Chapter 3
National Trends

> *In the past 25 years, the number of people of pensionable age (65 and over) in OECD countries rose by 45 million, but the population of working age rose by 120 million. As a result, population ageing has so far posed no major economic or social problems for our societies. This will change dramatically in the next 25 years when the number of persons of pensionable age will rise by a further 70 million, while the working-age population will rise by only five million.*
>
> (OECD 1998: 1)

3.1 Population Profiles

As shown in Chap. 2, demographic trends and their implications change dramatically when societies experience very low birth rates and extended longevity. This 'new demography of aging' is reshaping national age structures. According to classical demographic transition theory, national age structures gradually evolve from an initial triangle or pyramid shape to a final pentagon with vertical sides, as the representation of all but the oldest age groups evens up. However, in contemporary developed countries, new types of national age structures are gradually emerging, notably some variously described as having the profile of an 'aircraft carrier', an 'overhanging cliff', an 'upside down pyramid' or a 'coffin'. These top-heavy, narrow-based forms – indicative of marked imbalances in societies – will become widespread unless current trends are reversed. Changes in age structures immediately underlie much of the transformation that aging societies are experiencing. The patterns of age structure change reveal the processes at work in different countries, enable comparisons of trends through time, and permit generalizations about the past and future of population aging. This chapter first discusses trends in national and regional age structures at four points in time, using United Nations estimates for 1950, 1975, and 2000 together with medium variant projections for 2025. These four 'slices' provide a manageable summary of developments in each area over a 75 year period. They reflect the

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cumulative effects of past changes and features that will influence future experience. Projections for 2050 are not included in this more detailed analysis because they are much more speculative than those for 2025. Later sections examine consequences of age structure transformation evident in labour force changes and generational shifts affecting the ability of societies to maintain their populations.

3.2 Types of Age Structures

The analysis of changes in national age structures is based on a classification of age distributions, at the above four points in time, for 33 United Nations regions and sub regions and 139 countries with populations of a million or more in the year 2000. The classification, which grouped similar age structures, was obtained using the statistical technique of cluster analysis. Figure 3.1 presents the results of the classification in terms of groups of age structures associated with (i) above replacement fertility, (ii) below replacement fertility, and (iii) discontinuities in age structure change, such as baby booms. The chart presents an average age structure for each group, as well as statistics on median ages, the percentages 65 and over and the number of cases in each group.

The age structures in the first row of Fig. 3.1 correspond to the sequence of changes predicted in the demographic transition; they are mainly from developing countries. The transition has a theoretical end point in the post-transition stage, where a new balance between birth and death rates produces zero growth, although no country has reached this stage. The model population on the right of the first row of Fig. 3.1 represents a post-transition age structure: it has replacement level fertility and zero growth. It is also a long-lived population, with life expectancies of 85 for females and 79 for males, which is consistent with current prospects – compared with 75 for females in the original, classical transition. Its median age of 41 years is less than that for most of the age structures associated with below-replacement fertility. The shape of a post-transition age structure, if it existed, would vary according to the life expectancy reached at the end of the transition: the higher the life expectancy, the higher the ultimate percentage in the older ages. The post-transition age structure represents what is, demographically, most sustainable in the long-term – because it avoids problems of growth and decline, maintains a balance between the numbers in different generations, and avoids excessive aging. Its profile is superimposed on the others in Fig. 3.1 to provide a benchmark for comparisons. The model draws attention to deficits and surpluses in particular age structures. Compared with the model population, the types of age structures associated with above-replacement fertility have relatively high proportions in the young ages, a situation currently forewarning of substantial future rises in the numbers of older people.

In contrast, the age structures in the middle row reflect that below replacement fertility creates deficits in the child ages and raises the percentage of older people. Deficits can flow on to labour force and family formation ages, inducing a cycle of self-perpetuating decline. Whereas the first demographic transition forecast that national age structures would converge to a rectangular form, the second demographic

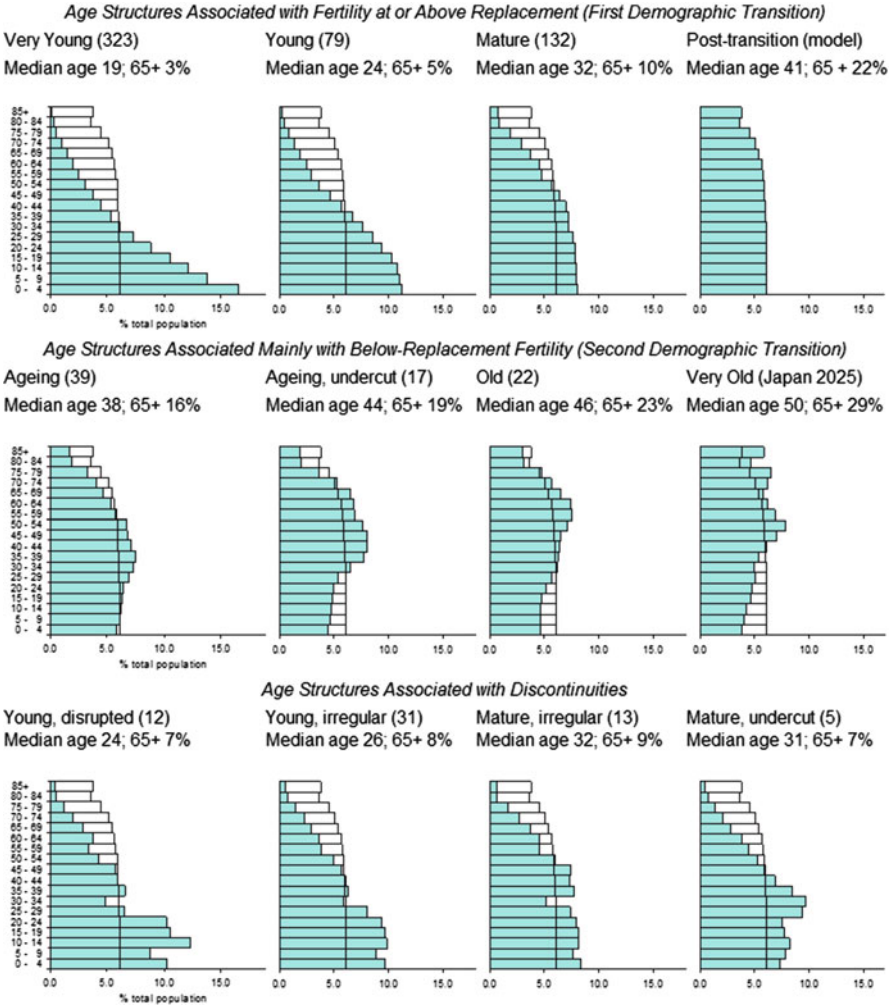

Fig. 3.1 Main types of national and regional age structures, 1950, 1975, 2000 and 2025 (*Note*: The figures in brackets show the number of age structures of each type. There were 172 countries and regions in the classification, giving a total of 688 age structures; 15 age structures were ungrouped or belonged to groups of less than 5) (Source: Cluster analysis of data from United Nations 2001)

transition foreshadows diversity among the oldest populations, depending on the extent to which their age profiles are undercut. There is no specific end point to these changes because the situation is inherently unstable: the potential for change ranges from moderate rejuvenation to extreme decline.

An emerging prospect for many developed countries is a long-term struggle to maintain demographic viability. Most regions of the Western world had mature or aging profiles in 2000 and are projected to have mainly old profiles in 2025. The oldest population in the data set, Japan in 2025, has a median age of 50 years,

and a tapering age pyramid, which highlights the severe population aging effects of below-replacement fertility. The classification procedure did not group Japan's projected 2025 age structure with any others – it was unique – but it is included in Fig. 3.1, at the end of the middle row, to show the structure of the oldest population. Countries with below replacement fertility currently have high potential for growth in both the numbers and the percentages of older people although, ultimately, the numbers may decline. Conversely, countries that are still only part way through the first demographic transition have very high potential for growth in their numbers of older people.

Besides conforming to trends anticipated from the first and second transitions, national and regional age structures can also reflect discontinuities in demographic evolution. The classification identified four types of profiles associated with discontinuities. These have arisen partly from the effects of baby booms, migration booms and fertility control policies, and partly from wars and other disasters leading to episodes of heightened mortality and refugee movements. Uncertainties and inaccuracies in data for populations affected by war or civil disorder would have also contributed to irregularities, as in estimates for European countries in 1950 and some African countries at later dates. Also, illiterate people often do not know how old they are, and this is more common at later ages. The age structures reflecting discontinuities are shown in the third row of Fig. 3.1; they belong to four groups:

- First, the 'young, disrupted' type occurred only in former Soviet Republics, mainly in Western Asia in 1950 and 1975, and was associated with the impact of war losses, social disruption and relatively high fertility.
- Second, the somewhat similar 'young, irregular' type characterized many other age structures in Eastern Europe in 1950 and 1975. Losses in the adult population again made truncation a factor in the development of this type of age structure in Eastern Europe. Yet the same type of profile arose also in the context of rejuvenation through baby booms due especially to earlier and more universal marriage and childbearing. Thus the 'young, irregular' age structure was conspicuous in 1975 in baby boom-affected countries in Western Europe together with the United States, Canada, Australia and New Zealand. The same type of age structure occurred as well in Israel in 1975 and 2000 as a consequence of immigration and high birth rates. All age structures of this type were weighted to the younger ages, although not necessarily with a single pronounced step below 30–34.
- Third, the 'mature irregular' age structures occurred in 1950 in war affected countries of Europe, including France, Belgium, Germany and Austria, as well as in parts of Eastern Europe in 1950 and 1975.
- Finally, the 'mature undercut' profile appeared only in the year 2000 and arose from accelerated fertility decline. It was characteristic in the United Nations region of East Asia, notably China and South Korea.

Inevitably, the classification does not show the full extent of diversity because it collapsed the whole range of structural variations into groups of profiles that most resembled each other. This means that the average age structure for each group is not identical to particular national age structures within the group. Diversity within groups

Table 3.1 Summary of age structure changes in United Nations regions, 1950–2025

United Nations region	1950	1975	2000	2025
World	Very young	Very young	Young	Mature
More developed regions	Mature	Mature	Aging I	Old I
Less developed regions	Very young	Very young	Young	Mature
Least developed regions	Very young	Very young	Very young	Very young
Africa	Very young	Very young	Very young	Very young
Asia	Very young	Very young	Young	Mature
Eastern Asia	Very young	Very young	Mature, undercut	Aging I
Latin America & the Caribbean	Very young	Very young	Young	Mature
Europe	Mature	Mature	Aging I	Old I
Eastern Europe	Young, irregular	Mature, irregular	Mature	Aging, undercut
Northern Europe	Mature	Mature	Aging I	Old I
Southern Europe	Mature	Mature	Aging II	Old II
Western Europe	Mature, irregular	Mature	Aging II	Old II
Northern America	Mature	Young, irregular	Aging I	Aging II
Oceania	Mature	Young, irregular	Mature	Aging I

Source: Cluster analysis of data from United Nations (2001)
Note: The 'aging' and 'old' groups were split where the percentages aged 65 and over were at or below the average for the group (aging I, old I), and above the average (aging II, old II)

was partly addressed by providing more detail, in Tables 3.1 and 3.2, for two of the advanced stages of the population aging process. Thus the 'aging' and 'old' groups were split according to whether each population's percentages 65 and over were at or below the mean for the group, (aging I, old I) or above the mean (aging II, old II). This highlights, for example, the relatively high levels of aging already developing in Southern and Western Europe, as well as in their constituent countries. Because assumptions about fertility are usually the main cause of differences between sets of national projections, the 2025 classifications would vary somewhat if a different series of projections was used. For example, comparing projections for Europe from the 2008 revision of the UN projections with those for the 2000 revision used here, the higher fertility assumptions in 2008 raise the proportion in the child age groups slightly (up 1.6% in 2025) and decrease the older age groups (down 1.9% in 2025). These changes in the apparent extent of aging could alter again in further revisions of the projections.

3.3 Changes Through Time

Tables 3.1 and 3.2 show the results of the classification for regions and selected countries respectively. The latter refers to the subset of 38 countries, described in the Preface, with the oldest populations or the largest aged populations, together

Table 3.2 Age structure changes in selected countries, 1950–2025

Countries	1950	1975	2000	2025
North America and Australasia				
United States	Mature	Young, irregular	Aging I	Aging II
Canada	Mature	Young, irregular	Aging I	Old I
Australia	Mature	Young, irregular	Aging I	Aging II
New Zealand	Mature	Young, irregular	Aging I	Aging II
Northern and Western Europe				
United Kingdom	Mature	Mature	Aging II	Old I
France	Mature, irregular	Mature	Aging I	Old I
Switzerland	Mature	Mature	Aging I	Old II
Belgium	Mature, irregular	Mature	Aging II	Old II
Netherlands	Mature	Young, irregular	Aging I	Old I
Denmark	Mature	Mature	Aging I	Old I
Norway	Mature	Mature	Aging I	Old I
Sweden	Mature	Mature	Aging II	Old II
Finland	Mature	Young, irregular	Aging I	Old II
Germany	Mature, irregular	Mature	Aging II	Old II
Austria	Mature, irregular	Mature	Aging I	Old II
Southern Europe				
Italy	Mature	Mature	Aging II	Old II
Greece	Young, irregular	Mature	Aging II	Old II
Slovenia	Mature, irregular	Young, irregular	Mature	Aging, undercut
Spain	Mature	Mature	Aging II	Old II
Portugal	Mature	Mature	Aging I	Old I
Eastern Europe				
Poland	Young, irregular	Young, irregular	Mature	Aging, undercut
Czech Republic	Mature, irregular	Mature	Mature	Aging, undercut
Croatia	Young, irregular	Mature	Mature	Old I
Bulgaria	Young, irregular	Mature	Mature	Aging, undercut
Russian Fed.	Young, irregular	Mature, irregular	Mature	Aging, undercut
Ukraine	Young, irregular	Mature, irregular	Mature	Aging, undercut
Hungary	Mature, irregular	Mature	Mature	Aging, undercut
Latvia	Mature, irregular	Mature	Mature	Aging, undercut
Asia and Latin America				
Japan	Very young	Mature	Aging II	(very old)
Singapore	Young	Young	(mature, v. undercut)	(old, irregular)
Hong Kong	(v. young, irregular)	Young, irregular	(mature, v. undercut)	Aging, undercut
China	Very young	Very young	Mature, undercut	Aging I
Indonesia	Very young	Very young	Young	Mature
India	Very young	Very young	Young	Mature
Bangladesh	Very young	Very young	Very young	Mature
Pakistan	Very young	Very young	Very young	Young
Mexico	Very young	Very young	Young	Mature
Brazil	Very young	Very young	Young	Mature

Source: Cluster analysis of age data (standardized) from United Nations (2001)
Note: The 'aging' and 'old' groups were divided into populations with percentages aged 65 and over that were at or below the average for the group (aging I, old I), or above the average (aging II, old II). Bracketed descriptions denote ages structures occurring only once or twice in the classification

with a further four countries of particular interest for comparisons. The countries are listed mainly by region in Table 3.2, for comparability with later analyses, especially the grouping of countries in Chap. 17. Dominating the global pattern are trends in developing countries, which now have by far the greatest numbers of older people. Hence the age structure classifications for the less developed regions are the same as for the world as a whole, with very young profiles giving way to young by 2000 and mature by 2025. The same pattern occurred in the United Nations regions of Asia, except for Eastern Asia, as well as in all the constituent regions of Latin America and the Caribbean. This was also true for 4 out of the 7 countries with the largest projected aged populations in 2025, namely, India, Indonesia, Mexico and Brazil.

Nevertheless, differences in the pace of fertility change are producing variations among developing countries. The least developed regions, including much of sub-Saharan Africa, remain very young over the whole 75 years. In contrast, China, Hong Kong and Singapore are aging relatively rapidly (Table 3.2). Although these three have high growth economies, the UN includes them in the less developed regions. After China, Japan – with a population in 2010 of 127 million – is the next most populous country in Eastern Asia. Japan is ahead of China in terms of aging, because of its higher life expectancy and because its rapid fertility decline after the Second World War brought an early start to its experience of below replacement fertility. Out of all of Asia, Latin America and Africa, regional population aging is pronounced only in Eastern Asia.

Meanwhile, the more developed regions had mature profiles in 1950 and 1975, leading to aging and old profiles in 2000 and 2025 respectively. Their mature age structures in 1950 and 1975 correspond to those projected for much of Asia and Latin America in 2025. The recent history of more developed regions reveals heightened aging associated with the crossover from the first to the second demographic transition. When populations with mature age structures experience sustained below-replacement fertility, undercut and rapidly aging profiles soon emerge.

Europe's age-structure changes are consistent with the more developed regions pattern overall. In coming decades Europe is likely to have some of the world's highest percentages in older ages. Its age structure is also developing greater inherent momentum of decline and all regions of Europe are aging significantly. Whereas Northern Europe's pattern of age structure change is the same as that for the sub-continent overall, Western and Southern Europe both have somewhat older age structures in 2000 and 2025. Because of the size of their populations, Germany, Italy and Spain have a considerable impact on the aging of these two regions. Countries with the youngest age structures in Europe in 2025 are the United Kingdom, France, the Netherlands, Denmark and Norway.

Like Eastern Asia, Eastern Europe has had a distinctive experience of age structure change and aging (Table 3.1). Its young irregular and mature irregular profiles in 1950 and 1975 were the net outcome of turbulent national histories, including the effects of the Second World War, subsequent refugee movements and continuing political oppression and upheaval. Peaks and valleys in Eastern Europe's age structures have generated sharp changes in the numbers advancing from one age group to the next. Despite these circumstances, fertility in Eastern Europe remained relatively

high over this period (TFR 2.9 to 2.2) and even in 2000 the region's age structure was still mature. The shift to an aging undercut age structure by 2025, is indicative of an expected acceleration of aging associated with low fertility bringing a falling representation of children and people in the working ages. Most of the individual Eastern European countries in Table 3.2 also have this type of age structure in 2025.

More moderate patterns of aging are evident in the United States, Australia and New Zealand which had prolonged baby booms after the Second World War and whose fertility has been projected to remain relatively high for developed countries. Thus despite having mature age profiles in 1950, they underwent rejuvenation leading to young irregular profiles in 1975. Similarly in 2025 their age structures are projected to be younger than that for developed regions overall (Table 3.2).

3.4 Labour Force Changes

The sustainability of higher levels of population aging will depend substantially on the size and productivity of national labour forces, which low birth rates and longer life have the potential to undermine and overburden. Prospective changes in the numbers of working age are indicators of the ability of societies to support the financial demands of aging populations. Total numbers aged 15–64 are an initial measure of labour resources despite the fact that many are engaged in domestic duties or full-time education, or are unemployed or unable to work. In the future, higher labour force participation among adults of all ages may augment labour supplies independently of the size of the 'working age' population.

United Nations projections highlight the impact that low birth rates may have on labour force numbers, especially in the longer term (Table 3.3). At a regional level, Europe is the only major region projected to experience a decline in the working

Table 3.3 Changes in total and working age populations, United Nations regions and selected countries, 2000–2050

	Total population		Working ages (15–64)	
Region/country	Numbers 2000 (thousands)	% change 2000–2050	% change 2000–2025	% change 2025–2050
Global summary				
World	6,115,367	49.6	36.9	11.5
More developed regions	1,194,970	6.7	0.5	−7.9
Less developed regions	4,920,401	60.0	46.5	15.0
Africa	819,461	143.9	88.0	56.5
Asia	3,698,294	41.5	37.3	5.0
Eastern Asia	1,472,443	8.7	13.1	−14.0
Europe	726,570	−4.9	−5.1	−14.7
Eastern Europe	304,085	−21.1	−13.5	−21.4
Northern Europe	94,357	19.3	7.6	1.9
Southern Europe	145,119	5.9	2.9	−17.0
Western Europe	183,002	1.0	−3.5	−11.7

(continued)

Table 3.3 (continued)

Region/country	Total population		Working ages (15–64)	
	Numbers 2000 (thousands)	% change 2000–2050	% change 2000–2025	% change 2025–2050
Latin America and the Caribbean	521,228	39.9	39.0	2.3
Northern America	318,657	40.7	19.2	8.9
Oceania	31,161	64.7	34.3	18.8
North America and Australasia				
United States	287,842	40.3	19.4	9.1
Canada	30,686	44.7	17.0	6.6
Australia	19,170	49.8	21.6	9.9
New Zealand	3,869	38.3	20.8	5.3
Northern and Western Europe				
United Kingdom	58,909	22.8	9.8	4.2
France	59,129	14.4	3.7	–3.5
Switzerland	7,185	18.5	5.0	–2.2
Belgium	10,193	12.7	2.5	–3.9
Netherlands	15,914	9.3	0.0	–5.6
Denmark	5,336	4.0	–2.1	–4.3
Norway	4,484	32.6	16.7	4.9
Sweden	8,860	19.3	6.2	3.7
Finland	5,173	5.2	–4.7	–3.8
Germany	82,073	–14.1	–11.3	–21.8
Austria	8,006	6.4	1.9	–12.7
Southern Europe				
Italy	57,114	–0.1	–1.7	–19.5
Greece	10,944	0.0	–2.8	–17.0
Slovenia	1,987	–1.6	–6.8	–16.3
Spain	40,267	27.3	15.7	–14.1
Portugal	10,227	–2.1	–0.4	–20.7
Eastern Europe				
Poland	38,431	–16.7	–8.9	–23.5
Czech Republic	10,224	0.7	–4.7	–13.6
Croatia	4,504	–15.1	–11.4	–18.4
Bulgaria	8,009	–32.7	–20.3	–31.0
Russian Federation	146,672	–20.8	–14.2	–19.8
Ukraine	48,870	–28.3	–18.8	–23.6
Hungary	10,214	–12.5	–10.0	–15.7
Latvia	2,371	–21.9	–14.7	–19.6
Asia				
China	1,266,954	11.8	16.5	–12.7
India	1,042,592	54.8	53.6	12.9
Japan	126,703	–19.8	–17.0	–27.7
Singapore	4,017	30.0	21.5	–15.3
Hong Kong	6,668	29.3	9.3	–7.9

Source: Calculated from United Nations (2009)

ages 15–64, namely 5% 2000–2025 and 15% 2025–2050. At a sub-regional scale only Northern Europe, which includes the UK and the Nordic countries, maintains labour force growth until mid-century. Heavy sustained losses occur in Eastern Europe as net outward migration reinforces depopulation. Labour force decline and overall population decline often go together in Eastern Europe with Bulgaria, the Russian Federation and Ukraine having the highest losses (Table 3.3). Southern and Western Europe may also have high labour force losses in the second quarter of the century due to the cumulative effects of low fertility. Germany is the only Western country with substantial overall population decline and labour force decline projected for the first half of this century.

Perhaps surprisingly, Italy's projected total population at mid-century is close to its total at the start of the century, but the working ages decline by 20% in the second quarter (Table 3.3). The size of Italy's population at 2050 is reasonably consistent with 2007 projections from the Italian National Institute of Statistics (ISTAT 2007). However the figures differ substantially from a previously projected 25% decline in its total population 2000–2050 (United Nations 2001). The absence of overall population decline in the newer figures is due to higher projected total fertility rates of 1.4–1.7 for 2010–2050, instead of 1.2–1.6, together with life expectancy rising to 88.4 for females in 2050 instead of 85.6. These changes maintain moderate overall growth until about 2015, after which numbers decline continuously to 2050. Net immigration of 150,000 per annum after 2015, which is half the figure in the 2000 series, becomes increasingly inadequate to offset the depopulating effects of Italy's low fertility regime in which deaths are expected to exceed births by a greater margin each year (ISTAT 2007). Thus the similarity between Italy's population totals at 2000 and 2050 masks a situation where there is no natural increase, a top-heavy age structure is developing as growth occurs only at the apex of the age pyramid, and there is a considerable decline in the numbers of working age. Italy's level of aging is high at 33% aged 65 and over in 2050. Greece, Portugal, Spain and Slovenia are other Southern European countries with substantial labour force declines after 2025 and levels of aging above 30% by 2050 (Table 3.3).

Previously (United Nations 2001) the same was anticipated in some other Western and Northern European countries, but higher fertility and life expectancy assumptions have greatly moderated this, as well as reducing projected levels of aging at 2050. Nevertheless, in Europe only the United Kingdom, Norway, and Sweden have appreciable labour force growth in the 2008 projections. Much greater population and labour force growth is anticipated for Australia, New Zealand, Canada and the United States. Yet even these countries are confronting economic concerns arising from population aging, which emphasizes the challenge that awaits countries less favourably placed in terms of maintaining their labour forces. Among the developed countries, Japan stands out as having the oldest population, as well as the greatest declines in total numbers and people of working age outside of Eastern Europe (Table 3.3).

Meanwhile, great increases in the numbers of people of labour force age are projected for Africa, Asia and Latin America. Small island states of the Caribbean and Oceania will also experience relatively high increases that will be difficult to absorb locally.

Most dramatic is the expectation that India's population of working age (15–64 years) could increase by about 54% in the first quarter of this century. India is overtaking China as the world's most populous country. China's labour force may grow by 16% (141 million) 2000–2025, but, by 2050, the numbers are likely to fall close to the 2000 total because of the smaller size of cohorts born since the 1970s.

Migration from developing to developed countries offers some mutual benefits, including migrants' remittances to relatives at home. However, the number of migrants that countries with the oldest populations can absorb, while maintaining economic and social stability, could be too low to offset their own labour force deficits, or to have any appreciable effect on numbers in the most populous countries of emigration. At the same time, the potential supply of immigrants is much more limited than population statistics imply, because the workers now in greatest demand by countries of immigration – people with occupational skills and qualifications – are in shortest supply and are often those that the places of origin can least afford to lose.

3.5 Generational Changes

Generational changes, entailing shifts in the relative size of cohorts at different stages of life, have further implications for the ability of societies to maintain themselves. The projections suggest there will be dramatic variations through time in indicators of this, such as national labour market entry-exit ratios. These reveal generational differences underlying labour force decline as the numbers at labour force entry age (15–24) fall below the numbers at labour force exit age (55–64). The regional figures in Table 3.4 point to an almost world-wide shift in this direction, with only Africa and parts of other less developed regions defying the trend. Unprecedented labour shortages could occur in many countries as aging peaks, necessitating higher and longer labour force participation as well as higher labour productivity.

In 2000, only Germany, Italy and Japan had fewer at the entry ages than at the exit ages. The ratios were favourable for labour force growth in all the other countries. Some had particularly high ratios in 2000, including Hong Kong and Singapore and parts of Eastern and Southern Europe (Table 3.4). By 2025 the situation could change dramatically in the developed countries, with only the United States, Australia and New Zealand projected to have either an excess of entries or a balance of entries and exits. Germany, Austria and Japan, together with Hong Kong, Singapore and several Southern European countries, might all have ratios of less than 70 entries per 100 exits. These reversals mainly reflect the impact of deficits in generation building. The situation in 2050 is far more uncertain but the projected upswing in total fertility rates – for example to between 1.7 and 1.9 in the sub-regions of Europe in 2050 – would ameliorate the situation. This reflects that age structure changes are sensitive to seemingly minor alterations in birth rates, as even a positive change of 0.2 in a total fertility rate entails an appreciable number of extra births

Table 3.4 Indices of generational changes, United Nations regions and selected countries, 2000, 2025 and 2050

Region/country	Labour market entry-exit ratio[a]			Aging index[b]			Aged dependency ratio[c]		
	2000	2025	2050	2000	2025	2050	2000	2025	2050
Global summary									
World	275	157	113	22	43	83	11	16	25
More developed regions	134	85	84	78	131	170	21	33	45
Less developed regions	338	177	119	15	33	72	8	13	23
Africa	489	399	225	8	12	26	6	7	11
Asia	297	144	96	19	44	97	9	15	27
Eastern Asia	207	82	71	31	85	164	11	22	40
Europe	132	78	77	84	137	182	22	32	47
Eastern Europe	157	84	67	71	120	167	19	28	43
Northern Europe	118	89	92	82	115	144	24	31	39
Southern Europe	125	70	78	105	157	222	25	34	57
Western Europe	106	72	84	93	160	197	24	38	51
Latin America and the Caribbean	343	159	96	18	48	114	9	16	31
Northern America	161	106	97	58	100	130	19	29	36
Oceania	194	135	120	38	66	98	15	23	30
North America and Australasia									
United States	162	109	99	57	97	126	19	29	35
Canada	147	78	85	66	127	164	18	32	43
Australia	149	98	98	61	107	143	19	30	40
New Zealand	157	99	92	52	97	140	18	29	39
Northern and Western Europe									
United Kingdom	116	89	95	84	112	139	24	31	38
France	140	97	99	86	135	166	25	37	47
Switzerland	106	72	91	89	148	166	23	35	45
Belgium	118	81	94	97	134	166	26	36	46
Netherlands	118	81	98	73	135	162	20	35	44
Denmark	100	87	100	80	130	148	22	34	40
Norway	128	92	94	75	112	146	23	31	40
Sweden	102	90	88	93	126	146	27	36	41
Finland	119	86	89	82	145	164	22	40	44
Germany	85	54	67	105	203	258	24	40	59
Austria	106	64	76	91	158	210	23	34	52
Southern Europe									
Italy	99	64	77	129	193	247	27	39	62
Greece	132	68	75	108	169	230	24	35	57
Slovenia	140	67	72	88	158	212	20	35	54
Spain	145	72	85	114	137	215	25	32	59
Portugal	134	72	75	100	169	242	24	35	59
Eastern Europe									
Poland	196	82	57	64	150	235	18	32	52
Czech Republic	143	82	73	84	135	179	20	32	48
Croatia	123	73	73	92	152	195	23	35	49
Bulgaria	123	71	66	106	155	212	24	34	55

(continued)

Table 3.4 (continued)

Region/country	Labour market entry-exit ratio[a]			Aging index[b]			Aged dependency ratio[c]		
	2000	2025	2050	2000	2025	2050	2000	2025	2050
Russian Federation	162	88	71	68	109	145	18	27	39
Ukraine	128	77	68	80	116	154	20	29	42
Hungary	131	86	73	90	138	177	22	31	44
Latvia	117	75	62	86	121	168	23	30	44
Asia									
China	229	84	71	26	74	153	10	19	38
India	361	207	102	12	30	75	7	11	20
Japan	98	68	66	118	269	337	25	50	74
Singapore	168	52	61	33	185	291	10	35	58
Hong Kong	189	45	57	65	186	289	15	34	58

Source: Calculated from United Nations (2009)
[a]Labour market entry-exit ratio: persons 15–24 per hundred 55–64
[b]Aging index: aged (65+) per hundred children (0–14)
[c]Aged dependency ratio: aged per hundred 15–64

and subsequent labour force entrants. For example, assuming a TFR of 1.9 in the first half of this century (as well as constant mortality and zero net migration) the UK's population would be nearly 10% higher in 2050 than if its TFR was 1.7. Despite this, moderate increases in fertility would not of themselves prevent net losses from labour forces cumulating for decades.

Others aspects of generational changes, such as shifts in the relative sizes of younger and older age groups, have further implications for the ability of societies to maintain themselves. Coming decades will witness dramatic shifts in indicators of this, namely the aging index and the aged dependency ratio. Large cohorts continue to rise up the age structure 'escalator' to the older ages while below replacement fertility results in falling numbers of children. Even in the year 2000, Germany, Japan and Southern European countries already had numbers of older people equal to or exceeding the numbers of children, as shown by aging indices of 100 or more (Table 3.4). The statistics for 2000, however, only mark the beginning of the shift towards the situation where the aged outnumber children. By 2025, in Germany and Japan there could be two older people to every child, while in all the other countries in Table 3.4 the aged are also projected to outnumber children substantially – except in Australia, New Zealand and the United States. The figures for 2050 more strongly reflect consequences of long-term below replacement fertility which would deepen the trend and extend it to all countries. This would include the United States where the 2008 medium variant projections assume below-replacement fertility after 2015. Extreme outcomes in 2050, with two or three older people per child, are anticipated in Japan, Singapore, Hong Kong, Germany, Austria, parts of Eastern Europe and most of Southern Europe.

Of itself, the contracting size of the child generation is unlikely to free up sufficient extra resources – for example from the funding of primary and secondary education – to offset the extra costs of a much larger generation of the aged. An early estimate for

OECD countries indicated that per capita public expenditure on persons aged 65 and over in more developed countries was three times higher than for children under 15 (Holzmann 1988: 430). A later estimate found that a child absorbs more resources than an old person, with the result that the first 20 years of life cost more, especially in terms of private expenditure, than the total years lived after 60. Combining public and private expenditures, children appear more expensive per capita. This seems to imply that the decreased cost of supporting children is offsetting the increased cost of supporting the aged. Yet much of the decreased cost of children will be a saving in private expenditure, which the taxation system cannot easily redirect to the aged (Easterlin 1996). Some writers envisage intergenerational rivalry arising from competition for society's resources, especially in view of the mounting political weight of the elderly. Where they comprise a quarter of the total population, they will comprise a higher proportion of the electorate nationally and even a majority in certain communities of out-migration and retirement. Yet the aged are diverse in terms of age, social class, ethnicity, disposition and political allegiances; older voters have an interest not just in their own welfare but in the welfare of their children, their grandchildren and the wider community.

The so-called aged dependency ratio, despite its disadvantages (see National Research Council 2001: 42), helps to illustrate the mounting difficulty of raising sufficient tax revenue from people of working age to support the elderly (Table 3.4). Like the aging indices, aged dependency ratios are useful indicators of changes in the relative numbers in broad age groups. The ratio of older people to 'workers' is particularly relevant to issues surrounding the economic sustainability of population aging. The model of the demographic transition shows that aged dependency peaks in the post-transition stage at 25 older people per hundred of working age (see Table 1.3). As noted earlier, however, the effects of continuing demographic change, as exemplified in projections for Italy to 2050, could raise the aged dependency ratio above 60 older people per hundred 15–64. In a number of countries, the aged dependency ratios are projected to more than double in the first half of this century, with substantial increases already by 2025 (Table 3.4). Particularly high ratios, of 50 aged per 100 workers in 2050, are projected for Germany, Austria and the countries of Southern Europe. Such figures denote major changes, especially considering that many people of working age are not in the labour force. More favourable ratios are projected for the United Kingdom, the United States, Australia and New Zealand. Yet even in these countries trends in aged dependency ratios have already prompted policy interventions.

3.6 Conclusion

Age structure changes underlie the 'silent revolution' transforming societies around the world. The revolution proceeds from the flow of generations from one stage of life to another. The revolution has been long expected, but never on the scale now anticipated because of the cross-over from the demographic transition to circumstances

associated with the second demographic transition. Dramatic changes are occurring in the quantum of generational flow. In the past, younger generations always outnumbered their parent's generation; now in many countries this long-established pattern is reversing. Indices of generational change and labour force change capture key consequences of shifts in age structure evolution. They provide examples of projections demonstrating futures that in a majority of cases would be better avoided. Labour force trends are a major influence on the sustainability of population aging. Even more fundamental are developments in family formation which ultimately drive much of the processes of generational change and age structure evolution. A particular challenge for the immediate future in many countries is to reshape age structure evolution through policies that are ultimately conducive to near-zero population growth, rather than to high rates of population growth or to population decline and hyper-aging.

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