnings security of older workers, and for the overall adaptability of the economy.

3. Desired age of retirement

A large literature applying the theory of labour/leisure choices to retirement has clarified how economic incentives affect labour supply near the end of the working life. One of the key empirical findings is the importance of pensions for the timing of retirement [Gruber and Wise (1997); OECD (1998c)]. Public and private pensions often create strong incentives for workers to retire at the age of first benefit entitlement, because of high effective tax rates on earnings. In some OECD countries, unemployment and disability benefit systems, or special early retirement programmes, also create strong incentives for workers to withdraw from the labour force in advance of conventional retirement ages. Past increases in the generosity of these income transfers and, especially, the extension of eligibility to younger workers appear to explain an important share of the secular trend toward earlier retirement in most countries. Estimates of the effect of pension systems on the age at which workers retire vary considerably, however, and some studies conclude that other factors, such as the secular rise in wage levels, changes in preferences, or shifts in the job structure towards sectors where earlier retirement is typical, account for the majority of the reduction in effective age of retirement [Anderson *et al.* (1997)]. Another complicating factor in assessing the independent impact of expanded pension benefits on lowering the effective age of retirement is that the expansion of benefits has sometimes been a response to the employment difficulties of some groups of older workers (OECD, 1995b).¹³

The empirical research suggests that much of the recent trend toward earlier retirement is poten-

tially reversible. Changes to public pensions or other social security programmes that either reduce the income support provided for early retirement or provide financial incentives for later retirement probably would cause many workers to prefer to retire somewhat later or more gradually. It is more difficult to assess how readily firms would accommodate such a reversal. It is clear, however, that changes would not occur overnight. The theories of on-the-job training and implicit contracts imply that the *anticipated* age of retirement affects recruitment, training and pay practices throughout a career. Mistaken expectations about the timing of retirement could be costly and governments may be able to facilitate the labour market adjustment to work-force ageing by providing timely information to workers and employers that help them anticipate the implications of demographic trends and policy changes for the timing of retirement.

D. AGE, RELATIVE EARNINGS AND EMPLOYMENT

As noted in the previous section, compensation is a potentially key factor affecting the employability of older workers. This section examines how earnings vary by age. The risk of low-paid employment for older workers is also assessed.

1. Relative earnings of older workers

Chart 4.3 shows age-earnings profiles in 1995 for 20 OECD countries. They tend to have an inverted U-shape, with lower earnings among younger workers, rising to a peak around age 50 and then declining. National differences are quite large, however, both in how steeply wages rise between labour market entry and prime-earning ages and in the extent to which wages subsequently fall.¹⁴

Table 4.4 reports ratios of average earnings for workers in three age groups. The ratio of earnings in what are often the peak-earnings years (aged 45 to 54 years) to the earnings of recent entrants into the labour force (aged 25 to 29 years) averages 1.4. The ratio of earnings of individuals aged 55 to 64 to those aged 45 to 54 indicates that earnings of older workers fall an average of 9 per cent. There is considerable variation in these ratios across countries, however.

Since educational attainment differs between cohorts, the overall relationship between age and average earnings confounds pure age effects with the returns to education. Chart 4.4 shows age-earnings profiles separately by level of education in 1995 for the G7 countries. They are flatter and lower for workers with lower education levels. When ratios of the average earnings of 45 to 54 year-olds (“peak

earners”) and 25 to 29 year-olds (“recent entrants”) are calculated by level of education, there is a strong tendency for this ratio to rise with the level of education (Table 4.4). Averaging over all countries, the earnings premium of peak-earnings workers relative to recent entrants rises from 23 per cent for workers with only a lower secondary education to 89 per cent for those with a university degree. The variability across countries also appears to be higher for higher educational levels.

Controlling for educational attainment weakens the tendency for age-earnings profiles to slope downward late in the working life. However, average earnings still tend to fall between ages 45 to 54 years and 55 to 64 years in five of the G7 countries, especially for the higher education groups. But this pattern is either absent or weak in Germany and Italy.

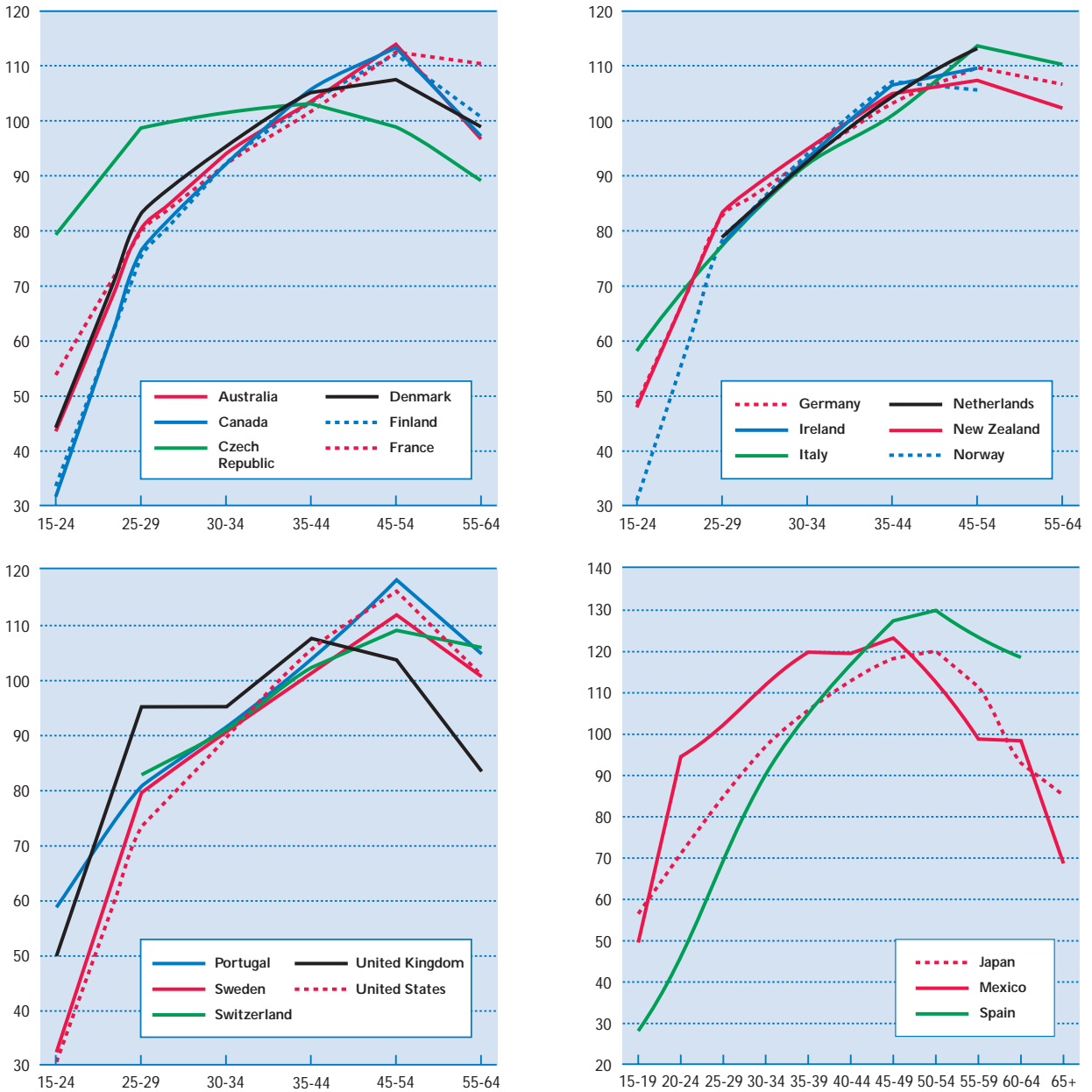
Table 4.5 shows that the earnings premium of peak-earnings workers relative to recent entrants has tended to rise recently in the three countries for which time-series data are available. Between 1980 and 1995, this premium rose 35 percentage points in France, 10 percentage points in Japan and 31 percentage points in the United States. In France and the United States, the change in the earnings ratio is in the same direction for workers at all levels of education. The pattern is more mixed in Japan, where the relative earnings ratio for peak-earnings workers with tertiary-level education declined. Across these three countries there does not appear to be any clear trend in the earnings of late-career workers (aged 55 to 64 years) relative to peak-earnings workers.

The recent tendency for the earnings premium received by peak-earnings workers to rise illustrates that these relativities do not adjust in lock-step to changes in the age mix of the work force. Indeed, a quite strong downward trend in the relative supply of younger workers over the past few decades generally has not led to an increase in their relative earnings [OECD (1996, Chapter 4)]. While recent trends in relative earnings by age do not confirm a tendency for relative wages to adjust quickly to changes in the age structure, market forces for such an adjustment may strengthen as ageing proceeds, particularly if there is a significant trend toward later retirement.

Whether higher earnings of older, relative to younger, workers reduces the employment opportunities of older workers is an important and complicated issue. There is no significant cross-country correlation between the earnings premium of older relative to younger workers, and the share of older workers in total employment (data not shown here). However, these correlations are always negative. There is also a positive correlation between the

Chart 4.3.

Age-relative earnings profiles, 1995^a
Average gross annual earnings = 100



a) For Japan, Mexico and Spain, earnings for each age group are calculated relative to all workers aged 15 and over; for other countries they are calculated relative to workers aged 25-64. For Ireland and the Netherlands, data are for 1993. For Finland and Portugal, data are for 1994. Data are not available for the following groups: Ireland 15-24 and 55-64; the Netherlands, 15-24; Norway, 55-64; Switzerland, 15-24. For the Netherlands, the age group 45-54 refers to 45-64, while for Spain, the age group 60-64 refers to 60 and over.

Sources: Data for Australia, France, Japan and Mexico were provided by national authorities as part of the OECD project on population ageing. Data for Spain were supplied by the Instituto Nacional de Estadística (INE) from the *European Structure of Earnings Survey*. Data for other countries are from the OECD Education Database.

Table 4.4. **Earnings ratios by age group and level of educational attainment, 1995**

Gross annual earnings before taxes

	45-54 years/25-29 years					55-64 years/45-54 years
	Less than upper secondary	Upper secondary	Non-university tertiary	University	Overall	Overall
Australia	1.30	1.26	1.35	2.06	1.42	0.85
Canada	1.05	1.46	1.37	1.96	1.48	0.86
Czech Republic ^a	0.99	0.99	..	1.42	1.00	0.90
Denmark	1.21	1.23	1.29	1.60	1.29	0.92
Finland ^b	1.43	1.36	1.69	2.11	1.49	0.90
France	1.18	1.47	1.45	1.95	1.38	1.07
Germany	0.97	1.28	1.10	1.76	1.33	0.97
Ireland ^c	1.24	1.59	1.59	2.25	1.41	..
Italy ^a	1.27	1.64	..	2.60	1.46	0.97
Japan	1.23	1.44	1.64	1.99	1.42	0.86
Mexico	1.13	1.61	1.33	1.65	1.16	0.84
Netherlands ^{c, d}	1.19	1.41	..	1.73	1.43	..
New Zealand	1.25	1.39	1.16	1.93	1.29	0.95
Norway	1.10	1.26	1.88	1.67	1.35	..
Portugal ^{a, b}	1.56	1.89	..	1.80	1.46	0.89
Spain ^d	1.75	2.09	..	2.61	1.86	0.94
Sweden	1.38	1.26	1.67	1.70	1.40	0.90
Switzerland	1.06	1.25	1.52	1.80	1.32	0.97
United Kingdom	0.93	1.09	1.41	1.50	1.09	0.81
United States	1.29	1.28	1.39	1.67	1.48	0.89
Unweighted average	1.23	1.41	1.46	1.89	1.38	0.91

.. Data not available.

a) Data for non-university tertiary education are included in university education.

b) Data refer to 1994.

c) Data refer to 1993.

d) Non-university tertiary education is not applicable.

Sources: *France, Japan and Mexico*: national authorities, as part of the OECD project on ageing populations.*Spain*: Instituto Nacional de Estadística (INE), *European Structure of Earnings Survey*.*United States*: Bureau of Labour Statistics, Current Population Survey, unpublished data.*Other countries*: OECD Education Database.

earnings of workers aged 45 to 54 years relative to those aged 25 to 29 and the risk of a layoff leading to joblessness for the older group. Consistent with earlier research on substitutability in production (see Section C), these simple correlations provide, at best, weak evidence that cross-country differences in the relative earnings of older workers have been associated with greater employment difficulties, despite quite large cross-country differences in the relative earnings of older workers.

2. Low-paid employment

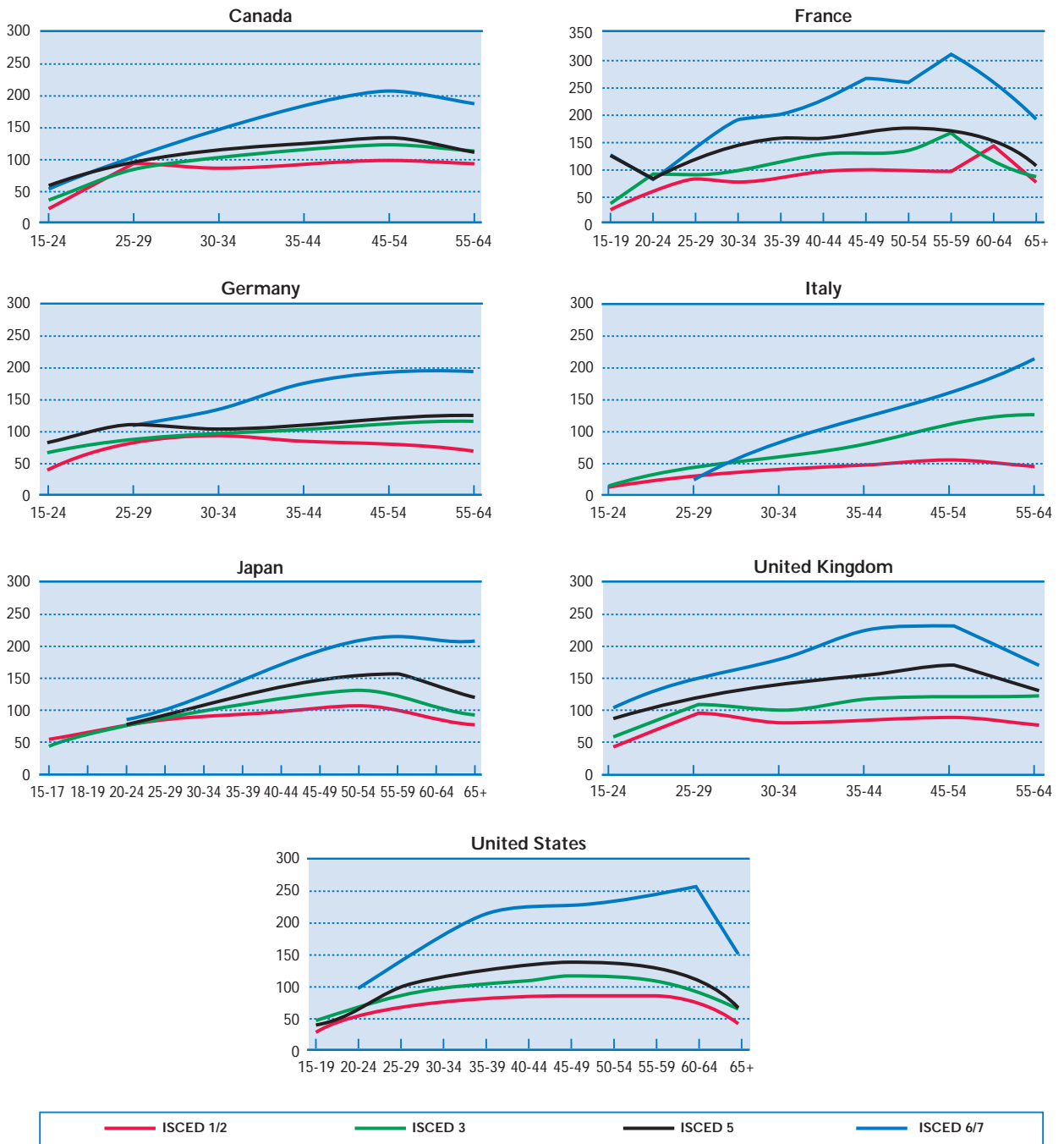
Like unemployment or involuntary retirement, low earnings when employed is also a potential threat to the living standards of older workers and their families. Flexibility in the level and composition of the compensation received by older workers – including possible reductions in earnings towards the end of the working life – might help labour markets to employ an ageing labour force, but could also increase the risk of earnings levels too low to

meet family income needs. Low pay and earnings mobility were extensively analysed in both the 1996 and 1997 *Employment Outlook*. The implications of that analysis for ageing are:

- in all countries, younger, female and low-skilled workers are more likely to be employed in low-paid jobs than older, male and high-skilled workers. However, in some countries the risk of being low paid does rise near the end of a career. In Japan, 20 per cent of full-time workers aged 55 and older were low paid, double the incidence among workers aged 25 to 54. Low-pay incidence also rises between prime and older ages in Australia, New Zealand, the United Kingdom and the United States, but falls in Austria, Hungary and Sweden;
- older, low-paid workers have substantially worse prospects of moving up the earnings distribution than younger workers. Comparing estimates of average cumulated time in low pay over the period 1986-1991 shows that

Chart 4.4.

Average earnings by level of educational attainment and age, G7 countries, 1995^a
 Earnings of 30 to 34 year olds in ISCED 3 = 100



a) Earnings are average annual gross earnings. Educational attainment is defined as follows: ISCED 1/2 is primary or lower secondary education; ISCED 3 is upper secondary education; ISCED 5 is non-university tertiary education; ISCED 6/7 is university education.

Sources: Data for France, Japan and the United States were provided by national authorities as part of the OECD project on population ageing. Data for other countries are from the OECD Education Database.

Table 4.5. **Earnings ratios by age group, level of educational attainment and year in three countries**

	45-54 years/25-29 years					55-64 years/45-54 years
	Less than upper secondary	Upper secondary	Non-university tertiary	University	Overall	Overall
France						
1982	1.03	1.17	1.19	1.49	1.03	0.97
1985	1.15	1.43	1.51	1.74	1.26	0.97
1990	1.27	1.47	1.43	1.81	1.35	0.96
1995	1.18	1.47	1.45	1.95	1.38	1.07
Change 1982-1995	0.15	0.30	0.25	0.45	0.35	0.10
Japan						
1976	1.14	1.41	1.87	2.10	1.26	0.82
1980	1.18	1.44	1.81	2.15	1.31	0.85
1985	1.25	1.49	1.79	2.19	1.38	0.86
1990	1.27	1.49	1.69	2.10	1.42	0.85
1995	1.23	1.44	1.64	1.99	1.42	0.86
Change 1980-1995	0.05	0.00	-0.17	-0.16	0.10	0.01
United States						
1975	1.04	1.04	1.07	1.23	1.00	0.87
1980	1.14	1.11	1.24	1.48	1.17	0.94
1985	1.24	1.19	1.25	1.38	1.21	0.91
1990	1.27	1.26	1.37	1.47	1.32	0.90
1995	1.29	1.28	1.39	1.67	1.48	0.89
Change 1980-1995	0.15	0.17	0.15	0.20	0.31	-0.05

Sources: *France and Japan*: national authorities, as part of the OECD project on ageing populations.
United States: Bureau of Labor Statistics, Current Population Survey, unpublished data.

older workers experienced more time in low-paid employment than other workers, especially in Germany and the United Kingdom (Chart 4.5); and

- labour force ageing will probably tend to increase the risk of low-paid employment among older worker unless off-set by other factors. The increased supply of older workers may generate market pressures for their relative earnings to fall. If older workers also change jobs more frequently (see Section F), the risk of downwards earnings mobility may also increase. Thus, the incidence of low-paid employment among older workers may well rise and it is probable that older workers, once low paid, would continue to have relatively poor upward mobility prospects.

E. AGE, TRAINING AND PRODUCTIVITY

The productivity of older workers, including their ability to learn new skills, will be an important determinant of their employability and earnings. It will also affect how well OECD economies will be able to meet evolving skill needs. In this section, evidence about how productivity changes with age is first considered. Training patterns by age are then analysed.

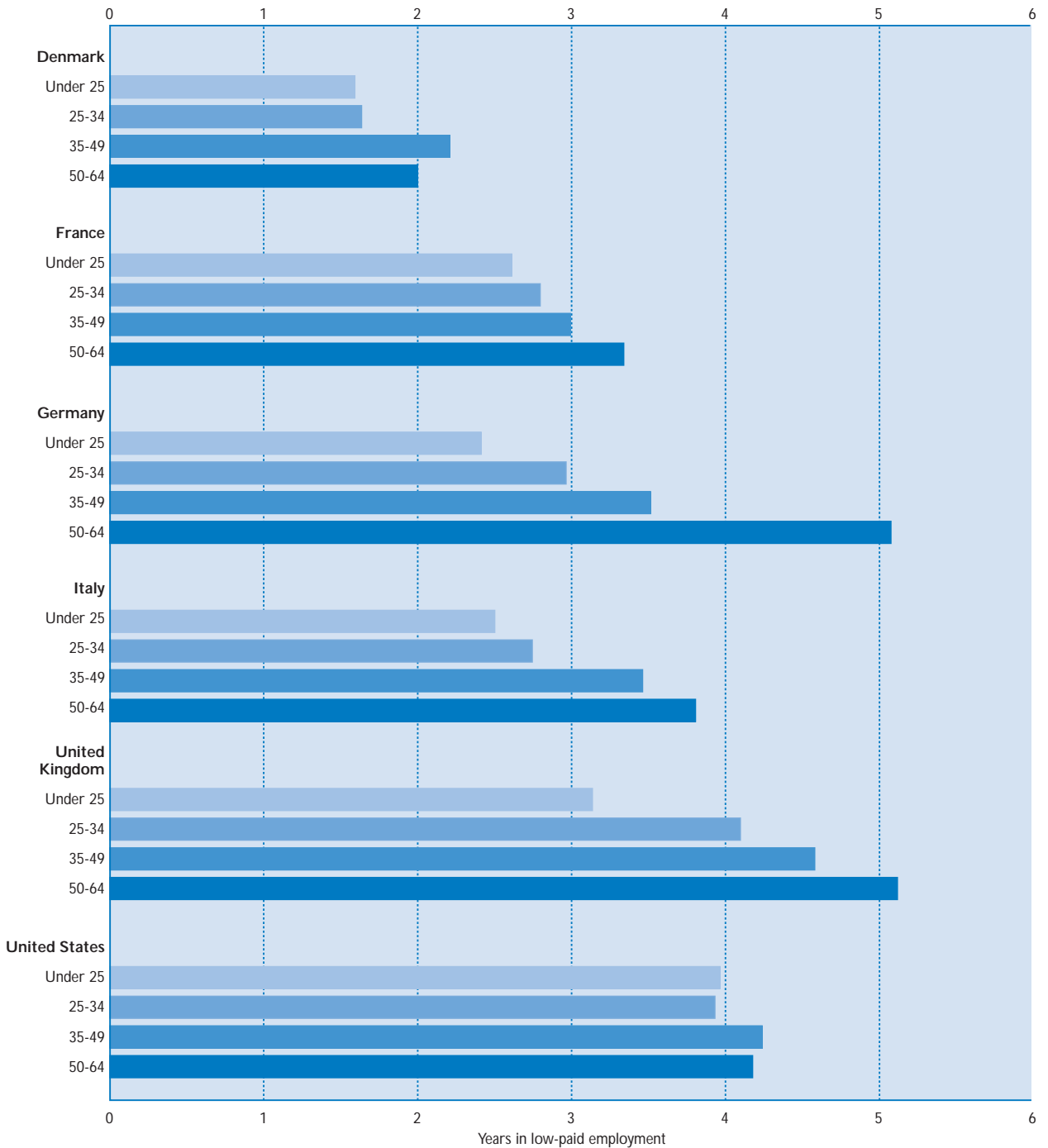
1. Individual ageing and productivity

It is difficult to generalise about how productivity changes as individuals age, since job-skill requirements and individual capacities are so diverse. A large number of gerontological/psychological studies present direct measures of job performance and analyse their relationship to age. A recent survey of this literature concludes that there is no significant overall difference between the job performance of older and younger workers [Warr (1994)]. In almost every case, variations within an age group far exceed the average difference between age groups.

One of the causes of large productivity differences within age groups, namely, poor health, is significantly related to age. The risk of poor health and disability rises with age, and the onset of health problems affects the timing of retirement for a significant number of older workers [Bound *et al.* (1997); Burkhauser *et al.* (1997)]. However, recent increases in longevity appear to have been accompanied by a significant reduction in the incidence of disability at older ages [Manton *et al.* (1997)], suggesting that the extent to which poor health reduces the productivity of workers at any given age is trending downward. The shift of employment away from manual occupations may also diminish the significance of age-related health problems for job performance.

Chart 4.5.

Average cumulative years in low-paid employment during 1986-1991, by age^a
 Continuously employed full-time workers who were low-paid in 1986



a) Low pay is defined as below 0.65 median earnings.
 Source: OECD (1997a), Chapter 2.

Economists have criticised the gerontological/psychological literature on age and productivity for paying insufficient attention to the economic significance of the performance measures that are analysed. An alternative research strategy is to infer how productivity varies with age from age-earnings profiles [Kotlikoff and Gokhale (1992)]. This approach may also be misleading, however, since earnings and productivity can follow rather different paths. A study that juxtaposes data on earnings with a direct measure of productivity found that earnings grew more steeply with seniority than did productivity [Medoff and Abraham (1981)], as is predicted by Lazear's theory of back-loaded compensation (see Section C).

An important aspect of how ageing affects productivity, especially in the context of policies designed to raise the effective age of retirement, is whether older workers have greater difficulty learning new skills. Even if ageing typically does not reduce a worker's ability to perform familiar job tasks, a declining ability to adapt to changing skill requirements would tend to lower their productive contribution over time. "Trainability", like productivity generally, defies easy measurement. Nonetheless, some indirect evidence is available.

The International Adult Literacy Survey (IALS) is an important source of evidence about the relationship between age, productivity and trainability [see OECD and Statistics Canada (1995c) for more information about the IALS]. The IALS provides continuous scores of several different dimensions of literacy (*i.e.* competencies using written and quantitative information) in realistic situations, such as are encountered on the job. A large body of research concludes that recent trends in work organisation and technology are increasing the importance for job performance of cognitive skills, such as the ability to comprehend, manipulate and communicate symbolic information. This inference suggests that the literacy skills measured by the IALS are an important determinant of worker productivity. Good literacy skills should also greatly enhance a worker's trainability, a key aspect of which is the ability to take in and process new information.

IALS literacy scores are substantially lower for older individuals, but these cross-sectional comparisons confound true ageing effects with other determinants of literacy, notably, the lower educational attainment of older cohorts.¹⁵ Accordingly, a multivariate analysis was conducted using IALS data for ten countries, which attempts to isolate the causal effect of ageing on literacy by including a rich set of demographic and economic control variables – including educational attainment – in the equation.¹⁶ The regression coefficients suggest that literacy skills generally decline only modestly

between ages 40 and 65 years, but more research is clearly needed on this important question.

Evidence from the IALS also indicates that literacy skills improve with practice and deteriorate if not used [OECD and Statistics Canada (1995c)]. This suggests a "use it or lose it" dynamic, with the ability to acquire new skills progressively deteriorating for workers in jobs where these skills are not well exercised. Workers employed in a "learning environment" appear much less susceptible to a decline in trainability. However, some gerontological research suggests that the ability to learn quickly is impaired with age, especially when the new material is qualitatively different from that previously mastered [Warr (1994)].

This review of how ageing affects individual productivity and trainability indicates that this critical relationship is not well understood. However, the evidence to date is largely reassuring. The productive potential of the older age groups does not appear to be substantially impaired by ageing *per se*. The most important concern related to the effect of ageing on work-force skills appears to be whether training practices will realise the productivity potential of older workers.

2. Training over the life-cycle

Incentives to train

Human capital theory indicates that older workers could receive little training either because it is efficient to concentrate training on younger workers, for whom the economic returns are greater, or because market failure leads to under-investment in training for workers of all ages. In both cases, low training could lead to low earnings or employability problems among older workers and, hence, raise equity concerns. In the case of market failure, policies providing older workers with increased access to training also have the potential to raise efficiency.

Two factors that could lower the returns to training older workers are a decline in trainability with age or a shorter pay-back period due to the imminence of retirement.¹⁷ The previous subsection presented evidence suggesting that a substantial decline in trainability is unlikely to occur for most workers who have continued to acquire new job skills through the course of their careers. In order to assess the effect of age on the effective pay-back period, Table 4.6 presents evidence about how expected future tenure with the firm varies with age, which is the time horizon of greatest relevance for employers considering a training investment. These five-year retention rates measure the percentage of workers of different ages who were still with their current employer five years later [see OECD

Table 4.6. **Five-year retention rates by age and tenure, 1990-1995**

	Percentages								
	Australia ^a	Canada	Finland	France	Germany ^b	Japan	Spain	Switzerland ^a	United States ^a
All ages	41.3	47.9	42.8	49.9	60.7	64.2	42.8	55.2	48.6
45+ years	48.1	51.9	40.6	47.6	65.4	62.8	45.7	69.8	56.2
Length of tenure (years)									
All ages									
[5-10]/[0-5]	33.1	36.4	35.5	28.1	49.9	58.2	28.6	46.5	39.7
[10-15]/[5-10]	63.0	71.3	55.9	90.2	73.9	68.3	73.7	72.1	64.6
[15-20]/[10-15]	61.8	76.0	62.9	77.6	74.2	75.6	73.0	72.8	68.3
45+ years									
[5-10]/[0-5]	40.2	39.6	34.8	29.6	63.9	60.5	26.5	63.3	47.3
[10-15]/[5-10]	59.2	65.2	45.6	68.8	65.4	63.6	65.6	83.9	63.2
[15-20]/[10-15]	56.2	65.7	48.2	57.7	66.8	65.3	69.4	67.0	67.8

a) 1991-1996.

b) 1989-1994.

Sources: See OECD (1997a).

(1997a)]. The retention rate for workers aged 45 years and older is higher than that for younger workers in six of the nine countries for which data are available. Data not shown here indicate that retention rates remain relatively high and comparable with those of prime-age workers through approximately age 50-54 years. Beyond the age of 55, the probability of an older worker remaining a further five years with the same employer declines substantially. Apparently, the pending retirement of these workers significantly shortens the amortisation period and may discourage further skill training. However, late-career trainees (aged 45 to 54 years) may be preferable to younger trainees, at least when an important share of the potential returns are expected to accrue over the first five years.

The high overall retention rate for older workers compared with younger workers reflects, in part, the greater stability of older recent hires relative to younger recent hires, as measured by the retention rate between 0-5 and 5-10 years of job tenure (Table 4.6). Thus, the need to provide significant initial training to new recruits may not be a general barrier to hiring older workers. However, the bottom line is that little is known about how firms assess the potential life of skill investments.

Incidence of training

Table 4.7 presents several measures of participation in job-related continuing education and training from the IALS. The share of workers receiving professional and career upgrading training in the previous year is about as high for those aged 45 to 54 years as for those aged 25 to 44 (21 versus 23 per cent in the unweighted averages). The rate falls to 15 per cent for the oldest group

(aged 55-64 years), which is close to the rate for the youngest workers (aged 15 to 24 years). Thus, these data suggest that firms – who finance nearly three-fourths of this training – generally do not view older workers as unsuited for training.¹⁸ Though causality is not implied, the training rate does decline beyond approximately age 54, the age at which impending retirements cause the 5-year retention rates to begin falling.¹⁹

The age profile of training varies substantially between countries. The Netherlands stands out as having a very sharp reduction in training rates with age: whereas 15 per cent of workers aged 25 to 44 years participated in professional and career upgrading training, the corresponding rates were 12 per cent for those aged 45-54 years and just 2 per cent for those aged 55-64 years. The United States is at the opposite extreme, with training rates peaking for workers aged 45 to 54 years and only declining a little for those aged 55-64, but with only a third as many of the youngest workers receiving training. The reasons for these differences, as well as their implications for work-force productivity, are important topics for future research.

Workers with lower educational attainment are substantially less likely to receive training than more educated workers [OECD (1995c)]. While the poor training access of low-skilled older workers reflects general training patterns, the “use it or lose it” aspect of trainability may mean that this pattern is most detrimental to employment and earnings prospects near the end of the working life. At some point, many low-education workers whose previous work history includes little skill training may have to adapt to changed job requirements or search for new jobs, and they may be ill-prepared to do so. This source of the employment and earnings

Table 4.7. **Participation in job-related continuing education and training by age, 1994-1995**

Percentage of the labour force taking a course in the previous year (standard error in parentheses)

	Participation in job-related continuing education and training		Participation in professional and career-upgrading training	
	Total	Paid for by the employer	Total	Paid for by the employer
Australia	39.6 (0.5)	22.6 (0.5)	24.4 (0.5)	17.3 (0.4)
15-24 years	48.6 (1.4)	15.2 (1.1)	14.9 (1.1)	8.1 (0.9)
25-44 years	41.0 (0.8)	26.6 (0.7)	28.1 (0.8)	20.8 (0.7)
45-54 years	32.5 (1.4)	22.6 (1.3)	26.2 (1.3)	19.1 (1.2)
55-64 years	25.0 (2.2)	16.8 (2.0)	21.7 (2.1)	15.5 (1.9)
Belgium (Flanders)	18.2 (1.3)	12.4 (1.2)	10.5 (0.9)	7.4 (0.9)
15-24 years	11.4 ^a (4.1)	6.2 ^a (3.1)	7.2 ^a (3.5)	4.2 ^a (2.8)
25-44 years	18.5 (1.4)	12.0 (1.4)	11.6 (1.1)	7.9 (1.1)
45-54 years	19.8 (2.5)	14.9 (2.5)	9.5 (1.9)	7.6 ^a (1.7)
55-64 years	19.6 ^a (5.1)	17.6 ^a (4.8)	6.6 ^a (3.1)	6.4 ^a (3.1)
Canada	38.0 (1.7)	23.1 (2.1)	26.6 (1.8)	18.8 (1.6)
15-24 years	52.3 (3.6)	11.2 (3.2)	18.5 (3.3)	10.1 (3.1)
25-44 years	38.6 (2.2)	27.7 (3.8)	28.8 (2.6)	21.9 (3.6)
45-54 years	30.3 (4.3)	18.8 (1.9)	25.5 (4.6)	15.5 (1.5)
55-64 years	30.2 (9.4)	23.7 ^a (15.4)	28.4 (9.5)	21.7 ^a (15.9)
Ireland	23.9 (1.8)	13.2 (1.4)	11.9 (1.1)	7.6 (0.9)
15-24 years	33.4 (2.5)	12.7 (2.0)	10.9 (2.0)	5.8 ^a (1.0)
25-44 years	23.3 (2.2)	15.2 (1.8)	13.1 (1.0)	9.1 (1.0)
45-54 years	19.3 (3.4)	11.2 ^a (2.2)	11.8 ^a (2.8)	7.0 ^a (2.2)
55-64 years	11.0 ^a (3.4)	6.2 ^a (3.2)	6.7 ^a (2.7)	4.1 ^a (1.9)
Netherlands	33.3 (1.4)	22.9 (1.0)	13.9 (0.7)	9.5 (0.6)
15-24 years	38.5 (3.8)	15.6 (2.7)	18.4 (3.1)	9.7 ^a (2.5)
25-44 years	36.2 (1.5)	26.5 (1.5)	14.8 (1.0)	10.2 (0.9)
45-54 years	27.2 (2.8)	21.8 (2.6)	11.6 (1.9)	10.1 (1.9)
55-64 years	15.2 ^a (3.7)	12.7 ^a (3.5)	2.3 ^a (1.4)	1.7 ^a (1.3)
New Zealand	47.9 (1.5)	31.4 (1.3)	34.4 (1.4)	26.2 (1.3)
15-24 years	60.8 (4.2)	26.1 (2.7)	27.3 (3.6)	18.8 (2.5)
25-44 years	47.9 (1.5)	34.0 (1.6)	37.6 (1.5)	28.9 (1.6)
45-54 years	45.2 (3.2)	33.6 (3.4)	38.3 (3.1)	29.7 (3.2)
55-64 years	30.0 (4.8)	21.9 (3.4)	22.4 (3.1)	17.6 (2.7)
Poland	14.3 (1.0)	10.6 (0.6)	13.1 (1.0)	8.6 (0.5)
15-24 years	10.9 ^a (1.9)	7.2 ^a (1.3)	9.5 ^a (1.8)	3.7 ^a (1.3)
25-44 years	15.3 (1.5)	11.3 (1.1)	14.2 (1.4)	9.5 (0.9)
45-54 years	15.0 (1.7)	12.2 (1.8)	13.3 (1.7)	9.7 (1.9)
55-64 years	7.5 ^a (3.3)	5.7 ^a (3.0)	8.3 ^a (3.8)	6.5 ^a (3.3)
Switzerland	31.9 (1.0)	20.1 (1.0)	26.0 (1.2)	16.8 (1.0)
15-24 years	34.5 (5.2)	23.5 (3.1)	21.0 (3.9)	12.6 ^a (4.5)
25-44 years	33.9 (1.8)	20.9 (1.5)	28.7 (1.7)	17.8 (1.4)
45-54 years	29.7 (2.2)	18.9 (2.3)	25.6 (2.3)	18.8 (2.0)
55-64 years	25.2 (2.7)	15.9 (2.6)	20.7 (2.8)	12.9 (2.8)
United Kingdom	50.2 (1.4)	39.2 (1.3)	15.4 (1.0)	12.9 (0.9)
15-24 years	55.6 (3.5)	30.3 (3.0)	14.4 (2.0)	12.1 (1.7)
25-44 years	55.2 (1.7)	46.3 (1.8)	18.1 (1.4)	15.0 (1.4)
45-54 years	42.8 (2.3)	35.3 (2.4)	13.1 (1.4)	11.1 (1.3)
55-64 years	32.1 (2.4)	27.2 (2.5)	8.6 (2.1)	7.4 (1.9)
United States	44.5 (1.7)	31.7 (1.6)	29.7 (1.3)	24.1 (1.2)
15-24 years	42.4 (7.0)	11.7 (2.8)	9.4 (2.2)	6.2 ^a (2.0)
25-44 years	46.4 (1.9)	36.2 (1.9)	32.5 (1.8)	26.9 (1.7)
45-54 years	45.7 (2.6)	36.2 (2.3)	35.8 (2.5)	29.4 (2.0)
55-64 years	36.8 (4.0)	25.8 (4.5)	28.4 (3.9)	21.4 (4.2)
Unweighted average	34.2	22.7	20.6	14.9
15-24 years	38.8	16.0	15.2	9.1
25-44 years	35.6	25.7	22.8	16.8
45-54 years	30.8	22.6	21.1	15.8
55-64 years	23.3	17.4	15.4	11.5

a) Estimate based on a maximum sample size of 30 observations.

Source: International Adult Literacy Survey, 1994-1995, unpublished estimates.

instability is likely to become increasingly important if pension reforms increase the desired age of retirement.

While it is clear that less-educated workers have less favourable employment and earnings prospects at all ages, the extent to which training magnifies this disadvantage among older workers is not known. Labour force participation rates are lower for less educated males at all ages, but the participation gap increases between prime working ages and the ages associated with early retirement (e.g. between ages 35-44 and 55-64) in most countries (Table 4.8). This pattern is consistent with the employability problems associated with low education becoming more severe with age. Similarly, earnings differences by educational level tend to rise with age (Section D). However, the greater propensity of lower education workers to retire early might reflect the structure of pension benefits, rather than increased difficulty in remaining employed [OECD (1998c)]. Differences in the timing of retirement may also distort pay comparisons among older workers.

The adaptation of training practices to work-force ageing

Training practices will have to adapt in order to minimise any adverse effects of ageing on overall productivity, while also accommodating any preference of older workers to delay retirement. The analysis of training rates by age suggests that firms' training investments reflect their predictions about the time of retirement. As an important complement of pension reforms designed to encourage later retirement, governments may have an important role to play in informing both firms and workers to anticipate such a shift and to begin as soon as possible to adapt training practices. By increasing the perceived pay-back period for investments in older workers, this information – if credible – could raise the age threshold beyond which training rates start to fall in anticipation of retirement.

Even if firms look more favourably on investing in training older workers, they may still be unwilling to invest much in those with low educational attain-

Table 4.8. **Labour force participation rates by educational attainment and age, 1995**

	Men aged 35 to 44 years				Men aged 55 to 64 years			
	Participation rate for educational attainment less than upper secondary (Percentage)	Increase in participation rate relative to educational attainment less than upper secondary (Percentage point difference)			Participation rate for educational attainment less than upper secondary (Percentage)	Increase in participation rate relative to educational attainment less than upper secondary (Percentage point difference)		
		Upper secondary	Non-university tertiary	University		Upper secondary	Non-university tertiary	University
Australia	88.5	5.9	8.0	9.0	57.9	5.0	12.3	19.3
Austria	92.1	5.3	5.2	6.2	40.0	4.5	19.6	43.9
Belgium	91.0	5.9	8.3	7.5	25.8	17.2	17.5	39.4
Canada	83.6	9.4	11.1	12.9	51.2	9.7	12.9	20.6
Czech Republic	88.0	9.0	..	10.8	39.6	13.5	..	32.4
Denmark	85.4	9.5	11.6	12.3	59.9	8.3	16.2	24.6
Finland	88.9	4.7	8.4	9.0	40.3	10.6	14.0	28.8
France	92.6	4.8	5.7	5.0	34.5	10.5	18.7	34.6
Germany	95.4	2.1	3.5	3.3	47.9	6.7	17.1	27.6
Greece	96.0	2.2	1.8	2.8	64.0	-15.6	-18.4	-1.1
Ireland	87.8	8.1	10.0	8.8	61.4	7.5	10.9	21.5
Italy	94.2	3.5	..	4.7	41.7	15.5	..	36.4
Korea	94.5	3.0	..	3.9	79.4	-0.5	..	2.9
Mexico	96.5	1.9	2.8	2.2	80.7	-7.3	16.9	2.0
Netherlands	90.2	6.4	..	7.1	35.5	7.8	..	19.0
New Zealand	87.2	8.0	7.8	8.1	61.3	8.8	11.7	21.1
Norway	83.3	10.5	12.9	14.5	59.4	14.3	21.9	32.6
Poland	85.5	6.7	12.4	12.8	42.6	-3.3	1.9	21.5
Portugal	95.1	2.3	4.2	4.1	60.6	-6.5	7.5	13.4
Spain	93.5	3.8	4.4	5.3	53.0	8.7	10.2	21.6
Sweden	93.7	2.3	2.8	3.4	83.7	0.0	-1.0	5.1
Switzerland	93.1	5.2	6.5	4.6	76.9	5.5	6.5	11.4
United Kingdom	83.4	11.2	12.6	15.2	53.9	11.5	14.0	14.6
United States	75.7	16.2	18.4	21.4	50.9	15.7	21.7	26.9
Unweighted average	89.8	6.2	7.9	8.1	54.3	6.2	11.6	21.7

.. Data not available.

Sources: OECD Education Database except for Mexico where unpublished data were supplied by STPS-INEGI, *Encuesta Nacional de Empleo*.

ment. These individuals may become increasingly vulnerable to skill obsolescence, especially if they attempt to delay retirement, and the market incentives for firms to address this risk may be quite weak. Rising educational attainment among future cohorts of older workers should be a positive factor mitigating this risk, but it seems probable that low-skilled older workers will represent a major challenge for labour market programmes.²⁰

F. MOBILITY OF OLDER WORKERS

This section considers whether the mobility of older workers is a problem in the context of work-

force ageing. The extent to which limited mobility currently is a cause of long-duration joblessness is first examined. Empirical evidence on hiring patterns are then examined in order to assess whether older job seekers are disadvantaged in competing for jobs. Finally, attention turns to whether older workers may have to change employers more frequently in the future.

1. Long-term unemployment

Table 4.9 presents data on the unemployment rate and the incidence of long-term unemployment. The unemployment rate for older workers is lower

Table 4.9. **Unemployment rates and the incidence of long-term unemployment, 1996**

	Unemployment rate (Percentage of labour force)		Unemployed for 12 months or more (Percentage of unemployed)	
	15 to 64 years ^a	45 to 64 years ^b	15 to 64 years ^c	45 to 64 years ^b
Australia	8.5	6.4	28.4	44.8
Austria	5.3	5.4	25.6	37.0
Belgium	9.5	5.9	61.3	76.6
Canada	9.7	7.3	13.9	21.6
Czech Republic	3.8	2.6	31.6	37.6
Denmark	6.9	5.6	26.5	43.6
Finland	16.2	16.4	39.3	61.8
France	12.1	8.0	39.5	62.0
Germany	8.9	10.0	47.8	57.8
Greece	9.9	3.9	56.7	54.6
Hungary	9.8	6.5	54.4	58.8
Iceland	3.7	2.6	18.4	40.0
Ireland	11.9	9.5	59.4	72.4
Italy	12.3	4.5	65.6	61.2
Japan	3.5	2.8	19.5	27.4
Korea	2.0	0.8	3.6	5.7
Luxembourg ^d	3.5	1.8	26.8	33.3
Mexico	4.5	2.4	2.2	5.1
Netherlands	6.5	5.1	50.0	60.5
New Zealand	6.2	3.9	20.8	34.6
Norway	4.9	2.3	15.4	35.7
Poland	12.7	7.6	39.0	47.4
Portugal	7.7	5.1	53.1	64.8
Spain	22.4	12.8	55.7	62.9
Sweden	8.1	5.9	17.1	27.0
Switzerland	3.9	3.5	25.0	..
Turkey	6.3	2.6	43.6	45.1
United Kingdom	8.3	5.9	39.8	52.2
United States	5.5	3.3	9.3	14.6
Unweighted average:				
North America ^e	6.6	4.3	8.5	13.8
European Union	10.0	7.1	44.3	55.2
OECD Europe	8.8	6.1	40.5	52.0
Total OECD	8.1	5.5	34.1	44.5

.. Data not available.

a) Unemployment rates for Australia, Canada, France, Germany, Ireland, Korea, Luxembourg and the United Kingdom differ from those in Table B of the Statistical Annex since they are estimated from different data sources or have a different upper age limit.

b) Australia, Canada and Korea, 45 years or more; France, 50 years or more; Luxembourg 45 to 54 years; Switzerland 55 to 64 years.

c) Estimates differ from those in Table G of the Statistical Annex for a number of countries due to differences in the upper age limit.

d) Data for duration of unemployment are based on small sample sizes.

e) North America comprises Canada, Mexico and the United States.

Sources: OECD Unemployment Duration and Labour Force Databases (see notes to Table G of the Statistical Annex).

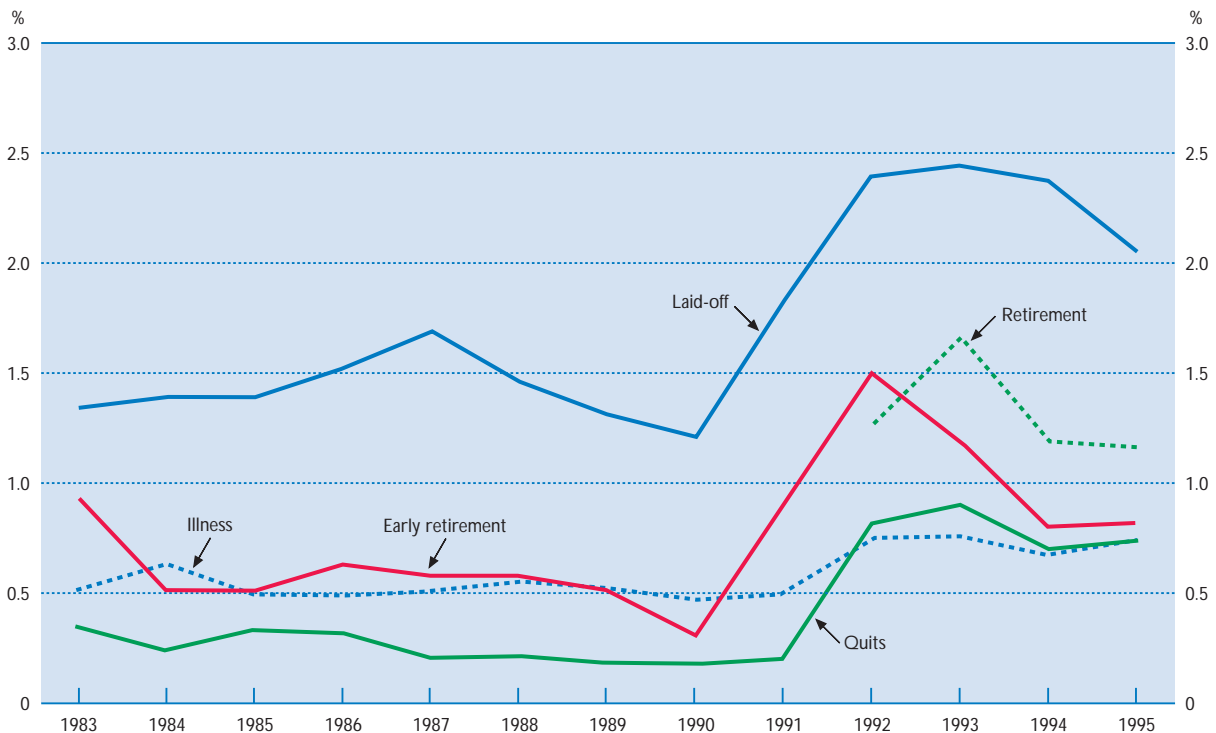
than the overall rate in most countries. However, they are significantly more at risk of entering the ranks of long-term unemployment.

Unemployment rates for older workers may either over- or understate the difficulties they have in changing jobs. The measured incidence of long-term unemployment will overstate the difficulties to the extent that it reflects supply-side incentives to remain jobless. For example, the special unemployment benefits sometimes available to older workers may function as a form of pension for workers who are effectively retired. Conversely, measured unemployment will understate the extent of involuntary joblessness, if significant numbers of older workers withdraw from the labour force following redundancies, because their job-search prospects are poor.

Though difficult to distinguish, both involuntary job loss and voluntary labour force withdrawal appear to be important routes to joblessness for older workers. Among older workers who left a job in the previous 6 months and were not yet re-employed, the reason reported for separating from the previous job gives an indication of the relative frequencies of involuntary job loss and voluntary departures as causes of joblessness (Chart 4.6). In 1995, the risk of joblessness stemming from layoff (2.1 per cent) was higher than the risk of retirement (1.2 per cent), early retirement for economic reasons (0.8 per cent), quits (0.7 per cent) or illness (0.7 per cent). Beginning in 1991, there was a significant increase in the percentage of older workers laid-off and jobless, which probably reflects the recession of the early 1990s, but may also reflect a

Chart 4.6.

Persons aged 45-64, currently without a job,
by reason for leaving their last job, selected European countries^a
Percentage of employment



a) Persons currently without a job refers to those currently unemployed or not in the labour force who left their job during the previous six months. Data are a weighted average for Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands and the United Kingdom. Data for retirement are unavailable prior to 1992.

Source: Unpublished data provided by EUROSTAT on the basis of the European Union Labour Force Survey.

secular increase in job displacement for older workers [Farber (1996)].

2. Hiring of older workers

To what extent does the high incidence of long-term unemployment among older job seekers reflect disadvantages they face in finding new jobs? Data on employers' recruitment choices among job applicants of different ages generally are not available, so this subsection considers broader comparisons of hiring patterns by age.

Older workers account for a smaller share of new hires than of total employment (Table 4.10). Among workers aged 45 to 64 years, their hiring share ranges from a low of 28 per cent of their employment share in Belgium to a high of 56 per cent in Australia. By comparison, the share of young workers (aged 15 to 24 years) in recent hires is more than twice their share of employment, while they are almost equal for prime-age workers. The disproportionately low share of older workers among recent hires illustrates that many firms who employ a significant number of older workers, nevertheless, tend not to hire them [Hutchens (1986)]. This pattern need not result from a preference among employers to recruit younger workers. If older workers are less likely to leave one job and

search for another, that too would cause under-representation in hiring, even if recruiting practices were age-neutral.

Multivariate analysis can provide a better indication of whether employers are less likely to hire older workers from among other candidates. A regression equation predicting hiring shares by age was estimated that also contained controls for a host of other factors believed to influence hiring, including differences by age in the share of workers who actively search for a new job. The econometric results imply that, on average across nine EU countries, the share of older workers in recent hires is almost 13 percentage points lower than that of prime-age workers.²¹ This analysis suggests that employer preferences for younger job candidates is one of the reasons why older job losers experience long jobless spells and larger earnings losses once re-employed.

The apparent tendency for some employers to prefer younger job applicants, controlling for observable characteristics, suggest that older job seekers may be disadvantaged in hiring. There are many potential reasons for this finding – declining skills or productivity with age, higher costs associated with hiring older workers, such as fixed hiring costs or a higher cost of providing non-wage benefits, or age discrimination – but research to

Table 4.10. **Relative hiring intensities by age group, 1995**
Ratio of share of new hires to share of total wage and salary employment^a

	15-24 years	25-44 years	45-64 years
Australia ^b	1.7	1.0	0.6
Austria	2.3	0.9	0.4
Belgium	3.7	0.9	0.3
Canada	2.5	0.9	0.4
Denmark	2.1	1.0	0.4
Finland	3.3	1.0	0.4
France	3.4	0.9	0.4
Germany	2.2	1.0	0.4
Greece	2.9	0.9	0.5
Ireland	2.3	0.7	0.4
Italy	3.3	0.9	0.3
Japan	3.0	0.7	0.5
Luxembourg	2.9	0.9	0.3
Netherlands	2.5	0.8	0.3
Portugal	2.6	0.9	0.4
Spain	2.2	1.0	0.5
Sweden	3.1	1.0	0.4
Switzerland	2.8	1.0	0.3
United Kingdom	2.3	0.9	0.5
United States ^b	2.3	0.9	0.5
Unweighted average	2.6	0.9	0.4

a) Workers with tenure less than one year are defined as new hires.

b) Data refer to 1996.

Sources: Data from the European Union Labour Force Survey were supplied by EUROSTAT. For Australia, Canada, Japan, Switzerland and the United States, see OECD (1997a).

date provides little help in assessing their importance.

3. Future trends

It appears likely that work-force ageing will create an increased need for older workers to change jobs because more will be laid-off. Layoffs occur when firms' downsizing needs cannot be met by voluntary attrition. Job losses due to downsizing and firm closure are relatively high in most OECD countries, in the range of 10 per cent of total employment annually, and show no downward or upward trend [OECD (1996)]. By contrast, work-force ageing may cause voluntary attrition to fall, since voluntary quits are relatively infrequent among older workers [Devine and Kiefer (1991, Chapter 8); OECD (1997a, Chapter 5)]. The combination of stable job loss rates and falling attrition implies a tendency for layoffs to rise, and the falling share of younger workers over the next few decades suggests that it will become more difficult for employers to protect older workers from these layoffs.

If more older workers do experience job loss, the economic costs resulting from their limited mobility would tend to increase. Greater proactive training investments to maintain trainability and acquire general skills probably could improve the mobility of older job changers. However, little is known about what sort of training would generate the highest returns and market incentives may be inadequate to induce the desired response.

G. CONCLUSIONS

OECD labour forces will become significantly older over the next several decades. The work-force ageing due to population ageing will be strongly amplified to the extent that the trend toward earlier retirement reverses. Such a reversal would limit the growth in the number of retirees relative to the number of active workers, which is one of the keys to avoiding the potentially negative impact of population ageing on living standards [OECD (1998a)]. Reforms to pension and other social security programmes that reduce significantly or eliminate existing incentives for early retirement probably would generate a significant increase in labour supply at older ages. However, the full potential benefits of such policies will only be realised if labour markets are able to generate enough good jobs for an unprecedentedly large number of older workers.

Proactive measures by workers, employers and governments to enhance the employability of older workers will be an essential complement to pension reform.

There is a striking disproportion between the importance of the challenge to expand the employment opportunities of older workers and the limited success of economic research at providing guidance for policy making. A number of important relationships between ageing and recruitment, training and pay have been identified, including potentially important equity and efficiency concerns. However, relatively little is known about the actual magnitudes of these potential problems nor about the best policies to redress them. The relationship between age and job performance, including how it is shaped by training practices, appears to be critical, but is not well understood. Limited mobility also appears to be an important concern, but the extent and causes of the apparent disadvantage of older job seekers are not well understood either. Further research on these and related topics deserves high priority.

Even with the present limited state of knowledge, several preliminary judgements appear justified. First, the preponderance of the evidence on ageing and productivity suggests that most workers have the potential to remain productive up to and beyond currently standard retirement ages, provided they receive adequate training. Second, although the market signals created by work-force ageing will tend to cause recruitment, training and pay practices to adapt in desirable ways, these adjustments may well not go as far, or proceed as rapidly, as desirable. In particular, there is a danger that insufficient investments will be made in maintaining the trainability and mobility of workers as they age. Finally, even if firms and workers make all desirable provisions for ageing, it will remain true that older workers face elevated risks of skill obsolescence and poor health. Advocates of reforming pensions so as to encourage later retirement have rightly emphasised that unemployment and disability benefit programs need to be tightly regulated, to ensure that they do not become substitute sources of *de facto* early retirement benefits. It should be understood, however, that raising the age of pension eligibility will expand the legitimate demand for these benefits.

Notes

1. The analysis in this chapter was conducted under the aegis of a comprehensive OECD study of the policy implications of population ageing [OECD (1998a, b)]. That study concludes that the implications of ageing are deep and pervasive, and recommends that governments take actions across a broad range of economic, financial and social policies. One of the guideposts offered for these reforms is that “active ageing” should be promoted by increasing the opportunities of older individuals to contribute to society and the economy. The labour market issues examined here are part of that broader agenda. The chapter’s coverage of issues is partial, however, even within the subtopic of work-force ageing. Important issues, such as the labour supply effects of pensions, disability and “flexible retirement” receive only cursory attention; they are, however, covered in OECD (1998c).
2. The trend toward earlier retirement among men in recent decades, along with increasing employment of younger women, has meant that the initial stage of population ageing generally has not been associated with an increase in the share of the labour force at or above historical retirement ages. It seems unlikely, however, that future changes in labour force participation patterns will continue to decouple the age composition of the labour force from that of the underlying population in most OECD countries. A continuation of simultaneous trends toward greater longevity and retirement at progressively earlier ages is likely unsustainable in the long run, because it would imply that the “dependency” ratio of retirees to active workers rises without limit. Such a continuation would make it very difficult to address the pension “affordability problem” and could lower living standards generally.
3. The later-retirement scenario is potentially unrealistic, in the sense that it assumes a sharp reversal of recent trends. However, if no such reversal occurs, it will be very difficult to maintain the solvency of many national pension systems or overall fiscal balance [OECD (1998b)].
4. The index of the change in the age composition is based on the absolute change in the cumulative distribution function of the labour force by age and is calculated as:

$$I = \sum_{i=1}^N |f_{i,t1} - f_{i,t2}|$$
 where i denotes age group, $t1$ and $t2$ denote the beginning and ending years of the period and $f_{i,t}$ denotes the share of the labour force in age groups i to i in year t . This index provides a measure of the overall extent to which the age mix of the population has changed, but no information about which age groups expanded or contracted.
5. The significant positive correlation between changes in the age structure and the employment to population ratio are an example of this relationship: labour force participation rates increased most rapidly in countries where the age structure changed most, because there was a larger shift from the youngest age groups, for whom school enrolment is important, to prime working-age groups.
6. Educational attainment is not projected to 2030, since the cohorts who will constitute the older work force then have not yet completed their initial education. Further increases in educational attainment are likely between 2015 and 2030.
7. In a pure signalling model, educational attainment is used by firms as a criteria for recruiting, but has no intrinsic effect on productivity. Accordingly, an increase in the educational level of the labour force has no effect on the availability of employment or the level of wages.
8. These are sometimes referred to as “Lazear contracts” although the balancing of productivity and pay over a career is rarely, if ever, written explicitly into employment contracts. Lazear (1979) emphasised the desire of employers to reduce shirking and monitoring costs through increasing the cost to workers of dismissal, but efficiency gains resulting from reduced quit rates and the increased appropriability of the returns to training investments could also motivate implicit contracts of this type. Equity concerns of trade unions or informal work-place culture can also create a tendency for compensation to rise more rapidly with age than does productivity. The theory of specific human capital also provides a rationale for employers to redistribute the compensation paid to a worker over the life of the contract [Becker (1993)]. However, compensation rises less rapidly than productivity in these models, implying that employers find it profitable to continue employing older workers.
9. Lazear (1979) originally argued that employers needed an explicit policy of *mandatory* retirement and, hence, that age discrimination legislation outlawing such policies would be inefficient. More recent research suggests that employers can structure occupational pensions to induce retirement at the appropriate age, even in the absence of mandatory retirement [Neumark and Stock (1997)].
10. Human capital theory identifies an additional advantage of announcing reforms to encourage later retirement as far in advance as possible, since the returns to skill investments depend on the anticipated age of retirement.
11. Employer-sponsored, defined-benefit pension plans, which are an important form of deferred compensation in some countries, provide an example. The

annual contribution costs for enrolling a newly hired worker typically rise with age [Casey (1997)].

12. There is also some evidence that substitution between workers of different ages is more limited for workers with a university education than for less educated workers. This suggests that work-force ageing will have the greatest impact on the employment and earnings prospects of highly educated workers. However, most of the research about how educational attainment affects substitution patterns among workers of different ages has focused on the labour market difficulties encountered by "baby-boom" cohorts as they entered the American labour market in earlier decades [Freeman (1979); Welch (1979); Berger (1983, 1985); Connelly (1986)]. It is possible that an expansion in the supply of older, highly educated workers would be easier for labour markets to absorb, since there is more time for training, promotion and other personnel practices to anticipate it.
13. Conversely, pensions and retirement complicate the empirical analysis of the labour market difficulties encountered by older workers, because it is difficult to differentiate between supply and demand-side influences. Some older workers classified as unemployed in labour force surveys may have voluntarily retired, while some identifying themselves as "retired" may have left the labour force in response to poor employment prospects. Retirement behaviour also makes cross-age comparisons of earnings or training more difficult to interpret. If workers retiring at younger ages differ from those retiring later, cross-sectional comparisons between older and younger workers may not provide a reliable picture of how earnings or training vary over the course of a career. Similarly, the earnings of older workers may provide a poor estimate of the potential earnings available to early retirees, if they were to seek work.
14. The lower annual earnings of the oldest workers could reflect lower annual hours worked or a tendency for the best-paid workers to retire younger, as well as a decline in wage rates.
15. The lower literacy scores of the current cohort of older workers probably reflect significant employment difficulties, but likely overstate the extent to which future cohorts will be so affected.
16. This regression analysis is based on a replication of the multivariate analyses presented in Willms (1997) and OECD, Human Resources Development Canada and Statistics Canada (1997b) for ten countries: Belgium (Flanders), Canada, Germany, Ireland, the Netherlands, New Zealand, Poland, Sweden, the United Kingdom and the United States.
17. The typically higher wages received by late-career and older workers might indicate a third reason why the returns to training fall with age. One of the costs of training is foregone production. If the higher wages of older workers reflect higher productivity, the hourly opportunity cost of training is also correspondingly higher. If the age/earnings premium exceeds productivity differences, however, relative wages overstate the true difference in the opportunity cost of training.

18. Lower training among the current cohort of older workers could be due to a number of factors, such as lower levels of education, in addition to age *per se*. A multivariate analysis (not shown here) of the probability of enrolling in a training course reveals that, when these are taken into account, the decline in the incidence of training between ages 45-54 years and 55-64 years is cut approximately in half.
19. The low training rate of the youngest workers is also associated with low retention rates. Data from business enterprises in the United States show a similar age profile for participation in training and suggest that annual hours devoted to training actually peak around age 50 [Lynch (1997)].
20. Another issue, about which little is known, is how effectively training practices will adjust so as to maintain the work force's adaptability in meeting shifts in job skill requirements or reallocations of employment across firms.
21. The estimated equation for the share in hiring of workers in age group j in country i at time t is:

$$\text{Employment} < 1 \text{ year}_{jt} / \text{Employment} < 1 \text{ year}_{it} = \alpha_i + \beta_1 \text{Age}_{it} + \beta_2 (\text{Employment}_{jt} / \text{Employment}_{it}) + \beta_3 (\text{Jobless} < 6 \text{ months}_{jt} / \text{Jobless} < 6 \text{ months}_{it}) + \beta_4 (\text{Early retirees}_{jt} / \text{Employment}_{jt}) + \beta_5 \text{Country}_i + \beta_6 \text{Year}_t + \beta_7 \text{Gender}_{it} + \beta_8 \text{Occupation}_{it} + \varepsilon_{it}$$

where:

Age_{it} = a vector of 2 dummy variables covering ages 15 to 24 and 45 to 64 years, with age 25-44 years being the omitted category;

$(\text{Employment} < 1 \text{ year}_{jt} / \text{Employment} < 1 \text{ year}_{it})$ = Employment of age group j with tenure less than one year as a percentage of employment of all ages with tenure less than one year, where j is age 15-24 years, 25 to 44 years and 45 to 64 years;

$(\text{Employment}_{jt} / \text{Employment}_{it})$ = Employment in age group j as a percentage of total employment;

$(\text{Jobless} < 6 \text{ months}_{jt} / \text{Jobless} < 6 \text{ months}_{it})$ = individuals in age group j jobless less than 6 months who were laid off or quit (excluding retirement and illness as a reason for leaving) as a percentage all those jobless less than 6 months for similar reasons;

$(\text{Early retirees}_{jt} / \text{Employment}_{jt})$ = persons who have retired as a percentage of employment;

Country_i = a vector of 8 country dummy variables, with Germany being the omitted category;

Year_t = a vector of 3 dummy variables covering 1993 to 1995, with 1992 being the omitted category;

Gender_{it} = a gender dummy variable;

Occupation_{it} = a vector of 8 dummy variables covering the International Standard Classification of Occupations (ISCO), with managerial, administrative and legislative occupations being the excluded category;

ε_{it} = a stochastic error term.

The second, third and fourth independent variables control for differences by age in the share of workers who actively search for a new job. They measure, respectively, the employment share of age group j , their share of job separations and the extent to which

older job leavers are more likely to leave the labour force rather than search for a new job. The results, using weighted least squares with employment as the weight, are as follows:

$(\text{Employment} < 1 \text{ year}_{ijt} / \text{Employment} < 1 \text{ year}_i) = 16.05^{**} + 18.46^{**} (15-24 \text{ years}) - 12.60^{**} (45-64 \text{ years}) + 0.70^{**} (\text{Employment}_{ijt} / \text{Employment}_i) + 0.32^{**} (\text{Jobless} < 6 \text{ months}_{ijt} / \text{Jobless} < 6 \text{ months}_i) - 0.01 (\text{Early retirees}_{ijt} / \text{Employment}_{ijt}) - 0.065 (\text{Belgium}) + 0.063 (\text{Denmark}) - 0.031 (\text{Spain}) - 0.073 (\text{Greece}) - 0.043 (\text{Ireland}) - 0.081 (\text{Italy}) - 0.483 (\text{Portugal}) - 0.020 (\text{United Kingdom}) + 0.009 (1993) - 0.16 (1994) + 0.10$

$(1995) - 0.013 (\text{women}) - 0.218 (\text{professionals}) - 0.262 (\text{technicians and associate professionals}) - 0.197 (\text{clerks}) - 0.195 (\text{service and sales workers}) - 0.327 (\text{skilled agricultural workers}) - 0.195 (\text{craft and related trades}) - 0.220 (\text{plant and machine operators}) - 0.208 (\text{elementary occupations}).$

Adjusted $R^2 = 0.89$, No. of observations = 1 746

where ** and * indicate significance at the 1 and 5 per cent levels respectively using a two-tailed T test.

ANNEX 4.A

Data sources and methods used to project labour supply

The labour supply projections analysed in Section B are based on the medium-fertility population projections reported in *World Population Prospects 1950-2050*, United Nations, New York (the 1996 revision), in combination with two scenarios for the future evolution of labour force participation rates. These participation-rate scenarios are based on historical estimates of labour force participation rates by 5-year age groups and gender reported in *Economically Active Population 1950-2010*, Fourth Edition, Bureau of Statistics, International Labour Office, Geneva, December 1996 (computer file distributed on diskettes).

Under the baseline scenario, it is assumed that future participation rates are the same as those in 1995, the most recent year for which the historical estimates are available. The later-retirement scenario assumes a gradual return, during the period 2000 to 2020, to the retirement pattern among men in 1970. It is implemented as follows:

- For all years, the projected participation rates for ages 44 and younger are set at their 1995 values (as in the baseline scenario);
- For years 1996 to 1999, projected participation rates for ages 45 and older are set at their 1995 values (as in the baseline scenario);
- For years 2000 to 2019, the projected participation rates for ages 45 years and older make a smooth transition (*i.e.* linear interpolation) between the rates projected for 1999 and 2020.
- For years 2020 and later, projected participation rates for ages 45 years and older are calculated to yield the same proportionate rate of labour force withdrawal, relative to the participation rate for ages 40 to 44 years, as was observed for men in 1970. For example, if the participation rate for men aged 60 to 64 years in 1970 was 63 per cent, compared with 92 per cent for men aged 40 to 44 years, the participation rate for men aged 60 to 65 years was 68 per cent [*i.e.* $(63/92)*100$] that of men aged 40 to 44 years. Thus, if the 1995 participation rate for women aged 40 to 44 years was 57 per cent, the projected participation rate for women aged 60 to 64 years in 2020 would be 39 per cent (*i.e.* 68 per cent of 57 per cent); and

Bibliography

- ANDERSON, P., GUSTMAN, A. and STEINMEIER, T. (1997), "Trends in Male Labor Force Participation and Retirement: Some Evidence on the Role of Pensions and Social Security in the 1970s and 1980s", National Bureau of Economic Research, Working Paper No. 6208.
- BECKER, G. (1993), *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (third edition), University of Chicago Press, Chicago and London.
- BERGER, M. (1983), "Changes in Labour Force Composition and Male Earnings: A Production Approach", *Journal of Human Resources*, Spring, pp. 177-196.
- BERGER, M. (1985), "The Effect of Cohort Size on Earnings: A Re-Examination of the Evidence", *Journal of Political Economy*, June, pp. 561-573.
- BOUND, J., SCHENBAUM, M.T., STINEBRICKNER, T. and WAIDMANN, T. (1997), "Measuring the Effects of Health on Retirement Behaviour", paper presented at International Health and Retirement Surveys Conference, Amsterdam, August.
- BURKHAUSER, R.V., DWYER, D., LINDEBOOM, M., THEEUWES, J. and WOITTEZ, I. (1997), "Health, Work, and Economic Well-being of Older Workers", paper presented at International Health and Retirement Surveys Conference, Amsterdam, August.
- CAIN, G. (1986), "The Economic Analysis of Labor Market Discrimination: A Survey", in Ashenfelter, O. and Layard, R. (eds.), *Handbook of Labor Economics*, Vol. 1, North Holland, Amsterdam, pp. 693-785.
- CARRINGTON, W. and ZAMAN, A. (1994), "Interindustry Variation in the Costs of Job Displacement", *Journal of Labor Economics*, April, pp. 243-275.
- CASEY, B. (1997), "Incentives and Disincentives to Early and Late Retirement", paper prepared for the Joint ILO-OECD Workshop: Development and Reform of Pensions Schemes, 15-17 December, Paris.
- CONNELLY, R. (1986), "A Framework for Analyzing the Impact of Cohort Size on Education and Labor Earnings", *Journal of Human Resources*, Fall, pp. 543-562.
- DEVINE, T. and KIEFER, N. (1991), *Empirical Labour Economics: The Search Approach*, Oxford University Press, Oxford.
- DISNEY, R. (1996), *Can We Afford to Grow Older? A Perspective on the Economics of Ageing*, MIT Press, Cambridge MA.
- FALLICK, B.C. (1996), "A Review of Recent Empirical Literature on Displaced Workers", *Industrial and Labor Relations Review*, March, pp. 5-16.
- FARBER, H.S. (1996), "The Changing Face of Job Loss in the United States", National Bureau of Economic Research, Working Paper No. 5596.
- FREEMAN, R. (1979), "The Effect of Demographic Factors on Age-Earnings Profiles", *Journal of Human Resources*, Summer, pp. 289-318.
- GRUBER, J. and WISE, D. (1997), "Social Security Programs and Retirement around the World", National Bureau of Economic Research, Working Paper No. 6134.
- HAMERMESH, D. (1993), *Labor Demand*, Princeton University Press, Princeton.
- HANDA, J. (1994), *Discrimination, Retirement and Pensions*, Avebury, Aldershot.
- HUTCHENS, R. (1986), "Delayed Payment Contracts and a Firm's Propensity to Hire Older Workers", *Journal of Labor Economics*, October, pp. 439-457.
- HUTCHENS, R. (1988), "Do Job Opportunities Decline with Age?", *Industrial and Labor Relations Review*, October, pp. 89-99.
- JACOBSON, L., LALONDE, R. and SULLIVAN, D. (1993), "Earnings Losses of Displaced Workers", *American Economic Review*, September, pp. 685-709.
- KOTLIKOFF, L.J. and GOKHALE, J. (1992), "Estimating a Firm's Age-Productivity Profile using the Present Value of Workers' Earnings", *Quarterly Journal of Economics*, November, pp. 1215-1242.
- LAZEAR, E.P. (1979), "Why is there Mandatory Retirement?", *Journal of Political Economy*, December, pp. 1261-1284.
- LAZEAR, E.P. (1984), "Social Security and Pensions", National Bureau of Economic Research, Working Paper No. 1322.
- LYNCH, L. (1997), "Too Old to Learn?", Tufts University, Boston, December.
- MANTON, K.G., CORDER, L. and STALLARD, E. (1997), "Chronic Disability Trends in Elderly United States Populations: 1982-1994", *Proceedings of the National Academy of Sciences USA*, March, pp. 2593-2598.
- MEDOFF, J.L. and ABRAHAM, K.G. (1981), "Are Those Paid More Really More Productive?", *Journal of Human Resources*, Spring, pp. 186-216.
- NEUMARK, D. and STOCK, W. (1997), "Age Discrimination Laws and Labor Market Efficiency", National Bureau of Economic Research, Working Paper No. 6088.
- OECD (1995a), *The Transition from Work to Retirement*, Social Policy Studies No. 16, Paris.
- OECD (1995b), *The Labour Market and Older Workers*, Social Policy Studies No. 17, Paris.
- OECD and STATISTICS CANADA (1995c), *Literacy, Economy and Society - Results of the First International Adult Literacy Survey*, Paris and Ottawa.
- OECD (1995d), *Employment Outlook*, Paris, July.
- OECD (1996), *Employment Outlook*, Paris, July.

- OECD (1997a), *Employment Outlook*, Paris, July.
- OECD, HUMAN RESOURCES DEVELOPMENT CANADA and STATISTICS CANADA (1997b), *Literacy Skills for the Knowledge Economy: Further Results from the International Adult Literacy Survey*, Paris.
- OECD (1998a), *Maintaining Prosperity in an Ageing Society*, Paris.
- OECD (1998b), *Maintaining Prosperity in an Ageing Society: Background Report*, Paris.
- OECD (1998c), *The Retirement Decisions in OECD Countries*, ECO/CPE/WP1 (98)2, February, Paris.
- OI, W. (1962), "Labor as a Quasi-fixed Factor", *Journal of Political Economy*, June, pp. 538-555.
- PODGURSKY, M. and SWAIM, P. (1987), "Job Displacement Earnings Loss: Evidence from the Displaced Worker Survey", *Industrial and Labor Relations Review*, October, pp. 17-29.
- WARR, P. (1994), "Age and Job Performance", in Snel, J. and Cremer, R. (eds.), *Work and Ageing: A European Perspective*, Taylor and Francis, London.
- WELCH, F. (1979), "Effects of Cohort Size on Earnings: The Baby Boom Babies' Financial Bust", *Journal of Political Economy*, October, pp. S65-S97.
- WILLMS, J.D. (1997), "Literacy Skills of Canadian Youth", Statistics Canada, Ottawa, May.